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FORAY NEWFOUNDLAND AND LABRADOR

is an amateur, volunteer-run, community, not-for-profit organization with a mission to organize enjoyable and informative amateur mushroom forays in Newfoundland and Labrador and disseminate the knowledge gained.

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foray AT nlmushrooms DOT ca,

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COVER

Amanita muscaria var. *guessowii*, as Atlas bearing the world; photo Maria Voitk, Sandy Point, NL, August 6, 2011. Or, potpourri of bryophytes, fungi, gymnosperms and lichens.

We can separate the depicted groups alphabetically, as above, or by their looks, their breeding habits, their genetic lineage, their function, their edibility or any other characteristic we choose. That is taxonomy.

Each classification (taxonomic ranking) gives us a different understanding of these organisms, but has no effect on them. More inside.

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Message from the Editor

Welcome to our TAXONOMY ISSUE! Taxonomy may not be why you took an interest in mushrooms at first, but there is very little to write about in the middle of winter. (Except perhaps very rarely about *Phyllotopsis nidulans*, but that is here because we needed a one-pager to keep an even number of pages, and has otherwise nothing to do with the theme of this issue.)

This issue has the first clade tree to appear in OMPHALINA. This is a basic tool of most DNA marker analysis. Virtually no new species or reassignment of an old species will be published these days without a phylogeny diagram. If you were ever curious about the information such "DNA analysis" provides, this is a mandatory introduction. To help you get more out of these diagrams, we offer a hands-on tutorial in interpreting clade diagrams first. In fact, we have a plan:

> You learn how to read one in this article. Then you try it on a real-life diagram in the next article. After you have tried it, turn to page 20 and compare your interpretation to that of an expert. The next three times such a diagram appears in future issues, you interpret it again, and a professional interpretation will appear elsewhere in the same issue that you can use for comparison and learning. The fifth time such diagram appears, we shall do a test: submit your interpretation and earn a prize.

One of the end results of taxonomy is an ability to distinguish one taxon (named species or group of species) from another, i.e. accurate identification. Is that important? The story of Nick Evans and *Cortinarius rubellus* (summarized from published articles in the British press) gives one perspective. You will do well to study the accompanying mushroom pictures closely and answer the question yourself.

You may think that in art the identity of the subject does not influence the aesthetics. However, a large part of the enjoyment of art derives from the complexity of associations it evokes. Glynn Bishop's pencil sketches are enjoyable in their own right, but become much more so, if they elicit echoes from your own experience, allowing you to deduce their names and compare to pictures of your own (as the Editor did in this case). Accurate portrayal of species adds another layer of complexity to mushroom art, at least for those interested in mushrooms as well as art.

OK, this issue may be a bit heavy. We are not ashamed to admit that we had a difficult time with some of the concepts. Just persevere with it in good spirit, and on our part we promise not to repeat this type of issue any time soon—unless there is a huge outcry among the membership, clamouring for more! And, of course, we sincerely invite comments that might help us guide the direction of future issues.

Happy mushrooming!

andrus

Oblivious to all this frantic academic (nomenclatural) *bustle, Muskflowers and most naturalists pleasantly carry on their normal lives because in nature it matters not a whit what others call you, it only matters how you interact, cope, and cooperate with your fellow biosphere travellers.*

Guest Editorial

Henry Mann:

Taxonomy, Madness and Life

Classifying organisms by defining group boundaries is a madness that has consumed individuals, organizations and journals, and rancorous debates continue to rage by those grasping tightly to their treasured insights. “Madness”, because we try to define the indefinable. No genus, species or variety exists in the physical world, never has, never will. They are will-o’-the-wisps, mental constructs, human concepts without basis in reality. Only individual organisms exist, floating in a fluid matrix, interacting, dispersing, recombining, much like the molecules of water in a pond, the matrix being fairly stable, but never the same from one moment to the next. Individuals and groupings change with the passage of time, yet like robots we force all the flux of life into a series of fixed hierarchies. Each category in our hierarchy is a leaky box. As fast as we pigeonhole organisms into boxes, they leak out, especially from the boxes at the base of the hierarchy (genus/species/variety). Boxes hold them barely long enough that in our short lifespan we get an illusion that we have created a stable system. DNA marker analysis has not alleviated this madness, but in some ways intensified it.

The boundaries between species lie arbitrarily here for this group, there for another, essentially determined by the authorities *du jour*, more based on authority than objective criteria. Cladistic techniques clearly indicate that fixed boundaries are imaginary. All that can be said with certainty is that today some amplified sequences are more similar or less similar, a Sesame Street exercise. Tomorrow they will have a different relationship.

Change is an unsettling reality that we prefer to deny. This is the basis of the schizophrenic madness, not only in taxonomy, but in all aspects of our lives. Change continually waves the flag of mortality before us and we shield our eyes not to see that which makes us uncomfortable. A good career, a good home, a good personal relationship, a loving family, good health are aspects of life we desire to endure, to last forever, but these like the concepts of genus, species and variety are ephemeral, forever changing, leaking out of the boxes in which we have them sequestered. Attempting to impose stillness on flow is an unsettling impossibility, a paradox that may be necessary to human mental, perhaps even physical survival. Our minds have developed the ability to remember the past as well as project into the future. We grapple with the concept of infinity, something too vast, scary and uncomfortable to fathom. We fear where change will take us, when what we desire is just some stability. Building boxes, however leaky, may be the only way we can root ourselves for our short duration. Maybe, instead of being mad as a hatter, we are really crafty as a fox, having developed a way to retain our integrity in the fluid matrix by denying the flow until it sweeps us away.

Someone once defined madness as doing the same things over and over, expecting different results. As long as we attempt to force round pegs into square holes we will continue to argue who is right and who is wrong. Perhaps this will be the result of the phylogenetic system, championed to replace the traditional Linnaean System of fixed hierarchical category-boxes. Let the groups fall where they may relative to one another and watch as they merge, recombine, diverge, split, or extinguish and cease to exist over time. Accept the flow of life and stop arguing about genus, species, variety. Tranquility at last!

But no! We have a need to name, organize and categorize! Logic and reality do not always provide the solace we need. We need to identify our surroundings by our senses. Our primary sense is sight, so a morphological system of recognizing plants, animals and fungi has been and may still be critical to our survival as a species. Perhaps escape from the classification madness requires a dual approach. We may need to expand our minds to accept the flow of life with its ripples, devoid of pigeonhole boxes—same and different do not matter, only the flow. At the same time we need to maintain a system of hierarchical boxes to keep our feet on the ground. The two views need not be conflicting, but as the left and right hand, we use whichever or both, as appropriate.

Is this an escape from madness or another madness? I don’t know…

Epiphany about *Macrotyphula contorta*

Andrus Voitk

This article is dedicated To Dave Malloch. Once, when I expressed frustration about the seemingly wide morphologic variation of a purported single species, he told me that fungi were living organisms, and to see if species were the same or different, all I had to do was to study their behaviour. Not very helpful, Dave! My grandchildren have behaviour, dogs have behaviour, but mushrooms just sit there, right?

To learn how wrong I was, let us begin with a brief summary of the taxonomic journey made by two species since their first description in 1790—through three genera, fusing, dividing and recombining along the way, to end up as one. Many workers, all with their own opinions and contributions, have been omitted to give you the bare bones highlights only. Much of this summary was put together with the help of Greg Thorn, who helped with some of the references and tirelessly corrected my erroneous interpretations.

Clavaria

- In 1790 Johan Theodor Holmskiold described two new species, *Clavaria contorta* and *Clavaria fistulosa* (Figure 1).[1]
- In 1904 Franz Xaver Rudolf von Höhnel stated, "*Clavaria fistulosa=Clavaria contorta*".[2]

Clavariadelphus

- In 1950 Edred John Henry Corner reassigned them to a new genus, *Clavariadelphus*, as varieties of the species *Clavariadelphus fistulosus*, viz *Clavariadelphus fistulosus* var. *contortus* (and *Clavariadelphus fistulosus* var. *fistulosus)*.[3]
- In 1958 Pilát recombined them as separate species, *Clavariadelphus fistulosus* and *Clavariadelphus contortus*.[4]

Macrotyphula

- In 1972 Ronald H. Petersen erected the genus *Macrotyphula*, to which he reassigned *C. fistulosus* as *Macrotyphula fistulosa*.[5] He did not make a new combination for a variety, but listed Holmskiold's *Clavaria contorta* as a synonym.
- In 1984 Walter Jülich published new combinations, making Holmskiold's two original taxa varieties of the species *Macrotyphula fistulosa*, viz *Macrotyphula fistulosa* var. *contorta* (and *Macrotyphula fistulosa* var. *fistulosa)*.[6]

Thus, currently within the genus *Macrotyphula* both Holmskiold's taxa are known as one species—either without differentiating between them (Petersen), or as varieties of the same species (Jülich). To consider them as more distantly related, a formal new combination is required. That will happen if evidence supports a classifiable degree of difference at the species or genus level. For now we follow Jülich.

The reason to load your already heavy burden in life with this additional seemingly useless baggage, is that recently I stumbled on events that suggest Holmskiold may have been right in considering the two as distinct and separate species. Here is a summary of my encounters with them (none with one and two winters with the other).

