

# FRY, THRIVE, OR DIE



## *A Fun Pocket Guide*

to 50 Common, Delicious,  
Hallucinogenic, Medicinal,  
and Poisonous Mushrooms  
of the Western United States



**DR. MICHAEL AMARANTHUS**

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These are some gorgeous *Ganoderma conks*, one of the most important medicinal mushrooms, with immune-protective and anti-inflammatory effects. The fruiting bodies are too woody and bitter to eat. People in China, Korea, and Japan commonly drink decoctions of them, a tradition that dates back millennia; I take *Ganoderma* commonly known as reishi in the form of encapsulated extracts and recommend it often to patients.

—**Dr. Andy Weil**

*Clinical professor, Internal Medicine  
Director, Program of Integrative  
Medicine, University of Arizona*

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## PREFACE

Wild mushrooms that make a splendid meal; wild mushrooms that can improve your health and maybe save your life; wild mushrooms that can end your life—how do you tell the difference? A friend, Johnny Jones, who has hunted mushrooms for fifty years, tells skeptics who aren't sure how to identify the “fry” (edible mushrooms) from the “die” or (deadly poisonous ones):

“If you can tell the difference between a Pomeranian and a red fox, between a black-and-white cat and a skunk, you can learn to differentiate mushrooms.”

We are witnessing a “mushrooming” in interest in fungi. In my experience as a scientist for the last forty years, I have seen so much change. For decades, Americans have had a case of severe fear of fungi (“mycophobia”), germs, parasites, disease, and even the fear to touch a mushroom—let alone eat one. Fungi were the enemy in the management of farms, fields, forestry, parks, and golf courses, where often the only approach to dealing with them was chemical and industrial fungal extermination—basically, nuking the soil and environment into submission. These practices may have delivered some temporary control, but often the harmful fungi would rebel and come back in full force the following year.

Things are changing—it's exciting! Fungal mycorrhizal inoculants are now available for farmers, foresters, and ecologists. Medicinal fungi are available for our health, mind-restoring mushrooms for well-being, and gourmet mushrooms for our palate. Mushroom products are everywhere. Television shows, movies, documentaries, podcasts, and journalists are exploring the fascinating fungal opportunities and functions. Research is exploding into various attributes and uses of our fungal friends.

I hope you will find *Fry, Thrive, or Die* a handy tool in your exploration of the fungal world and mushroom hunting. And

welcome aboard ... because fungi are part of the “all-hands-on-deck” for sustainable planetary solutions!



Reishi products come in a variety of forms. Research indicates reishi has unique medicinal qualities.

I spent most of my scientific career publishing papers in technical journals that are so full of technical terminology—taxonomic and statistical information—that only other scientists specially trained in the field could understand. Now that I am retired, I love reflecting on the joy of fungal discovery. There is a growing pool of fungi lovers who appreciate what these remarkable organisms can do for our planet. But I suspect you are getting “into” fungi because you want to learn how to hunt wild mushrooms and how to serve them up.

*Fry, Thrive, or Die* will help you in your quest. With time, you may witness a metamorphosis in your thinking and activities. Your curiosity may be sparked, and you will want to learn more about fungal biology—how they grow and function, how they communicate, how they heal people and the planet, how they stimulate plant growth, and how they recycle the earth’s resources. This book is for you.

Enjoy, fry, and thrive.

## **ACKNOWLEDGMENTS**

Everyone “into” mushrooms has had help on their fungal journey. I would like to thank some of those that have helped me on mine.

Dr. Jim Trappe, Dr. Dave Perry, and Dr. Nick Malajczuk—thank you for your passion and insight into the fungal world and your friendships.

To “Myconauts” David Arora and Paul Stamets, thank you for your vision and fearlessness.

I would also like to thank the many who helped make the book fun and insightful with recipes, quotes, stories, comments, anecdotes: Eileen Amaranthus, Dave Steinfeld, Jack Ingvaldson, Eric Ballinger, Dr. Andy Weil, Paul Stamets, Dr. Pam Kryskow, Dr. Megan Frost, Zack Amaranthus, Brianna Amaranthus, Tim Giraudier, Gordy Longhurst, Dr. Jim Trappe, and Chef James Daw. Thanks to Linda Woodrow-Gray for the exceptional illustrations in the book. Thanks to David Steinfeld, Faith Sumalinog, and Aimee Jenkins for the suggestions and insights that make *Fry, Thrive, or Die* understandable and relatable.

