


[Information CMS](#)
[2006 Newsletter](#)
[About Forays](#)
[2005 Mushroom Fair](#)
[Schedule Articles](#)
[2004 Recipes](#)
[Stalking](#)
[2003](#)
[2002](#)
[Return to Articles](#)
[Index](#)

Dr. Mushroom

In His Own
Words

Fungi finally have their own PR man: Greg Mueller of the Field Museum

As told to Cal Fussman

How can you tell if a mushroom is poisonous? Well, there are a lot of old wives' tales out there.

Boil them with a silver dollar. If the coin turns black, they're poisonous. This is one that can really get you into a lot of trouble.

It's edible if it's growing on wood. Nope, there's a deadly species of *Galerina* that grows on wood.

Watch the deer and squirrels and eat what they eat. Au contraire. There are different digestive systems. A deer can eat poisonous amanitas that would kill a human.

Unfortunately, there's only one rule that can be applied to the dinner table: You have to know exactly what kind of mushroom you've picked to know if it's edible. And if you don't? Well, that's why, between April and October, my phone rings at three in the morning. A mycologist knows.

When I was a kid growing up in Southern Illinois, I'd see mushrooms and think they were something to be kicked. I didn't know their purpose. Many people have no idea. When I tell grown men and women what I do, their eyes generally narrow as if asking a single question: Why would anybody spend his life studying mushrooms?

So I get to educate them. and usually by the end of the conversation, they understand why I'm so passionate about these organisms and other macrofungi. Hey, if you don't know about something, how can you be excited about it?

Mushrooms are among nature's great recyclers. They break down dead wood and dead leaves. That may

Re-printed with
permission.

Discover Magazine, July
2005, Vol. 26, No. 7.

seem confusing on the surface. A mushroom may pop up in a week, a year — or maybe every few years. But you do see a lot of dead leaves and decomposing wood out there.

When you think of a mushroom, you have to see it like the apple on an apple tree. It's the fruit body that produces the spores. Most of the mushroom is growing underground and forming what's called the mycelium. That's the part that interacts with the environment and decomposes things.

Ever pull up the bark of a decomposing tree? Sometimes you'll see this white stuff. That's the mycelium of some mushroom or another macrofungus at work. It's giving off enzymes that are breaking down the cellulose and the lignin. Without mushrooms and other fungi, we'd have miles and miles of logs. Without mushrooms, there'd be no space for anything to grow.

If you're interested in conservation ecology, this is exactly where you ought to start. Mushrooms are not only critical components in recycling nutrients back into the soil for plants and animals to use; many form an obligate symbiosis with trees in the forest.

Oak, spruce, pine, fir, eucalyptus — none of them can grow and survive without their appropriate fungi. The roots of each tree and the mycelium combine to form a sheath around the roots. The fungus brings water and nutrients into the trees, and it feeds on the excess sugars produced by the trees. The system is so well balanced, we call it mutualism. The tree cannot get the necessary nutrients and water without the fungus, and the fungus cannot grow without its carbon source. People in forest management are now recognizing how critical this symbiosis is. In order to manage what's above the surface, they have to take into account what's going on beneath it.

The most recent data have shown there is a flow of nutrients from one type of tree to different types of trees through these mycelial networks. Ideas are in a state of flux right now as we try to figure out exactly what's going on. But one thing is sure: Analyzing trees in an isolated way is the wrong way to go.

There's a timber tree out in the Pacific Northwest called the Douglas fir. It's one of the most essential trees in the area from an economic standpoint and one of the most important forest trees from an ecological standpoint. There are most likely nearly 1,000 species of fungi that react with this tree. If you pull any one out, will you have problems? Is there some kind of ecological redundancy? If we lose half, will the remainder work fine? Are different fungi playing different roles in the protection against stress? Are they fail-safe systems? We don't know. But from a conservation standpoint, these are critical questions.

You can get detailed maps of the distribution of almost every bird and mammal and how they cluster together. Try requesting maps for fungi. The answer you'll get is "Ask me that in 15 years." I'm trying to understand patterns, distribution, and diversity. I'd be a very busy guy even if I wasn't fielding up to 10 calls a week from people wondering exactly what they put in their spaghetti sauce.

Sometimes the calls come in the afternoon. A parent or a teacher will see a kid with a mushroom in his or her mouth and freak out. It's mostly adults who get into the really nasty stuff. But kids can. I've seen the deadly amanita — *Amanita virosa* — under swing sets in parks.

If someone eats this amanita, the amatoxin will stop RNA synthesis. That means it will inhibit cell division. The toxin will go about destroying cells throughout the body, but because blood circulates through the liver and kidneys, that's where the toxins accumulate.