Macrotyphula fistulosa var. *fistulosa*

I have never seen this species and we have never recorded it at any of our forays. It is possible that we have missed or misidentified it, but given the many diverse, small, rare and otherwise unusual species that have been collected and identified[7], a much more likely explanation is that this species is either very rare or not present in our province. The few sources of information about it suggest the following: 1) It is a pure saprobe, fruiting on dead deciduous wood and litter on the ground. 2) It usually fruits in the late summer and fall. 3) It is distributed in temperate regions. 4) On the mainland of North America it is more commonly encountered than *Macrotyphula fistulosa* var. *contorta*. 5) Its swollen-topped fruitbodies are gregarious and erect, like organ pipes, possibly the origin of the common name pipe club fungus. 6) The fruitbodies are hollow inside, giving rise to the epithet (fistulosa=hollow), which is an identifying characteristic of Petersen's genus *Macrotyphula*.

Macrotyphula fistulosa var. *contorta*

I. Winter, 2010-2011 (Figure 2). I first encountered this species in 2010; it was identified for me from a photo by Esteri Ohenoja.[8] Once alerted, I found the species six times between November 2010 and March 2011, twice on *Alnus incana* ssp. *rugosa* and four times on *Betula papyrifera*. Each time it fruited on a dead branch of a living tree. In the case of the birch, all four were found on high dead branches of trees just felled.

II. December, 2011. On December 7-8, 2011, Newfoundland and Labrador was hit by a weather bomb, with winds clocked over 165 Km/h. In our coniferous woods trees were blown down, and our birch woods were littered by a remarkable carpet of broken off dead branches. Ordinarily it may be difficult to tell a newly fallen dead branch from an old dead branch, but this time it was obvious: snowless dark twigs and branches contrasted with the white snow cover below them. *Macrotyphula fistulosa* var. *contorta* was fruiting on at least every third branch examined.

Sequentia

While it may be difficult to draw valid conclusions from six encounters with a relatively uncommon fungus because the contribution of chance cannot be excluded, seeing such a massive number of fruitbodies at one time instills much more confidence that a consistent observation is significant. From the two winters (with a few parenthetical additions), the following can be concluded as reasonably reliable:

1. *Macrotyphula fistulosa* var. *contorta* is a very common fungus species in our province. Its remarkable abundance on recently fallen branches after the storm suggests that it may infest a majority of our mature birch. The likely reason that its commonness has not been appreciated, is because it
    a. resides high in the crown of mature trees, where it is not readily accessible for viewing to terrestrial human,

observers,

b. fruits during winter, when most people are not looking for mushrooms, and
c. is rather small and nondescript, escaping notice of all but the few fanatics with an eye perverse to the point of depravity for odd fungi.

2. It is primarily an inhabitant of birch in our province, very rarely found on alder and possibly on other deciduous hosts. (I examine alder very often, so finding only two collections after several years suggests that alder is a very infrequent host.)
3. It thrives in our northern climate.
4. It prefers to fruit during thaws in the winter. (All encounters to date have been between November and March; I have not seen it on recently felled birch in summer.)
5. *Macrotyphula fistulosa* var. *contorta* fruits exclusively on dead branches of living trees.

It is this last observation that deserves our closer attention. The rare privilege to see hundreds of downed *Macrotyphula fistulosa* var. *contorta* at one time in several birch woods commands heedfulness to their message. Singly barely audible, their massed voices shouted out, "Remark our common choice of substrate: a dead branch of a living tree!" Although it may seem that *Macrotyphula fistulosa* var. *contorta* decomposes dead deciduous wood in the air as its cousin does on the ground, reflection suggests this is not so. I examine brush piles, branches, stumps or logs left over from birch logging sites quite often without having ever found the species on dead wood. Every specimen fruits exclusively on dead branches of living trees, and none on dead wood alone. Ergo, *Macrotyphula fistulosa* var. *contorta* cannot survive on dead wood alone and requires the presence of a living tree. This suggests very strongly that its food comes from the living tree, not from digesting the dead branch, and that this fungus is an obligate parasite of living hardwood. It makes its

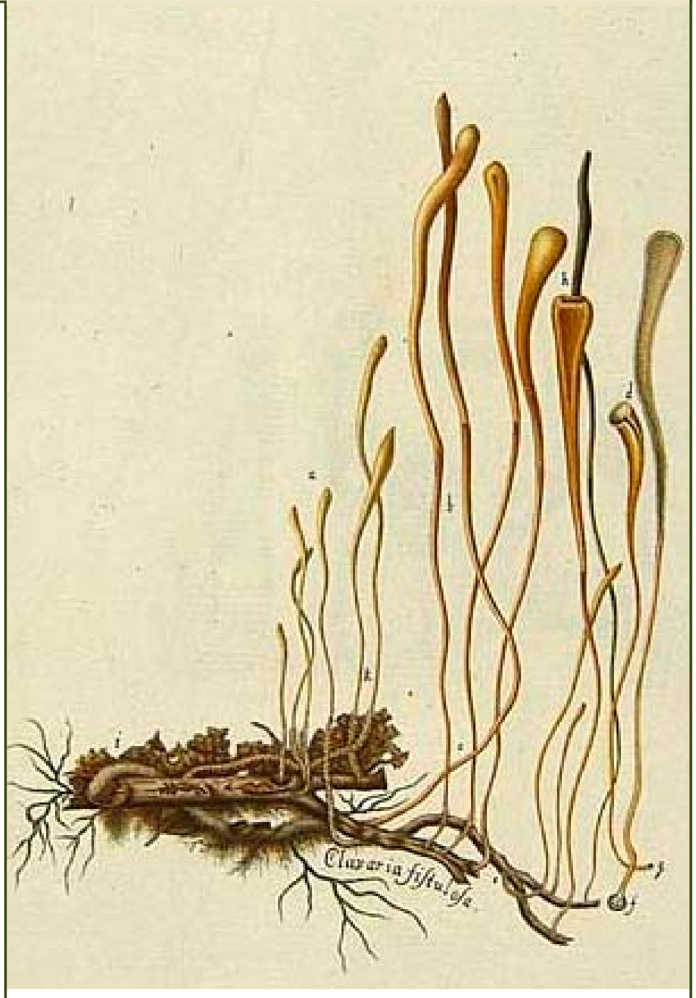

Figure 1. *Clavaria contorta*, top, and *Clavaria fistulosa* below, right, from Holmskiold's book. The pictures were commissioned from the artist Johan Neander, and coloured by J. C. Bayer. There seemed to be no doubt in the minds of the author or artists that these were different species. Illustrations from the web, now in the public domain.

Figure 2. *Macrotyphula fistulosa* var. *contorta*. Upper Left: Mature fruit bodies on birch one week after the branch was broken by storm. Upper Right: Young fruit bodies on standing alder. Below: Mature fruit bodies on standing birch. Note great variation in appearance and the finely granular coating of fresh fruit bodies, not seen one week after separation from tree. Two to three weeks later no evidence of these mushrooms could be seen and no new ones appeared.

living by either digesting live hardwood and absorbing the resulting sugars, or taking up the tree's sugars found in the sap. Therefore, its mycelium must be distributed through both live and dead tree. When a smaller branch dies (possibly being choked off or sucked dry by the mycelium), the organism sends out fruit bodies to the surface. The energy to create them must be transported by mycelium from the more proximal living tree tissues. Break that connection and the organism, dependent on living tissue for its sustenance, dies off, explaining why it is never found in brush piles or dead logs. In this regard its behaviour differs from *Plicaturopsis crispa*, for example, which may also be found on dead branches of living trees. The difference is that *Plicaturopsis* will also happily fruit on fallen dead wood, suggesting that it may not be an obligate parasite, if a parasite at all, but possibly a decomposer of dead wood.

If true, these conclusions provide an epiphanic insight into the nature of *Macrotyphula fistulosa* var. *contorta* in the light of the current taxonomic concept of this taxon. It would be unusual for an organism that makes its living only one way to be conspecific with another organism that makes its living a different way. Hence, an obligatory parasite is unlikely to be of the same species as a saprobe. *Macrotyphula fistulosa* var. *fistulosa* is known as a pure saprobe. It decomposes dead hardwood and litter. The seemingly exclusively parasitic nature of *Macrotyphula fistulosa* var. *contorta* differs so significantly from that of a saprobe, that it is very unlikely to be conspecific with or a variety of *Macrotyphula fistulosa* var. *fistulosa*

The little else we know about the two also suggests that they are distinct. Macroscopically *Macrotyphula fistulosa* var. *contorta* is misshapen and the other straight. The context of *Macrotyphula fistulosa* var. *contorta* is usually solid, thus not fitting well with the epithet "fistulosa", which means hollow. Or, for that matter, with Petersen's *Macrotyphula*: one of the four main identification features for the genus was its hollow nature.[5] Microscopically, according to Schild, an expert of this group, who has studied hundreds of collections, Holmskiold's *Clavaria contorta* has significantly longer spores than the other.[9] The taxa seem to have a different geographic distribution, *Macrotyphula fistulosa* var. *contorta* being found in colder climates. The fruiting time also differs, *Macrotyphula fistulosa* var. *contorta* fruiting during the snowy season. (Mushrooms using wind as a vector for spore dispersal must finish fruiting before they get covered with snow, if terrestrial, while their arboreal colleagues are free to fruit throughout the winter in periods of thaw.) All these differences suggest genetic divergence between these two taxa that is incompatible with conspecificity. Unless we are dealing with a species other than *Macrotyphula fistulosa* var. *contorta*, (e.g. a North American "sister species", or, for that matter, a complete misidentification) the odds are high that the two are very different species, as Holmskiold, and later Pilát, thought; it is even possible that his *Clavaria contorta* may belong to a genus other than the current *Macrotyphula*!

