

**Speaker for
February 20
MSSF Meeting**



S. Coleman McCleneghan

**Fungal Stories from the Great
Smoky Mountain ATBI:
Documenting Friends and Foes**

S. Coleman McCleneghan, Ph.D., will discuss The All Taxa Biodiversity Inventory (ATBI), an effort to catalog all living diversity in the Great Smoky Mountains National Park (GSMNP). In this presentation we will try to understand why the Smoky Mountains are so diverse, peruse some of the mushrooms, and discuss changes and threats to this ecosystem. McCleneghan became interested in mycology in

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Mycena News

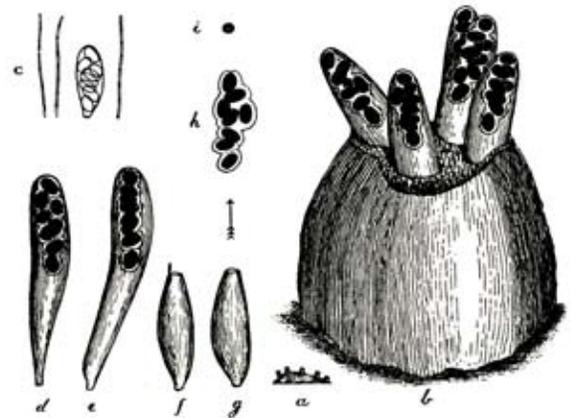
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MycoDigest: Spore Guns

Else C. Vellinga

Elfin saddles have, despite their romantic name, a violent way of sending their spores into the world. They belong to the very diverse group of fungi known as ascomycetes, which includes cup fungi, morels, earth tongues, cramp balls, and many others. The spores in this group are arranged, often in a single row, within an elastic, liquid-filled tube called an ascus (plural, asci). These balloon-like tubes stretch only lengthwise and are arranged side by side, like the bristles on a brush, in the cup of the fruitbody or on the outside of the head of the morel, elfin saddle, or earth tongue. Pressure mounts on the walls and the top of the asci during the development of the spores; when the time is ripe, the spores shoot off, along with the liquid, in one big squirt through an opening at the top. Some asci have a lid—others just a weaker spot in the ascus tip—that breaks open. You can easily see the release of the spores. Just put a ripe morel, elfin saddle, or other cup fungus in a box; let it sit for a few minutes, and when you open the box, a cloud of spores is released. More surprisingly, you can even hear the sound of the spores being fired by putting your ear close to the fruitbody! (Do not forget to wash your ear afterwards!) Expect to hear a fizzing noise, like the bursting of bubbles in a glass of soda.

Some ascomycetes, however, do not follow this general pattern. For example, there is no reason for truffles to maintain this elaborate apparatus when all they want is to have their spores eaten and dispersed by animals. Accordingly, there is no squirting or shooting, and the ascus walls just degrade.



The distances travelled by the ejected spores are small—just enough to get through the layer of still air around the surface of the asci and into nearby air currents. You can indeed pick a morel without being hurt by a bombardment of spores, but it

Ascobolus immersus: (a) fruitbodies on dung; (b) fruitbody enlarged with asci sticking out; (c) ascus and cells before spore release; (d) & (e) asci with ripe spores, ready for launch; (f) & (g) empty asci after spore release; (h) a cluster of spores shot out of the ascus; and (i) the ejected lid of the ascus (Buller, 1909)

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MycoDigest is a section of the *Mycena News* dedicated to the scientific review of mycological information.

THE PRESIDENT'S POST

mountains. Sometimes we go alone and share the stories later; other times in groups, building campfires in the woods over which to grill our morels or boletes, laughing and telling tall tales of our fungal exploits; or profoundly engaging in cutting-edge mycological discussions, deep into the starry nights....

In short, there is virtually nothing having to do with mushrooms that is not covered under the umbrella of the MSSF

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seems wise to be a bit more careful around dung, as we'll soon discuss.

First, one more fascinating tidbit of information: The asci direct themselves towards the sun. It has been shown that when the asci are on the steep side of a cup, they may not be able to turn far enough, so that the whole tip faces the sun; the lid of the ascus through which the spores escape is not mounted centrally on the tip, but on the *edge* of the tip nearest the light. The purpose of this orientation is, presumably, to have a clear line of fire.

A special case is presented by ascomycetes growing on dung. Here, the whole purpose of spore dispersal is to get spores beyond the substrate (the cowpat) into the grass, where they will be eaten by a cow or other herbivore. In due course, they emerge in a fresh dropping, where they can germinate and form new individuals.