Onset of symptoms is between 12 and 24 hours. you get severe gastrointestinal problems. there's vomiting, diarrhea, and severe cramping. This will go on for a couple of days if there's no treatment. But then it will subside. You think, "Oh, I'm getting better." Then two days later, bango! Worse pain. If there's no appropriate treatment, you're dead in a couple more days. Cause of death is usually liver failure. We don't have an antidote for the amatoxins. We give activated charcoal — this slurry stuff. It absorbs the toxins and then passes through the system. We can also give dialysis. If you filter the blood, you reduce the level of the toxin. Last resort is a liver transplant. Luckily, nobody's died on my watch — although there have been people who've gotten so sick they wished they had.

In the last three years, we've gone high tech in order to do triage very quickly. We've created an online Hotmail account called Shrooms-911. Now when there's a call from a hospital to the poison center in Illinois, instructions are given for taking digital images and having them e-mailed in. Wherever in the world my colleagues and I are, we can log on to Shrooms-911 and give a quick ID. We can recognize the mushroom and say, "You've got to get this person treatment" or "This is fine. Tell Mom to relax."

If I can't identify it immediately, I can go to the herbarium at the Field Museum and pull out specimens in our collection to determine a match. Our herbarium is an organized collection of plants and fungi. In it we have more than 150,000 specimens of fungi from around the world. The majority are mushrooms, but lichens and microfungi are also included.

You know how people have plant collections when they're young? They take a plant, stick it in their book, and let it dry out. We don't do that with mushrooms.

Flattened mushrooms aren't very interesting. We use food dehydrators — the same machinery used to make dried apples or bananas. They blow air at low heat and dry the mushroom out. So we've got shriveled-up mushrooms. They don't look as beautiful as they did when picked, but when I add to the collection, I always take photographs and describe the color and size. If I need to identify a mushroom that's been sent in, I can search for a match by taking piece of dried mushroom in our herbarium, rehydrating it, and putting it under the microscope. All the features are there. We can also extract DNA. So these specimens have a lot of value.

Of course, I need to know what I'm trying to match. That's why I always tell people: "When you collect mushrooms, save at least one in a brown paper bag in the refrigerator. If there is a problem after you've eaten, then we'll have a readily identifiable specimen."

People eat these nice meals at 6 or 7 p.m. At 8, something feels wrong. Around 10 or 11, they're in the emergency room, and a state trooper is running a sample of the mushroom to my office. Maybe I get the mushroom at 1 or 2 in the morning and put it under the microscope. One time, the only remnants were in the casserole. So I was picking through the casserole looking for the mushrooms. It can be worse. If there's no other way . . . well, it's not too hard to guess what the last stop is.

Back in the days of Caesar they had mushroom tasters. Now there's a job for you, huh? If the tasters lived, then Caesar would eat the mushrooms.

In the mid-1860s, an ex-Army captain named Charles McIlvaine decided that he would spend his retirement tasting mushrooms. He wanted to judge his body's reaction to the mushrooms he tasted, so he didn't try them within a day or two of each other. He kept voluminous notes. He ended up writing a book called *One Thousand American Fungi*. What he learned has stood the test of time — although if you follow his book to the letter you might get yourself into trouble. He was fortunate to have had an iron stomach, and he died of natural causes. He obviously knew better than to sample an amanita.

Amanitas contain one of the deadliest poisons found in nature. The mushroom starts as an egg-shaped button that resembles a small puffball. This breaks open as the mushroom grows. Once it's developed an amanita will be gilled with parasol-shaped caps. They come in white, yellow, red, and brown. But the gills are white. They don't call *Amanita virosa* the destroying angel for nothing. One cap can kill a person.

Galerina has the same deadly compound as *Amanita virosa*. It's a small brown mushroom that grows on wood. The problem with *Galerina* is that it's known to

grow intermixed with honey mushrooms, which are good edibles. If you're willing to inspect closely, the two are easy to tell apart. If you cut the cap off, put it on a white piece of paper and let it sit overnight. The honey mushrooms will reveal white spores, *Galerina* has brown spores.

Then you've got false morels. Morels are some of the best edible mushrooms. They look like honeycombs, and they're hollow inside. False morels resemble the shape of a brain. They're solid inside. They have monomethylhydrazine inside them, which is basically rocket fuel. There have been fatalities, but others have eaten them and survived. Studies indicate that the toxins are cumulative. So you can eat them a few times without problems, and you have no idea you're eating your last supper.

The two most commonly eaten mushrooms that you don't want to eat around Chicago are the jack-o'-lantern and the green-spored lepiota. The jack-o'-lantern is pumpkin colored and grows in clusters on wood. It has gills coming down the stem. It actually glows, but the green glow is so faint in the light that you can't see it. People think they look like chanterelles, which are delicious edibles and also have pleasant smell. But if you see the two together, you'll never confuse them. Chanterelles have flat-edged interconnecting ridges or wrinkles instead of knifelike gills.