We have had the good fortune to interest Andy Methven, who has studied this group of organisms for a long time, to pursue this matter with further work, including genetic marker analyses. Stay tuned.

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Parting shot

This story shows the difficulty we run into with our scientific ranking systems, especially when it comes to rarely encountered species. The story is also a good example of how classification by behaviour helps us understand the nature of fungi. An opportunity such as I had is very rare. What the irascible Lloyd called "name shuffling",[10] is an opinion. Most uncommonly encountered species are seldom seen in their natural habitat, and taxonomic opinions are primarily based on examination of scattered dried herbarium collections. Corpses have form, but no behaviour.

Addressing this confusion, Breitenbach and Kränzlin[8] offer what must surely be a tongue-in-cheek explanation: the reason "certain authors" consider Pilat's *Clavariadelphus contortus* and Petersen's *Macrotyphula fistulosa* conspecific is that the contorted shape is merely the result of the poor mushroom's being "checked in its development by unfavourable conditions during growth". These "certain authors" might just as well use their unsubstantiated "explanation" to suggest that *Morchella elata* is the same as *Russula paludosa*, but just turned out black and gnarled because of unfavourable growth conditions! In fact, the causative linking of unhappy childhood to a subsequent twisted personality has been transferred from mycology to the behavioural and social sciences with great success. It is now the accepted pathogenesis behind some people's turning out well-balanced and good against all odds, thus becoming total misfits in our otherwise dysfunctional society.

CLASSIFICATION OF MUSHROOMS

Andrus Voitk

Set all things in their own peculiar place,
and know that order is the greatest grace.

John Dryden

All limitations belong entirely to the mind,
and we are perverse if we expect the
objective world to keep to our categories.

James Hamilton-Paterson

The obsessive compulsive in me would like to seek order along with Dryden, but the philosopher fears that Hamilton-Paterson has it right: order is an internal distortion, not reflected in the external world. Classifications are not a product of Nature, that we discover to our delight. Rather, they are products of our own creative effort, in an attempt to render what we see understandable—to us. Devised by us, they in no way bind Nature to obey them. Because they are our own devices, it should not be surprising that there are many, often conflicting, ways to classify natural phenomena, including mushrooms.

All classifications lump like with like, differing only in what is being compared. Friesian ranking compares morphology, the way mushrooms look. For over a century microscopic appearance has been added to the macroscopic. Biologic ranking uses the ability to breed—for mushrooms, only observable in artificial laboratory settings. Genetic or evolutionary ranking compares molecular patterns in DNA markers.

Each classification has it own use to help us understand fungi. The morphological approach is by far the most helpful to people wanting to identify mushrooms. With thousands of species, knowing them all by sight is impossible for most of us, without a system. By lumping like with like, we divide them into increasingly smaller groups, making the amount we need to know at any one time manageable. Thus, if we can get down to a genus, we can often identify the species with the help of a key, or even by matching pictures. This works well for putting the right name on our finds, but it does not really help us understand how they got here.

For that we turn to evolutionary classification, currently in vogue thanks to our relatively recent ability to analyze genetic material. DNA is examined and organisms with shared evolutionary pathways are lumped together. This method is much more helpful in telling us how they evolved, how they got here, what makes them different from other kingdoms and how certain lines differ from each other. We gain a limited insight into the process of evolution itself. At times this system has wrought real havoc with classical morphological classification, much to the fascination and delight of some and chagrin of others. This ranking is not very helpful to the person trying to learn to identify mushrooms. It is neither intuitive nor otherwise helpful to lump together a bolete, a gilled mushroom and a truffle, delighting in their shared genetics, while denying other truffles, gilled mushrooms, or those with pores entry into this group. Nobody will be able to learn to identify mushrooms by such an approach and therefore there will always be a need for morphological taxonomy in the foreseeable future—even if it is not valued very much at present.

If the objective is to understand how mushrooms work, what they do, and where they fit, none of the previous three classifications is helpful. Much more useful is to classify them according to behaviour. This democratic system cares not a whit for their looks, with whom they mate, or their family connections—only what they do on their own.

An example of this approach is the debate whether *Macrotyphula fistulosa* var. *contorta* really is a variety of that species or a separate species. As the previous article shows, knowing their shape and spore size does not seem to have helped to reach a firm conclusion. But perhaps knowing their behaviour will.

Generalizing from the specific, a behavioural classification can readily be erected for all mushrooms. The schema on the next page is an attempt at one such classification. Not heard of bichens or michens? Relax, neither have I. But the terms help to make a point: from a functional point of view, there is little difference between mushrooms that we call lichens and other mushrooms using a photobiont for a partner.

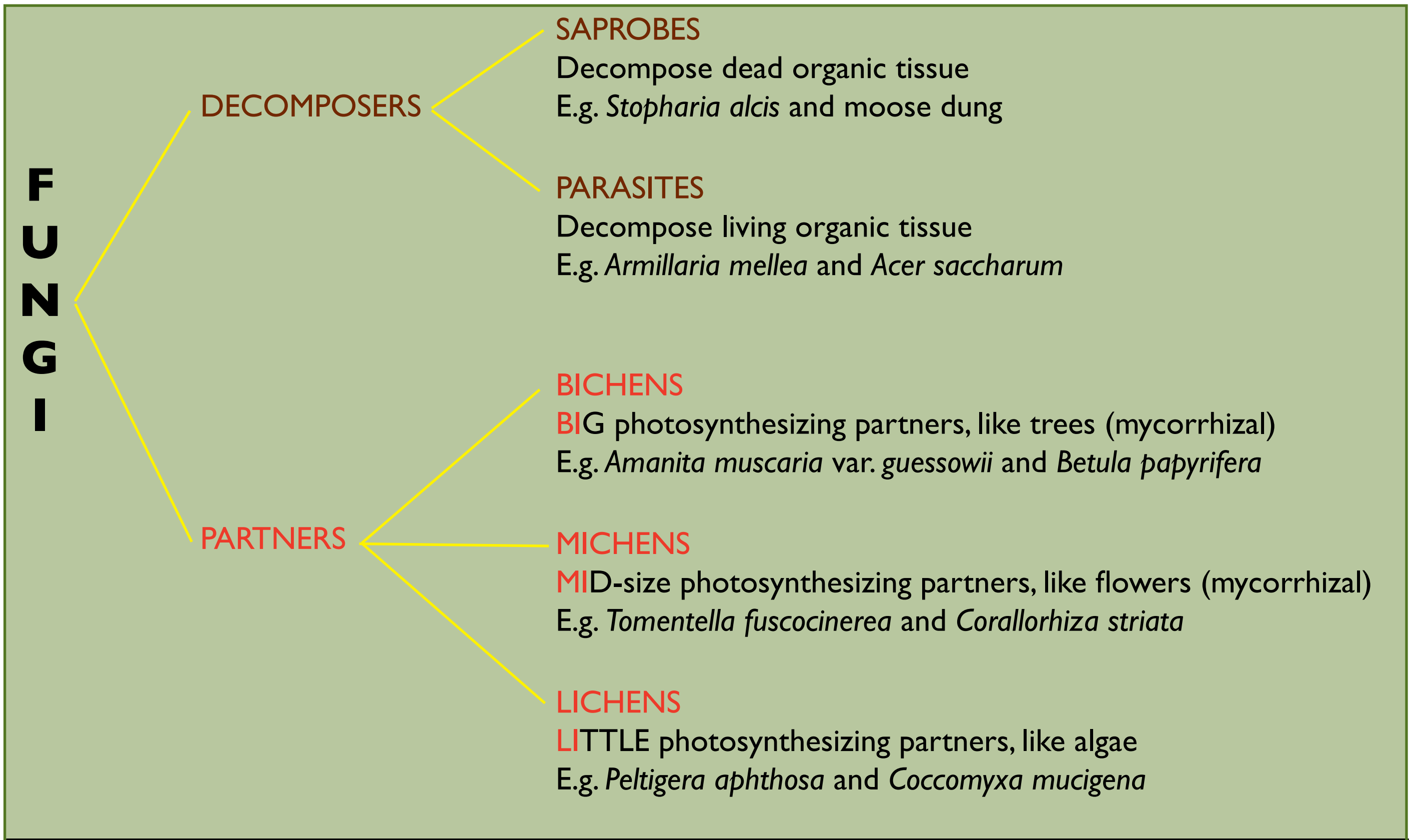
Although you may smile and scrutinize that table for evidence of tongue in cheek, please consider it a little closer. It does not help you to identify the mushrooms that you encounter. It does not help you to understand where mushrooms came from or how different lineages are genetically linked to each other. But it sure does explain what mushrooms do, their role in the system, how they glean their energy: what they contribute, what that costs, even who pays.