A special thank-you to my wife, Eileen, who has excelled in and never doubted this “mycopath” and whose reply to every challenge has been, “Let’s do it!”

Go explore your world and find some fungal treasures.

**Dr. Mike Amaranthus**  
*Grants Pass, Oregon*



Paul Stamets with the author. *Fry, Thrive, or Die* incorporates the insights and passions of many fungal enthusiasts.

## INTRODUCTION

Mushrooms! It's perplexing to know what to make of them. Some are great heroes. They can transform an ordinary meal into a great event. They can heal the human body. They can rewire the human mind to see and appreciate the world in new and imaginative ways. But others can be dangerous villains. Some can kill in a matter of hours. How does a person navigate these fungi that, when consumed, can bring forth a munchy, medicinal, murderous, or mind-altering experience? If you are a person wanting to participate in the wonders of the mushroom experience, this book will help you appreciate the differences and personalities of the mushrooms that can make you *Fry, Thrive, or Die*.

The *fungi* word starts with "fun." You will be with interesting people who hunt and gather, party, pontificate, and revel in being outside enjoying nature. The meals will be glorious, the fungal "fish" stories exaggerated, and the memories made ... unforgettable. That has been my experience.

*Fry, Thrive, or Die* is full of stories of mushroom hunts, meals and recipes, important medicines, hallucinogens, and ways to store mushrooms, make teas and tinctures, as well as identify and locate must-know mushrooms to make your journey fun and productive.



Interesting people put the “fun” in fungi.



Morel discovery puts the “fun” in fungi.

For those of you who are new to all this, fungi are neither plant nor animal. They are in a separate kingdom to themselves. It may seem strange, but from an evolutionary standpoint, they are closer to animals on the tree of life than they are to plants.

Dr. David McLaughlin, professor of plant biology at the University of Minnesota, came to this conclusion in the journal *Nature* after analyzing the DNA of animals, fungi, and plants. So if you go to dinner and order a mushroom burger, know that the mushroom is more closely related to the waiter than the lettuce on the bun. Crazy.

Fruiting bodies of fungi in this book are referred to as mushrooms, corals, conks, or truffles. They are the “apple,” and the fungal threads, or *hyphae*, in the soil or wood are the “apple tree.” These hyphae are efficient enzyme producers, and like the microbes in human stomachs, they digest food in the soil, root, or wood for nourishment.

Hawksworth and Lücking (2017) in *Fungal Diversity Revisited* estimate that there are 2.2 to 3.8 million species of fungi. Regrettably, it's estimated that only fourteen thousand produce mushrooms (Miles and Chang 2004). But all these fungal species are still busy doing something. Some are critically important for making bread, cheese, wine, beer, and medicine; sequestering carbon; recycling nutrients; and caring for plants. Some are known pathogens. For the millions of other fungal species, we are just beginning to learn about them and what they do. I have often wondered why most major universities have departments of plant science but not departments of fungal science. There is so much left to learn about fungi.

You will need to know your mushrooms—not all of them, but the ones you want to use. It's not rocket science, but it does take some experience and time. Hang out with people that have mushroom-collecting experience. It seems every community has mushroom clubs and classes to help you on your journey. And if your community doesn't, start one yourself.

### **Life Learning**

Using this book should increase your knowledge and appreciation of these over fifty common and important mushroom species. Obviously, including all Western US mushrooms in a pocket guide would require pockets three feet deep. But if you are curious about the other fungi you may encounter on your forays, there are technical guides that cover the hundreds of species not described in this book. Two comprehensive and technical references are *Mushrooms Demystified* by David Arora and the *National Audubon Society Field Guide to North American Mushrooms* by Gary Lincoff. I have included a list of handy references and websites at the back of this book for the mushroom collector and enthusiast wanting detailed information on a variety of fungi and their uses. The information on fungi continues to evolve and expand. Enjoy the journey.