The green-spored lepiota grows in yards or grassy areas. It's a big mushroom that grows in a fairy ring. It's white and looks very innocent and pure. As the mushroom matures, the gills turn green. A couple of lepiotas are great edibles. but the green-spored lepiota will give you major diarrhea and vomiting. You'll have to check into hospital for dehydration. Depending on your personality, you'll either be embarrassed or you'll have a great story.

When you travel around the world, you find there are mycophiles or mycophobes. People tend to either love mushrooms or be fearful of them. Folks from the U.K. for instance, are generally not into eating mushrooms. But collecting and preparing mushrooms is a big pastime in France, Russia, and China.

I'm not overly adventurous when I'm eating mushrooms, but there are a few that I love. The black trumpet — it's also called the horn of plenty — is one of my favorites. It's hard to see because it's only a couple of inches tall. You'll have to get down on your hands and knees to find one. It looks like a black herald's trumpet and has this wonderful nutty flavor. I don't like to hide the flavor, so I just sauté them with a little olive oil.

Puffballs can grow as big as volleyballs and are usually between a forest and a grassy area. You find them on

bike trails. You can get multiple meals out of one. You can cut it up and put it in pasta. Or if you want to have a little fun, you can make a puffball pizza. Slice the mushroom into a nice crust, put on cheese and tomato sauce, then toss it in the oven and bake.

The golden chanterelle has a beautiful orange color. It's usually found in oaks, but it can be in pine woods also. I get a lovely apricot smell from the chanterelle. It goes nicely with light sauces.

Boletes are soft and squishy with a nice texture that will stand up to the sauce in pasta. They're found either in oaks or pines — often in people's yards. We had a case where a guy got sick after eating them, and the emergency room called. It took us a while to figure out why. This is a good, edible mushroom. Finally, we tracked the problem to its source and discovered that his neighbor had put an herbicide on the yard the week before. The mushroom had absorbed the herbicide, and the guy had herbicide poisoning. So I like to throw in my "know thy neighbor's lawn" caveat.

Oh, and don't let me forget morels. They come in springtime — in May around the Chicago area. Some say you can find them around dead elms. Morel hunters have their secrets. I'm not a good morel hunter, but I have some friends who take care of me. I like them in omlets. Sometimes we chop them up and put them in a roux with flour and milk and then pour it over melba toast. Ohhhhhhhh, so fine.

I'm telling you, what this world needs is a little Mushroom Public Relations 101.

We're trying to make the information more accessible. We have a virtual herbarium the Field Museum developed along with the Morton Arboretum and the Chicago Botanic Garden. You can find data for about 90,000 plant specimens. We started with just plants of the Chicago area — www.vplants.org — and we're expanding to include an online field guide of mushrooms. There will be a species page for all the mushrooms in the region where you can find an image and a short description. There'll be a distribution map, and you'll be able to read about the ecology. We're trying figure out ways to unlock our data through the Web.

Once you get started with mushrooms, you'd better be careful. You can get hooked pretty easily. Look what happened to me. I start out an ordinary kid in Belleville, Illinois, kicking mushrooms and growing up to play baritone horn in the high school marching band. Who would've known?

I meet this beautiful girl named Betty strolling across campus at Southern Illinois University in Carbondale. We get a job watering orchids and other plants at a greenhouse, and she introduces me to a mycologist.

Double bingo! I get the girl and a course on fungi.

I earn my undergraduate degree at Southern Illinois and a master's in mushrooms too. Then Betty and I head to the University of Tennessee for my doctorate. Next thing you know, we're hunting for mushrooms in Sweden while I work on my postdoctorate. And soon we're both at the Field, working an office apart. She's managing the scanning electron microscope facility that allows me to look at spores big time in 3-D. Then one day we're scavenging in a forest in Costa Rica, less than a football field apart, when I shout for her in shock. It's amazing that I can even get her name off my lips. She hurries over, and there it is: Macrocybe titans, the largest mushrooms in the world, more than three feet wide and in perfect condition. Nothing comes near this mushroom — neither bird nor insect — because of its cyanide odor. The two of us share a unique moment staring at this wonder of nature. And that's what love is. So be careful once you get started. You could end up like me, owning a few mushroom ties.

Copyright © 2005, Colorado Mycological Society.
All Rights Reserved.

Last update: 07-Dec-2005

Contact the [Webmaster](#)

[Home](#) | [Join CMS](#) | [Newsletter](#) | [Forays](#) | [Fair](#) | [Articles](#) | [Recipes](#) | [About CMS](#) | [Contact CMS](#) | [Meetings](#) | [Officers](#) | [NAMA](#) | [Links](#)