First, you see that mushrooms do only one of two things for a living: they either decompose organic matter to make sugars, or they enter a partnership with an organism capable of making sugars, trading water and minerals for some of these sugars. The decomposers break down either dead or living organic material. The former we call saprobes and the latter parasites. Food is food, whether quick or dead.

Considering the mushrooms that have chosen partnership routes, it becomes immediately clear that the important principle is to have an organism with chlorophyll, able to photosynthesize—a photobiont. The size of the organism is unimportant, and varies with the paths of coevolution these organisms took to their mutualistic ends. Thus, with one simple schema you understand where mushrooms fit in and what they do. As a bonus, you also see clearly what those fungi we call lichens are all about and where they fit in the fungal scheme of things.

A word of caution to biology students: do not reproduce this chart on a mycology exam asking you to classify fungi. Rather, reproduce whatever your professor told you—the time-honoured way to demonstrate your mastery of the subject. Spend the rest of the exam time pointing out how "Biology" is a hopelessly anachronistic and totally misapplied name for a department setting an exam in mycology. Bi-ology refers to the study of two kingdoms, plants (Botany) and animals (Zoology). A department that sets an exam in Mycology, study of Kingdom Mycota, should be renamed "Triology". Suggest that even older professors should be able to differentiate between two and three. That should surely earn you gratitude, respect, bonus marks and offer of a tenured staff position. Really.

And keep your eyes open for the first progressive school to officially announce a Department of Triology. Depending on whom you follow, we may be up to nine or more kingdoms, so surely Triology is neither trop risqué nor trop avant garde a dress for prim Lady Academia.



To make it more interesting, there are many with feet in two (or more) camps. E.g. *Fomitopsis pinicola* may be a saprobe and a parasite; *Morchella* species may be both decomposers and mycorrhizal partners; *Tomentella* species may be bichens with trees and michens with orchids. And so forth.

Interpreting a phylogenetic tree I

Michele Piercey-Normore

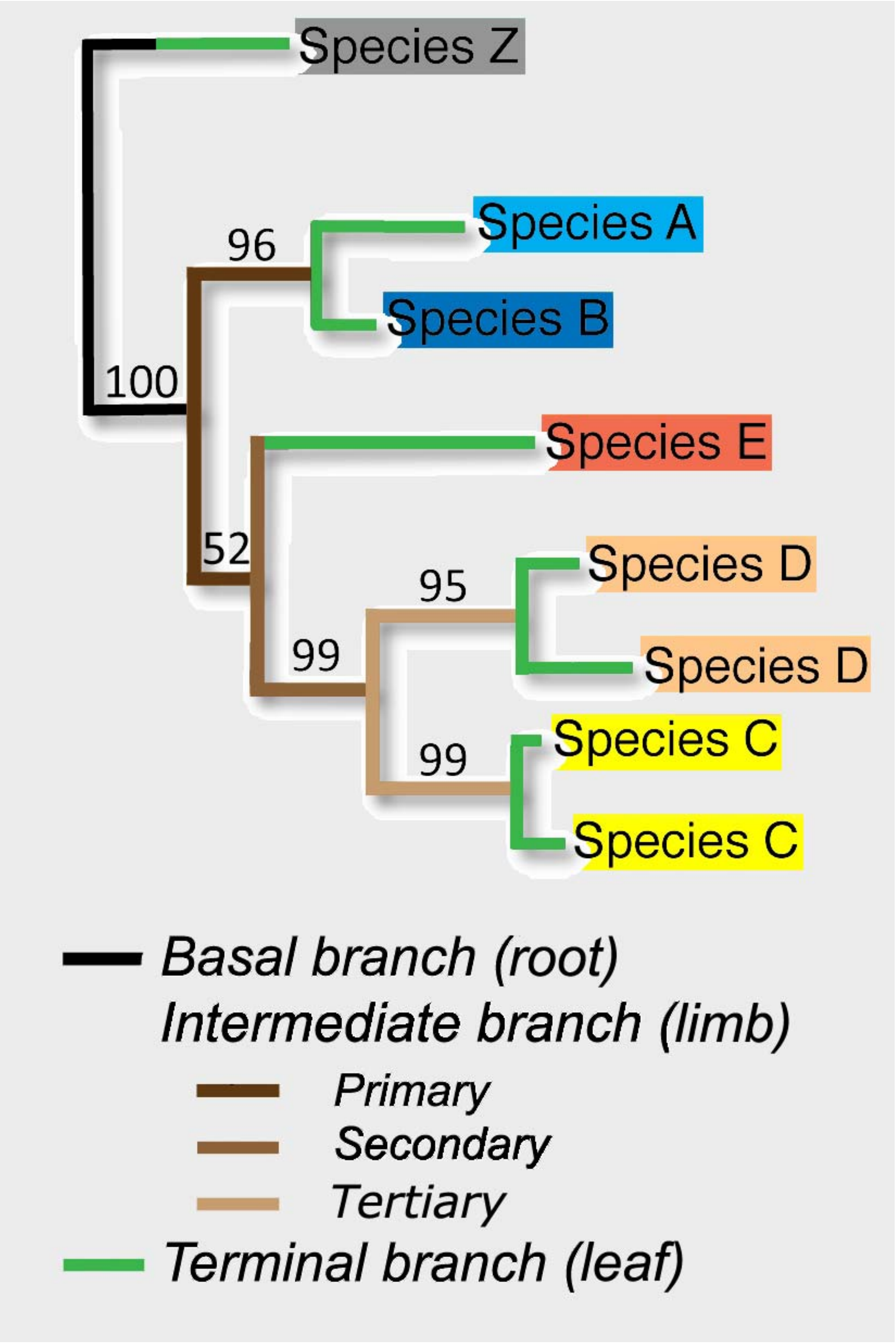
A phylogenetic tree can be represented by a tree diagram, much like that for a family tree. The oldest (great grandparents) are on the basal branches (often called root), members of subsequent generations (parents or grandparents) on the internal branches, and most recent members of the family (children) are on the terminal branches (often called leaves). The most closely related siblings cluster together and more distantly related family members (such as cousins) are found in different clusters. Phylogenetic trees are based on the same theory using similarities observed in present-day species to estimate a tree, which may span many generations over thousands or millions of years.

Apart from listing all family members, the branches of phylogentic tree diagrams may convey information about the relationship among members, confidence for the clusters, and evolutionary distance of the listed members. Let us use the theoretical diagram on the next page as an example. The members are listed by naming: Species A, B, C, D, E and Z. Their relationship to each other is shown by the bifurcating branches. The root of the tree is the black branch extending from the left of the tree (labeled with 100). It is swung around the tree to the right to facilitate the labeling of the terminal branch, species Z, arising from it. There may be any number of intermediate branches (3 levels shown in shades of brown). Terminal branches (green) denoting species can rise from any lower level. This is a monophyletic clade, a group where all terminal branches (species) are traced back to one single most recent progenitor.

Species Z is most distantly related to any of the species in the tree and is considered the root of the tree. A more distantly related species would branch behind species Z. How branches split from the root reveals the relationship between the species. The first (dark brown) intermediate branch splits all subsequent species along two limbs. All members arising from one limb are more closely related to each other than to any member arising from the other limb. Thus, Species A and B are closer to each other than either is to Species C, D or E; similarly, Species C, D and E are closer to each other than any of them is to Species A or B. The most closely related (and genetically similar) individuals are the two members of species C, and D, which arose as terminal branches from their respective tertiary (light brown) intermediate branch.

The length of each of the branches between the root and the terminal branch also indicates relative age of the species. Species D arose from the same intermediate branch that eventually led to Species C. Therefore it is closer to species C than to either species A or B. Both species A and B arose after one intermediate brown branch. Both species C and D arose after three intermediate brown branches. Therefore, species C and D are thought to be the most recent and newly evolved species in the tree.

Sometimes phylogenetic trees have numbers on the intermediate branches. These numbers represent a statistical level of confidence that the groups, which are connected by that branch, cluster together. For example, there is a 100% confidence level that the two lineages (dark brown branches) shown to arise from the root really do cluster together. That means that all these species, A, B, C, D, and E belong to one larger genetic grouping. Similarly, there is a 99% confidence level that members of species C are related with similar characteristics that no other species have. In other words, whoever identified them as Species C, was at least consistent and probably right on both occasions. Similarly, there is 95% confidence that the two members of species D are related with characteristics not shared by other species. There is 96% confidence that species A and B are related. Lastly, at 52% support, species E does not cluster significantly with any other species. Perhaps there was no other species that had a close relationship to species E, or none was collected or analyzed. Therefore, species E clustered with species C and D because no other species were more similar than these two.



The horizontal length of the branch represents the number of evolutionary changes that occurred to place that taxon in its position in the tree. The longer the branch, the more evolutionary changes it took to get there. For example, species A underwent a greater number of changes than species B. The combined length of the terminal branches between species A and B reflects the total number of differences between the two species. The combined length of the terminal branches between the two members of species C is less than that between species A and B. This relative difference between members of species C compared with species A and B, is evidence to support why both members of species C belong to the same species but species A and B are different species.