One species, *Ascobolus immersus*, has been a subject of study for almost a hundred years, starting with Buller in 1909. This species forms fruitbodies that are only a few millimeters across, but its asci and spores are enormous. Every day, a few asci ripen and stick halfway out of the top of the fruitbody. The spores are dark and have a sticky layer around them. This jelly serves several purposes: It keeps the spores together when they are ejected and increases the mass of the projectile; it makes the spore mass stick to the grass when it lands and keeps it there while the spores wait to be eaten; and it serves as some protection when the spores get inside the cow. The upper half of the asci of this fungus points toward the sun, guided by light coming through the top of the ascus. The spores are shot off around noon, when the sun is highest. (This works fine in temperate regions but is not a good strategy in the tropics, where the spores might be slowed by heavy air and land back on the firing ascus.) At the optimum angle, the spores may land up to 40 centimeters from the launching pad. Later, in the cow interior, the spore package



A typical cup fungus (*Peziza*)
Photo by John Lennie

experience. We embrace all aspects of our members' interests in the greater world of fungal pursuits. If your area of interest is not being addressed, perhaps it's time you took the lead. As I have stated before, the MSSF is exactly what we the members make of it; nothing more, and certainly nothing less.

—DC

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dissolves and the spores disperse, to prevent inbreeding in the cowpats. (The literature mentions a record distance of 70 centimeters, but this is almost unbelievable. I have not been able to discover what the species was—or whether it had been taking steroids.)

The spores are pushed out by the huge osmotic pressure inside the ascus, caused by glycerol and, to a lesser extent, proline in the *Ascobolus*. The ascus sap in another species, *Gibberella zeae*, was also analysed; mannitol was found to be the main component. (Mannitol is also the substance in Buller's drop, which forms on the spores of basidiomycetes just before they launch, but that is another mechanism and another story entirely.) As the asci of *Ascobolus* are huge, the pressure within them just before the asci shoot their spores off can be measured. It turns out to be three atmospheres, which is comparable to the pressure in car tires. This is why you need protective clothing to approach them (just kidding)! The asci collapse as soon as their contents shoot off, and shrink to half their former size.

Another ascomycete on dung, *Sordaria fimicola*, has a different but equally fascinating way of getting its spores out into the world. This fungus has flask-shaped fruitbodies with very narrow necks. One by one, the asci grow into the neck and, when they have reached the top, the spores shoot off. In this species the neck of the fruitbody, like the barrel of a cannon, is aimed at the sun. After the launch, the ascus shrivels at the bottom of the flask, and the next one follows suit. Just as in the *Ascobolus* species, the spores are dark, covered in jelly, and are shot 10 to 15 centimeters beyond the dung into the grass.

These are just a few examples of the ingenious ways in which ascomycetes disperse their spores. For further reading, I especially recommend Ingold's *The Ballistics of Sordaria* (the

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Our Secret Spot

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Mad hope driven by desire. I admit to having succumbed to the Gambler's Fallacy, the incorrect belief that if a card hasn't been dealt in several shuffles, it is more likely to appear in the next hand. In truth, each shuffled deck is independent of every other shuffled deck; and if one has lost all previous hands, there is no greater likelihood of winning in the future. Translated to the world of fungi, a place that hasn't paid off in the past is *not* more likely to yield a big haul next visit. Rather, it means that this is a poor place to hunt mushrooms.

Territorial Imperative. No one knows our Special Spot or visits it. We won't find cut stipes, kicked-over *Russulas*, discarded buggy boletes. We can openly carry baskets, although in view of the meager fruitings, there is little reason to do so. Having a secret place is very satisfying. We could mark its boundaries with urine or etch dead tree trunks, but there is no competition as yet and we'd like to keep it that way, thank you.

*Melano* by Bob Sommer**Officers: 2006–2007**

President: David Campbell.....(415) 457-7662
davidcampbell@mssf.org

Vice President: J.R. Blair.....(650) 728-9405
jrblair@outrageous.net

Secretary: Carol Hellums.....(415) 753-2144
hellums@worldnet.att.net

Treasurer: Lisa Bacon..... (707) 765-9085
lisa.bacon@comcast.net

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1988 when she stumbled into a king bolete that was as tall as her knees. Shortly thereafter she did a mycological master at Humboldt State University. Moving east in 1991, she continued her mycological endeavors at the University of Tennessee in Knoxville where she spent years collecting fungi in the Great Smoky Mountains for graduate research in the genus *Pholiota* (Family Strophariaceae). Over the last decade she has taught numerous fungal courses including mycology, fleshy fungi, and lichen courses at Appalachian State University, the Smoky Mountain Field School, and the Smoky Mountain Institute at Tremont.

Coleman also leads walks for the annual Wildflower Pilgrimage and the Roan Mountain Naturalist Rally. Her current research involvement is with the ATBI being conducted in the GSMNP, and cliff-face studies in the Cumberland Plateau. Coleman has been involved with amateur mushroom clubs, including North American Mycological Association (NAMA), Asheville Mushroom Club (AMC), and Blue Ridge Mushroom Club (BRMC). She has been giving presentations and leading forays for the Asheville Mushroom Club annually, since 1995.

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MSSF library has a copy) and those by Buller. Buller has particularly beautiful illustrations, and my husband tells me that Ralph Emerson's account 25 years ago of Buller's work is still the most memorable MSSF talk he ever heard.

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