While this discussion is fresh in your mind, read the *Hygrocybe nitida* update on page 12. Then look at the phylogenetic tree published to illustrate the findings. See if you can interpret what the diagram reveals about the species it lists. Please note that instead of giving actual percentage figures of confidence, this tree uses another convention. Thick lines are used to denote branches which cluster groups whose similarity is statistically significant. The definition of significance varies; in this case it is defined as confidence levels of 85% or over.

When you are finished, compare your interpretation with the discussion of the diagram on p. 20.

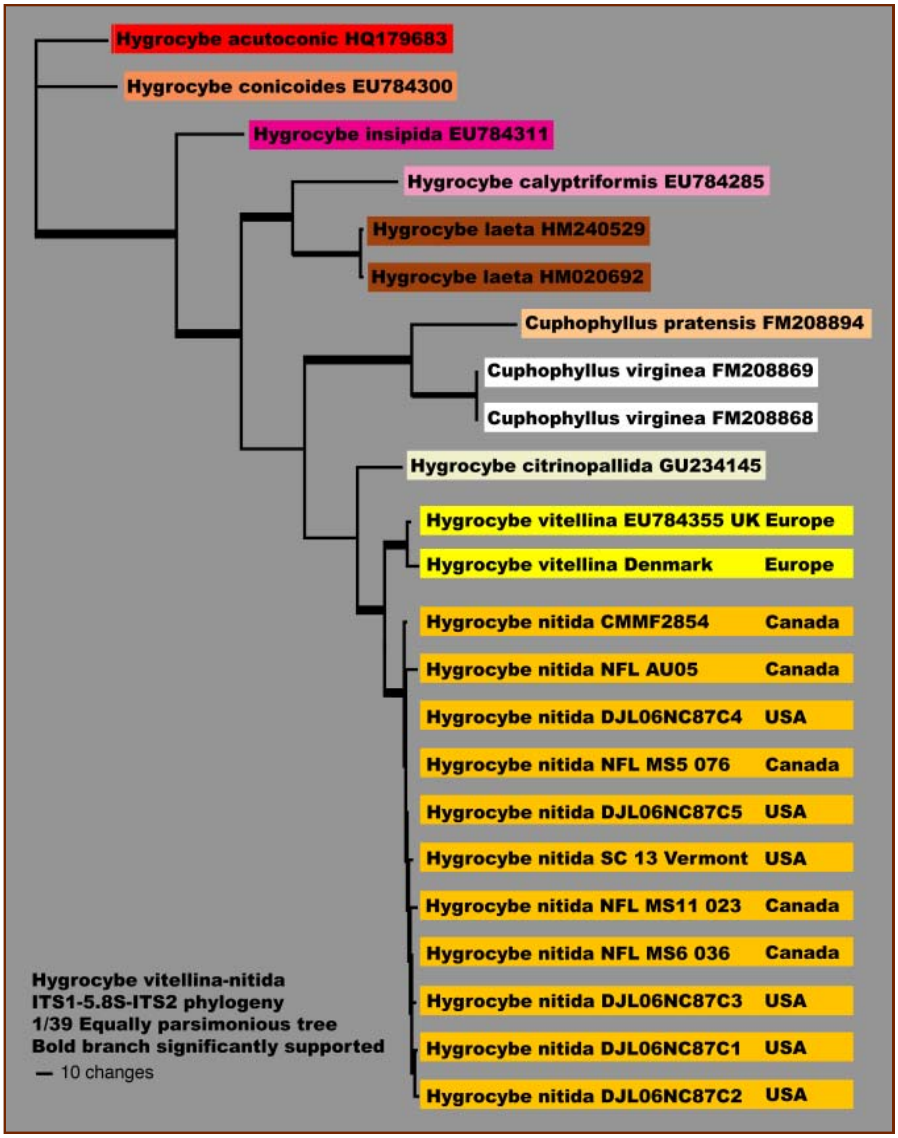
Update on

Hygrocybe nitida

David Boertmann

In 2009 I redefined the concept of European *H. viltellina*[1] and in 2011, at the request of Andrus Voitk and Renée Lebeuf, compared it with North American *H. nitida*, collected in Newfoundland and Québec.[2] Although the American taxon had been described to be somewhat bigger and have slightly bigger and more oblong spores[3], comparison of these with European collections revealed that collections from both continents had so many intervening forms, that a consistent morphologic difference could not be claimed. Therefore, by classical criteria they should have been considered the same species.

Since then, at the request of Andrus Voitk, Zheng Wang has kindly done genetic marker studies of the specimens that I examined. His analysis showed that the two populations differ enough genetically to be considered valid independent species. Jean Lodge, who has devoted years to the study of the *Hygrophorus* group of mushrooms, including *Hygrocybe*, kindly made her unpublished DNA data for North American *H. nitida* available for comparison. Wang's phylogenetic analysis showed that the Newfoundland and Québec collections match collections of *H. nitida* from continental North America with 100% statistic support. Presumably the European and North American species share a common ancestor. They have been split and isolated from each other for such a long time that sufficient genetic differences have accumulated to make them different genetic species. Morphological changes were not significant



The phylogeny diagram kindly provided by Zheng Wang from his unpublished material and from unpublished data kindly supplied by Jean Lodge.

Note that the European *H. vitellina* (one from the United Kingdom and one from Denmark) grouped together as a species. These are some of the specimens studied for my earlier report[1].

The North American material that I studied for the same report (marked "Canada") separated genetically along another arm as another species. The first of these comes from Québec and the others from Newfoundland.

Statistical comparison of the ITS1-5.8S0-ITS2 marker phylogeny of these collections with those of *H. nitida* from elsewhere in North America (marked "USA") sequenced by Jean Lodge and Karen Hughes, showed a 100% match. This means that the correct name for the Newfoundland taxon is *H. nitida*, and this is the only such morphologic taxon throughout at least northeastern North America.

enough (at least yet) to tell them from each other, but the North American *H. nitida* (photo, previous page) is a sister species to the European *H. vitellina* (phylogeny diagram, above).

Conclusions

1. The correct name for the North American taxon, including studied collections from Newfoundland and Québec, is *Hygrocybe nitida*, the name given it by Berkeley & Curtis in 1916.[3]
2. The correct name for the European species remains *Hygrocybe vitellina*.

Acknowledgments

I thank Zheng Wang for doing the genetic marker studies on this material and the analyses of his and Lodge's unpublished data, to develop the phylogeny in Figure 1; Jean Lodge, USDA Forest Service and Karen Hughes for making their unpublished data available for this analysis; Renée Lebeuf and the Cercle des Mycologues de Montréal, as well as Andrus Voitk and Foray Newfoundland & Labrador, for making available collections for the above analyses.

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2. Boertmann D: Relationship of Hygrocybe vitellina and H. nitida—preliminary report. Omphalina II(7):4-5. <http://www.nlmushrooms.ca/>. Last accessed 4 Jan., 2012. 2011
3. Berkley MJ, Curtis MA: Centuries of North American Fungi. Ann. mag. nat. hist. II: 417-435. 1916.

How do mushroom species evolve?

Andrus Voitk

In evolutionary theory (Darwin's survival of the fittest), just as in our society, fitness is not the result of jogging or pumping iron, but the ability to thrive in a given set of conditions. The assumption is that not all members of a species are exactly identical. Some members may be better suited to the ambient conditions, others less so. Those that cope well will survive, while those that wither under the same conditions will eventually die out. Thus, any given set of conditions selects some characteristics of a species that will be perpetuated, if they have a genetic basis. New species evolve (ex = out, volvere = roll) from old in response to changes in ambient conditions.

How does this happen? Let us consider a theoretical model of how a species X might evolve when exposed to the different conditions of regions A, B and C. Let us suppose that *Species eks*, growing in Ehland, has slightly elliptical spores, just a little bit longer than they are wide. Just like us, not all individuals are exactly alike: some have wider spores, almost round, while the spores of others are a bit more elongated, narrower. Now suppose that for various reasons *Species eks* spreads from Ehland to both the warmer Bieland and colder Seeland.

In the warmer Bieland, much of the nutrition needed for spores to grow into mycelia lies on top of the ground, and the underside of this superficial layer is constantly moist from the ground—the optimal place for spores to grow and germinate. Narrow spores would penetrate beyond this layer, deeper into the earth between granules of sand and organic matter. Fat, round spores would tend to stay relatively superficial. The round spores, lodged in the most nutrient-rich substrate, would produce robust fungal organisms. The narrow spores would be disadvantaged and find growing difficult, made more so by the need to compete with their stronger sisters. Over the course of hundreds of years of reproduction, these conditions would select the plump-spored members as the "fittest", while the individuals of *Species eks* with elongated spores would eventually fail to thrive and disappear. Thus, after hundreds of years, the spores of mushrooms that started as *Species eks* will look quite different in Bieland from the spores of the original *Species eks* back home in Ehland. If spore width is genetically determined, then the selection process in Bieland will have weeded out from the gene pool organisms with genes that produce narrow spores and kept only those with genes that produce plump spores.

While this went on in Bieland, things were quite different in cold Seeland. Suppose that the mycelium of *Species eks* is intolerant of cold. Therefore, while the spores of plump-spored individuals germinated well in the most fertile soil, the cold winters always killed the mycelium that developed. The spores of narrow-spored members passed deeper into the ground, below the frost line. While they did not have as much nutrients as the plump spores higher up, when they did germinate, any mycelium that did develop was much more likely to survive the cold season. Since these new organisms did not have to compete with more robust superficial sisters, they were able to survive. After hundreds of years the original *Species eks* of Ehland will differ both morphologically and genetically from its progeny in Seeland.

Next, suppose that the different conditions also favoured other character traits. Perhaps I did not mention it, but mushrooms of the original *Species eks* had a tan cap. Of course, not all were exactly the same shade, and individuals within the species had caps varying from light beige, almost bordering on off-white, to medium brown or darker. In warm Bieland heat was a problem, and over the years those individuals with darker caps, that absorb heat, failed to thrive. The very opposite happened in cold Seeland, which favoured darker mushrooms that absorbed more heat. After centuries, almost all progeny of the original *Species eks* of Ehland produced light-coloured and plump-spored mushrooms in Bieland and dark-coloured ones with elongated spores in Seeland.

Now it is easy to imagine additional characteristics, that might be favoured in one habitat or the other, so that selection by fit in each region will eventually produce entirely different looking mushrooms from each other and from *Species eks*, their original progenitor. Since these characteristics are genetically determined, and since some genetic lines will be suppressed and others augmented, the groups in the different locations will over time evolve into different species. We, who were not party to this development over thousands of years, only see that we are dealing with three sister species, quite different from each other: *Species eks* in Ehland, *Species whye* in Bieland and *Species said* in Seeland. When we compare their genetic make-ups, we discover, to nobody's surprise, that these also differ.

The above illustrates the possible fate of isolated stable populations. If, for some reason, winds blew spores back and forth across both Ehland and Bieland, there would be continual mixing of genetic material. The selective processes would still be operational, but their effect would be less evident because of constant genetic mixing. The combined population of both Ehland and Bieland would eventually differ somewhat from the original *Species eks*, possibly expressed on one extreme in Ehland and another in Bieland, but the overlap would be so great and the differences so small, that much more time would be required before two distinct populations would emerge, if ever. Coming late on the scene, we may be able to detect only one species, *Species dubbya* in both Ehland and Bieland—a species complex well worth keeping our eye on, for it might change in just about any millennium now!

But wait, that is not all! We have seen how species might evolve in response to different environments. Our model also allows us to understand the process of extinction. Adjusting to ambient habitat allows the most efficient use of existing conditions. This gives one a clear edge over other competing species with a less perfect fit to the habitat. However, the advantage can become a major disadvantage, should the habitat change. Suppose that the cold Seeland for some reason undergoes sudden (in triologic terms) warming. Now poor *Species said*, who had used centuries to adjust itself to thrive in cold, would be in trouble. Having adjusted to cold and shed all the coping mechanisms to deal with heat, it would suffer in the new conditions. Its dark fruit bodies would absorb heat and wither before fruiting. What spores were shed, would burrow into the deep soil with less nutrients, giving an edge to competitors that thrive in the richer upper layers. If the habitat change were sufficiently sudden and severe, *Species said* would become extinct in short order.

That is evolution: species come and species go. Whether they thrive or die, depends on how well they fit their living conditions. Triologic "fitness" does not mean brawn or stamina, but the ability to utilize what is on hand. In the shorter term, organisms with the best fit to their environment survive and others die out. Over the long term, however, ability to survive requires adaptability, an ability to adjust to environmental changes, not unlike our definition for intelligence. Organisms able to adjust to change survive, whereas those that have become too specialized, are at great risk of dying out, should there be a change in their environment.

It is all really just like life in our society.

A portrait would help put a human face to the story. We regret that because of copyright laws, we are unable to publish such a picture. Please never forget that behind the fame and the lack of a portrait, the subject of the story shares the human condition with us all.

Ed.

NICHOLAS EVANS

Andrus Voitk

After a stellar performance in law school at Oxford, Nicholas Evans gravitated toward journalism, and television documentaries. His efforts were crowned by awards, liaisons, children and mounting debt. This all changed when he heard of people using a "natural" skill to rehabilitate horses. Captivated, Evans pursued the subject, resulting in **The horse whisperer.** Robert Redford bought the movie rights, and turned it into a box-office hit, spurring sales of the book, which eventually sold over 15,000,000 copies. Sales and royalties from this and subsequent novels turned Evans' finances from monetary inadequacy to overabundance. This gave him the freedom to direct his new life. He married the sister of Sir Alistair Gordon-Cumming, chief of Clan Cumming. On a visit to the latter's 13,000 acre Scottish estate, his life, as well as that of his wife and his host, took yet another major turn.

According to an interview in **The Times**, Evans was "a keen cook and nature lover who has picked and eaten wild mushrooms without incident for many years". When in doubt about their edibility, he checked them out in his field guide. On an outing with his hosts, August 3, 2008, he sought out a place with mushrooms, where he had "been told were chanterelles and ceps". ["Cep" is one of many common names for the prized *Boletus edulis*. *Ed.*] Evans cooked them in butter and parsley, to be enjoyed by the party sitting outside. The taste was described as "slightly bitter", but the men partook with gusto, while the ladies showed a bit more reserve. Fortunately, the children elected not to share the meal.

After lunch Evans went for an hour's run, followed by a swim. He felt well the next day, but his wife and his brother-in-law developed vomiting and diarrhoea. By the afternoon Evans also began to feel unwell. That prompted him to recover some of the discarded mushrooms and identify them with a mushroom guide in the kitchen, unfortunately unconsulted at the time of preparation. His search resulted in a match with *Cortinarius speciosissimus* [current name, *Cortinarius rubellus. Ed.*], labelled "deadly poisonous".

Medical consultation was followed by hospitalization and aggressive treatment for all four adults. Unfortunately kidney failure ensued for Evans, his wife Charlotte, and Sir Alistair. Lady Louise, who had only tasted a little bit of the mushrooms, recovered kidney function. The others were transferred to Aberdeen, where arrangements were made for permanent haemodialysis during a two-week hospitalization. Evans continued to throw up for the next four months, but slowly regained his general health and was able to run and ski again. Final work on his last book, halted by the illness, has now been completed and the book published. For three years he attended a renal unit for a five-hour dialysis session every other day, while awaiting kidney transplant. As you read this, he is well, four months after a transplant of his daughter's kidney; we wish him well.

Evans considers the mycophagy "a stupid accident, like reaching for a CD at the back of the car while you are driving and having a head-on crash". Roy Watling, grand old man of UK mycology, confirmed the identification, and is quoted not to "understand how they could have mistaken them", because *Cortinarius rubellus* "hasn't much in common with chanterelle at all", "nor do *Cortinarius* look like ceps."

Watling is right, of course. There really is no excuse—the point of recounting this story. Yet do you not hear, at some level, this story whisper ever so faintly "There but for the grace of God go I"? In that whisper is its poignancy hid.

Cortinarius rubellus & Orellanine syndrome

Andrus Voitk

Cortinarius rubellus is found from late August to the end of September in moist spruce or mixed woods in *Sphagnum* or other deep moss. It seems to be a pericoastal species, becoming uncommon on the continent, away from the seashore. We have not collected it in Labrador, but have documented its presence throughout the Island. It is not abundant, and when collected at our foray, has been represented by a single collection.

C. rubellus is about 6-15 cm tall. The cap is 3-8 cm in diameter and usually retains an acutish peak; it is not hygrophanous. The gills are moderately widely spaced. The stem widens toward the base and its tip is often pointed. The universal veil is yellow and leaves yellow zigzag belts on the stem, as well as a powdery looking yellow veil. The flesh is light coloured, but darkens with age. As its name suggests, the mushroom has a red or reddish-brown colouration overall. The depicted mushrooms, probably due to handling and age, do not show the characteristic yellow belts too well. The lower photo, by Michael Burzynski, comes from an attempt by anonymous forces at our 2004 foray to dramatize its lethal nature.

Cortinarius rubellus is the only confirmed North American species of about half a dozen *Cortinarius* species known to contain the toxin orellanine. The name of the toxin derives from *Cortinarius orellanus*, the first mushroom from which the toxin was isolated. The complex contains several similar mushrooms, some not yet named or fully described; the number of *Cortinarius* species containing orellanine is unknown because most have not been analyzed. *Cortinarius gentilis*, a similar but smaller species was also thought to contain the toxin, but review of reported poisonings suggest that mushrooms were misidentified, or that meals contained a mixture of *C. rubellus* and *C. gentilis*. Although these reports suggest that *C. gentilis* is not toxic, the matter should be considered unsettled. Certainly in our area no *Cortinarius* should be consumed. Although we do have a few reportedly edible species, accurate identification can be very difficult in this genus of over 1,000 species. Most have not been analyzed, but of those that have, a host of harmful or potentially harmful compounds have been identified. Many *Cortinarii* contain anthraquinones, which are toxic dyes. This makes them choice mushrooms for dyeing, but a poor choice for consumption.

Orellanine syndrome is a clinical presentation that starts with typical mushroom poisoning symptoms (nausea, vomiting, diarrhoea, cramps, abdominal pain, fever) some six hours to six weeks (average, 3 days) after eating orellanine containing mushrooms, and then progresses to a variable degree of kidney failure. In the case of total kidney failure, death ensues, unless treated with dialysis or transplantation. There seems to be an inverse relationship between the time from consumption to onset of symptoms and the severity of kidney injury.

The latency from mycophagy to symptoms makes diagnosis difficult. There is individual variation to sensitivity, but toxicity is directly related to amount eaten. Orellanine is a specific cytotoxin (a poison that targets specific cells), in this case directed toward kidney cells. Why it chooses kidney cells or its exact mechanism of action is unknown. It is thought to kill its target cells by inhibiting protein synthesis, a restriction that invariably ends with cell death. It is not an allergic reaction, and plasmaphoresis offers no help. By the time symptoms occur, all the poison has been absorbed and well fixed to its target cells, the wheels have been set in motion irreversibly, and the time for an antidote is past, should there be one—there is not.

Although there is no treatment, in theory this should be an eminently preventable event. There are two ways for a mycophagist to avoid eating poisonous mushrooms:

1. Learn a few edible species and make sure you know them well. Add to them slowly. DO NOT COLLECT OR EAT ANY OTHER SPECIES.
2. Learn all the potentially lethal species in your area and know them well. This is possible, as their number in most places of the world is under ten. DO NOT COLLECT OR EAT ANY OF THOSE.

The first seems to avoid potential discomfort, but the best approach is an attempt to combine the two. Never assume, but know what you know and eat ONLY what you know FOR SURE.


Photo: Vello Liiv


Photo: Anu Kollom

Illustrations

Above: *Cantharellus cibarius*, the chanterelle. Yellow, flat cap, lighter yellow gill-like folds running down stem. Apricot odour.

Middle: *Boletus edulis*, king bolete or cep. Larger. Domed cap. Spongy layer of pores underneath, not gills. Net-like reticulation on stem. Intentional use of European species of chanterelle and king bolete.

Below: *Cortinarius* species (right) and *Craterellus tubaeformis* or winter chanterelle or yellow legs (left), growing side by each. Hurried picking might take both, but a careful inspection at home should quickly reveal the error. Best not to hurry in the field, but ALWAYS check again at home.

Phyllotopsis nidulans

Andrus & Maria Voitk

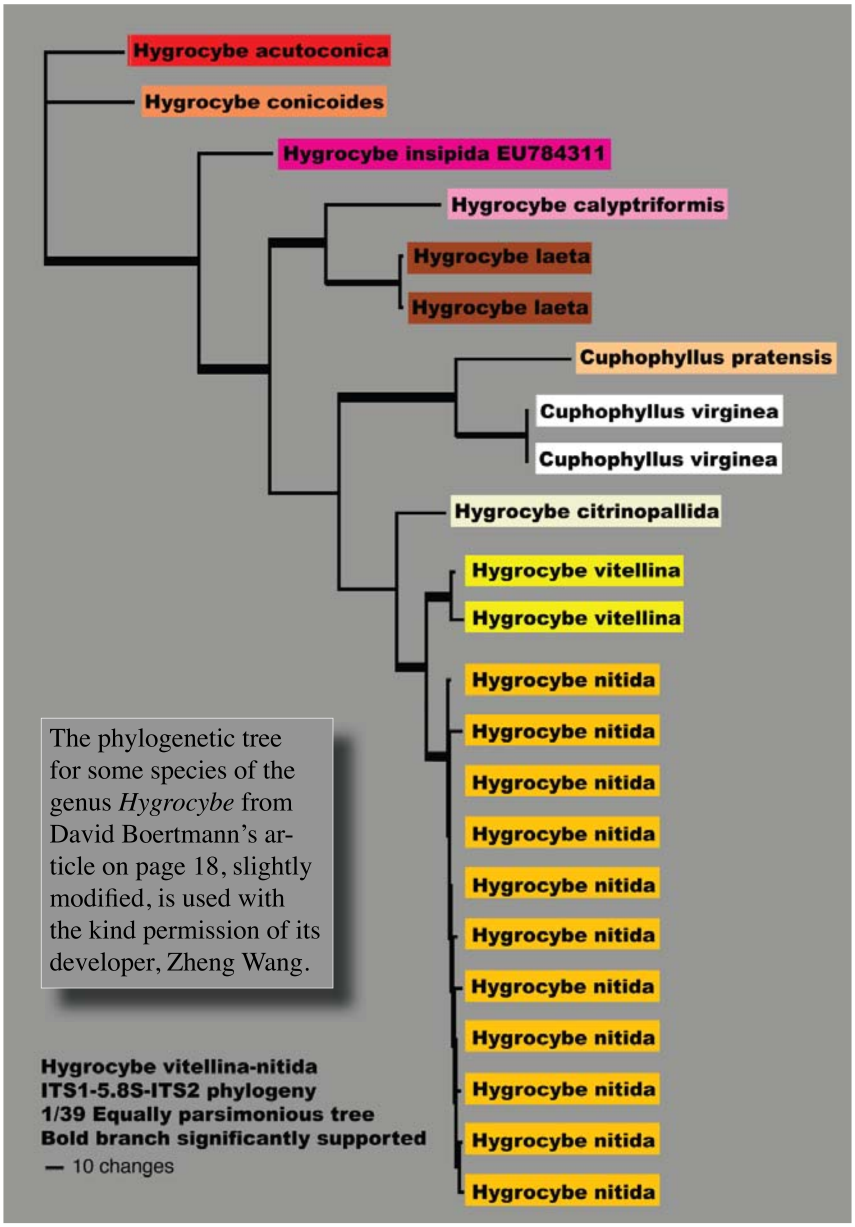
What a surprise to find a dramatic splash of orange in the steely gray-blue winter landscape! On top of a dead birch trunk nestled a flush of *Phyllotopsis nidulans*, completely frozen, January 23, 2012. Like many late fruiters, it seems to tolerate freezing: on thawing, these specimens gladly shed some beautiful red-pink spores.

Known from Europe and North America, it is a rare mushroom in our province: we have seen it only twice before and recorded only once at our forays. A lignin degrader, it causes white rot to both hard- and softwood.

Caps, nestled horizontally and fused laterally, are 2-8 cm wide, fan shaped, covered with concentric rings of light, conspicuous hairs. The inturned edge becomes wavy in maturity. Laterally attached to the substrate by an absent to rudimentary stem. Gills are close with several lamellulae. Ours did not smell, but by reputation it has an unpleasant skunk odour. Not edible.

Interpreting a phylogenetic tree II

Michele Piercey-Normore



The phylogenetic tree for some species of the genus *Hygrocybe* from David Boertmann's article on page 18, slightly modified, is used with the kind permission of its developer, Zheng Wang.

From the root of this tree spring two species, *H. acutoconica* and *H. conicoides*. All other species can also be traced back to this root. Therefore all species on this diagram are related, evolved from a common genetic background. The thickened branches represent high statistical support for the cluster of species they hold together. The thin branches are not significant and therefore there is low support for the taxa to which they lead. These taxa may have many similarities to other taxa in the tree.

At first glance the genus *Cuphophyllus* seems to be a bad fit, because it forms a highly supported cluster in the middle of species of *Hygrocybe*. Some authorities call everything here *Hygrocybe* so that *Cuphophyllus* is synonymized with *Hygrocybe*, while others feel that the genetic material of the specimens falling into the *Cuphophyllus* clade has undergone sufficient evolutionary change that some organisms may form new genera. Indeed, the dry species of *Cuphophyllus* with their domed caps are quite different from the smaller, mucus covered species. *Cuphophyllus* is monophyletic, in other words a "good" genus of related organisms, and forms a highly supported clade in this tree.

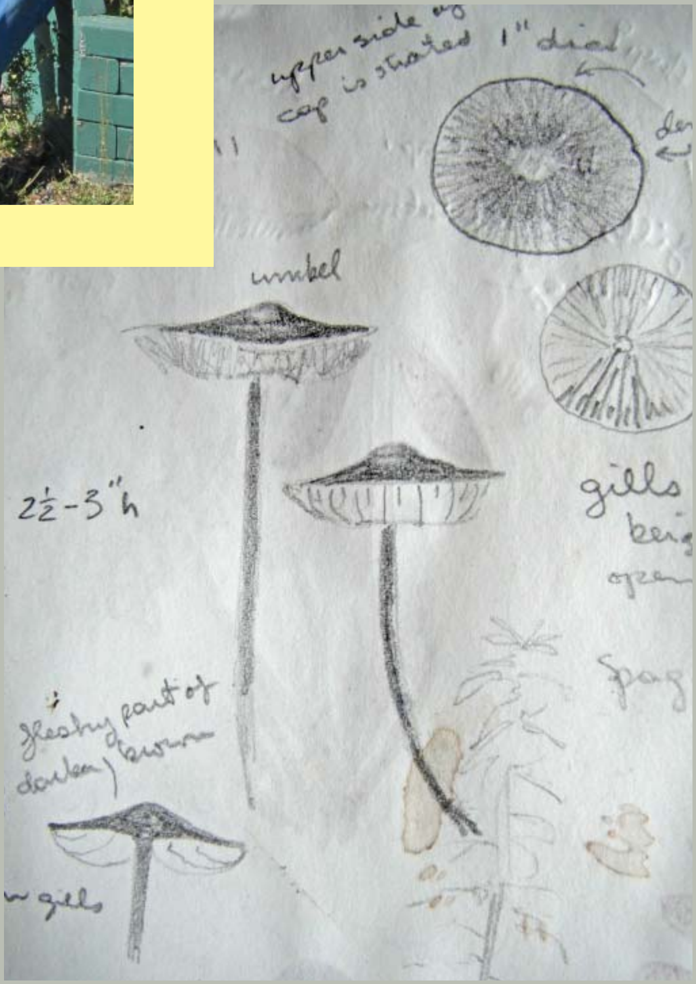
Hygrocybe vitellina and *H. nitida* are sister species in this tree. The limbs leading to each group are thick, indicating that the members within each species are very close to each other. *H. vitellina* is not the same species as *H. nitida* because they fall into two separate clades each with highly significant support. This means that the specimens within the *H. nitida* clade share features and DNA substitutions that are not shared with *H. vitellina*. Thus we have evidence of two closely related, but separate genetic species. In fact, although the different *H. nitida* individuals came from different provinces and countries, collected by different people, and the DNA analyses done by different people in different laboratories, their genetic similarity was 100%. This is proof of a very "good" species, which groups together, separate from its sister species that also groups together well among its members.

The thin branches on the tree do not statistically support the taxa at the terminal ends of those branches. Many of the thin branches lead to a single taxon and so no comparison can be made to produce a statistic.

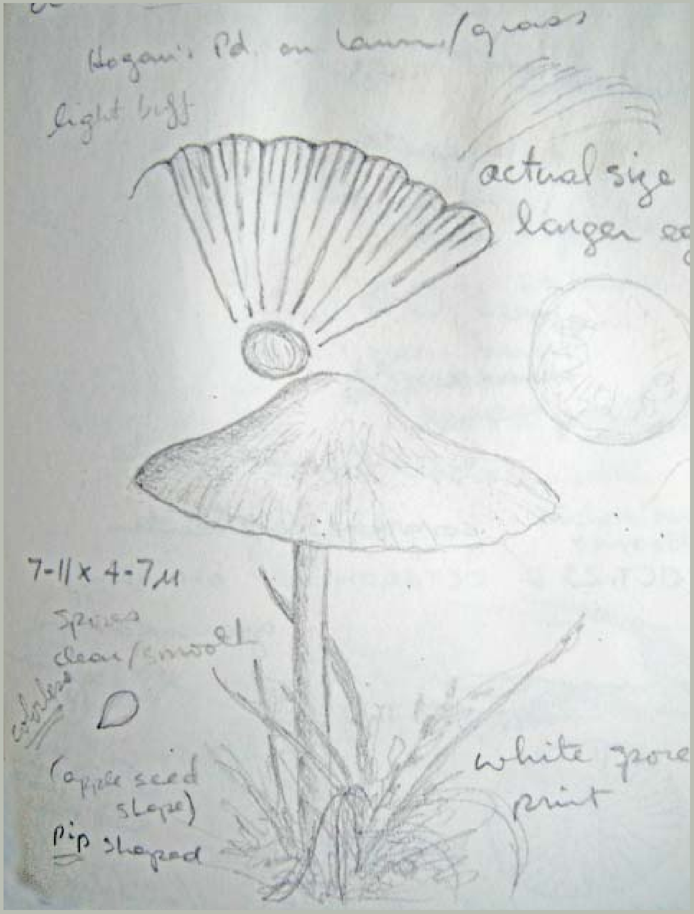
The tree has been interpreted, so now you can relax and enjoy a well deserved cup of tea.

The Bishop's Sketchbook

Galerina paludosa



Marasmius oreades



My Favourite Mushrooms: *Collybia tuberosa*

Jim Cornish

Mushrooms are the fruiting bodies of a web-like network of fibres called mycelia. For saprotrophic and parasitic mushrooms, this mass “feeds” by secreting enzymes to break down living or dead organic matter. Not surprising, mushrooms are subject to the same processes. One genus that “attacks” other mushrooms is *Collybia.* Its members are saprobes and commonly grow in the decaying remains of *Lactarius* and *Russula* mushrooms and produce sporocarps to reproduce. I found a *Collybia* for the first time this past fall and was struck by its small size, fragile appearance, and unique distinguishing feature. The mushroom made an impression, and after identifying it as *Collybia tuberosa*, it became one of my favourites.

Photo: Andrus Voitk

The Genus *Collybia*

Collybia is a good example of ranking changes brought about by ever evolving taxonomy. At one time, the genus included numerous fragile, white-spored, small mushrooms, but over the centuries, microscopic studies placed most of them in other existing or new genera. Finally, only four species, (*C. cirrhata, C. cookei, C. racemosa* and *C. tuberosa*), remained. A decade ago genetic studies caused *C. racemosa* to be transferred to a new genus all its own.

The three diehards in *Collybia* have all been collected in Newfoundland and Labrador. *C. tuberosa* is very common throughout the province, with *C. cirrhata* a reasonable second. *C. cookei* is uncommon.

Collybia tuberosa (Bulliard ex Fries) Kummer

Collybia tuberosa was first described as *Agaricus tuberosus* by the French naturalist Jean Bulliard in 1786. It was transferred to *Collybia* by Paul Kummer in 1886. Collybia means “small coin”, a reference, no doubt, to the flattened cap it sports at maturity. (Coin currency in the 18th century must have been very small indeed.) It is commonly called appleseed coin cap in North America and lentil shanklet in the UK.

Small mushrooms are often overlooked, even by seasoned mycologists. My first encounter with *C. tuberosa* was quite accidental. If I hadn’t looked down while changing camera settings, I would have missed it sticking just a centimetre or two above a very saturated patch of *Sphagnum*. The wet moss made it too risky to photograph the mushroom with my camera resting on the ground. Like most electronics, digital cameras and water don’t mix. Mindful of its delicate appearance, I carefully removed it from the substrate and laid it in the palm of my hand.

The white fibrous stem, about 5 cm long and less than 2 mm thick, looked disproportionately long when compared to the cap barely a half centimetre wide. Most surprising was what I found on the end of the stem. At first I thought it was the remains of a small spruce cone, but later learned it was a sclerotium, a tuber-like mass of hardened mycelium (hence the specific name *tuberosa*) that enables the fungus to overwinter.

It wasn't until I used my hand lens that I noticed a small buff area on the center of the slightly depressed cap and below, a remarkable arrangement of gills given the cap's small size. In less than 1 sq. cm of space, nature had arranged at least twenty full length white gills and then filled the space between them with 2 or 3 variable length lamellulae, effectively using the available space for spore production.


Photo: Andrus Voitk


Photo: Andrus Voitk

Images clockwise, from upper left.

Old *Collybia cirrhata*, showing long thread, and no sclerotium. Mature *Collybia tuberosa*, showing appleseed sclerotium. Young *Collybia cookei*, its sclerotia, resembling grains of rice or potatoes. The white background is not snow, but mycelium.

Previous page: *C. tuberosa* cluster with two diagnostic appleseeds evident.

Unlike the solitary one I found, *Collybia tuberosa* typically grows in clusters (troops) on old dead mushrooms on the forest floor and in *Sphagnum*.

The three remaining species in *Collybia* are easily distinguished from one another by the presence or absence of the sclerotium shaped either like an apple seed (*C. tuberosa*) or a grain of rice (*C. cookei*). The remaining species, *C. cirrhata*, may have prominent mycelial threads, but no sclerotium. When collecting a *Collybia* it is important to dig down far enough to ensure the sclerotium, if it exists, is included. Examine several fruit bodies, because even in the species with a sclerotium, not all individuals will have it.

The next time you encounter a *Collybia tuberosa*, take the time to examine a specimen with a hand lens and discover the beauty often overlooked if only taking a passing glance.

THE MAIL BAG

De

This myces chrysospermus (photographed 23.12.11) comes with thanks for opening our eyes to the beauty of fungi and with our very best wishes for the coming year

Elke and John

Cards
that reached the
OMPHALINA corporate suites,
AND a wall quilt with Frosty looking
at *Panellus violaceofulvus* on a balsam fir twig, AND
one book (look for review in the next issue).

OUR PARTNER ORGANIZATIONS

- People of Newfoundland and Labrador, through
  - Department of Environment and Conservation
    - Parks and Natural Areas Division
    - Wildlife Division
  - Department of Natural Resources
    - Center for Forest Science and Innovation
- People of Canada, through
  - Parks Canada
    - Terra Nova National Park
    - Gros Morne National Park
- Model Forest of Newfoundland and Labrador
  - Forest Communities Program
- RED Ochre Develpoment Board
- Memeorial University of Newfoundland
  - Grenfell Campus
  - St John's Campus
- Tuckamore Lodge
- Quidi Vidi Brewing Company
- Rodrigues Winery

LICHENS added!

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Terra Nova National Park

Headquarters: *Terra Nova Hospitality Home*

September 21-23, 2012

GUEST FACULTY*

David Boertmann
Gro Gulden
Nils Hallenberg
Jermy Hayward
Renée Lebeuf
Faye Murrin
Todd Osmundson
André Paul
Michele Piercy-Normore
Roger Smith
Greg Thorn
Steve Trudell
Jukka Vauras

*tentative at time of publication

Please check our website in the Spring, 2012, for Information & Registration Forms:

<www.nlmushrooms.ca>