## Mushroom People

Mushroom people are some of the most unique people to be found on the face of the earth. Different in many ways from the people around them, they speak a strange language of spore prints, caps, rings, gills, bruising reactions, and mysterious fungal forms. They wander and ponder endlessly about subtle differences in habitats and microclimates. Curious, passionate, and wondrous adventurers, mushroom people are a crazy cross between a gold rush seeker and Alice in Wonderland. They can be found on every continent and from every background with a twinkle in their eye and a bag on their hip. They are the mushroom people.





## **USING THIS BOOK**

*Fry, Thrive, or Die* is a pocket field guide to distinctive and important wild mushrooms found in the Western United States. The over fifty mushrooms in *Fry, Thrive, or Die* were selected because they are delicious edibles, medicinally important, or dangerous. These fungi extend from the Pacific Coast to the Rocky Mountains and from Mexico to the Canadian border and beyond.

You can use the keys in the back of the book for gilled mushrooms and for non-gilled mushrooms to determine if you have picked one of the fifty-plus mushrooms. Once you collect a mushroom that you suspect is one of these mushrooms, use the key to narrow down the species and location described in the book. At this point, it is important to compare the characteristics of your mushroom with the description and illustration of the species you suspect it is. To make a positive identification, *all* the key features of your mushroom must be present as described for that species, and if they are not, you must assume it is not the correct mushroom. It's best to gather several specimens so you can look at the range of characteristics as the mushroom ages. For example, the color of the gills is a common characteristic that can change as a mushroom matures.

At the top of each mushroom description is an icon—these designating whether it is a “fry,” “fly,” “thrive,” or “die” mushroom. The icons stand for the following:

- **Fry:** Edible<sup>1</sup>
- **Fly:** Hallucinogenic
- **Thrive:** Medicinal
- **Die:** Can cause severe gastric stress and in some cases kill you



Several mushroom species have more than one icon. For example, some mushrooms are known to be good edibles (such as hen of the woods and lion's mane) and are also used medicinally, hence both the “fry” and “thrive” icons. Some mushrooms that are hallucinogenic (such as the fly agaric and panther amanita) can also create severe gastric distress and nausea for some people depending on dosage and sensitivity. These mushrooms are given both hallucinogenic (“fly”) and poisonous (“die”) designations, even though eating a fly agaric or panther amanita can you make you very sick but will not kill you.

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<sup>1</sup> WARNING: Some people get allergic reactions or stomach distress from eating mushrooms that are commonly consumed as edibles. So go easy eating a “fry”-designated mushroom for the first time.

## UNDERSTANDING THE TERMS

It can take some experience to fully understand mushroom descriptions. For some mushrooms, the presence or absence of a universal veil or a ring on the stalk is critically important. For others, the key characteristic could be whether the gills are attached or free from the stem, and still for some, the presence or absence of a volva. For yet others, the color of the gills or smell can be diagnostic. I've included some important pinpointing features in the description heading for each listed mushroom and illustrations that highlight features that will help you identify a specific mushroom species.



The warts on an *Amanita muscaria* cap.



Underneath a Pacific golden chanterelle cap are blunt interconnected folds and not sharp-edged blades or gills.

### **Common and Scientific Names**

Each mushroom description begins with its common name followed by the Latin scientific name for the genus and species. Other known common names are also listed.

### **Cap Characteristics, Underside of Cap, and Stalk**

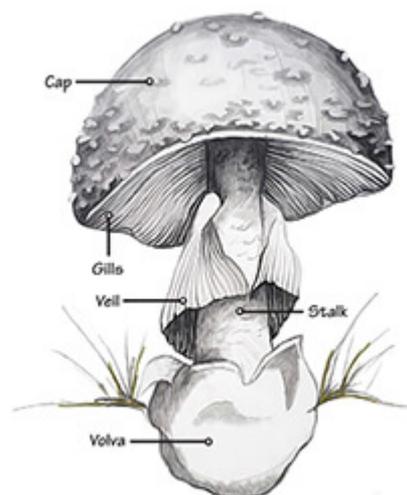
These are the features most used to distinguish and identify the mushroom.

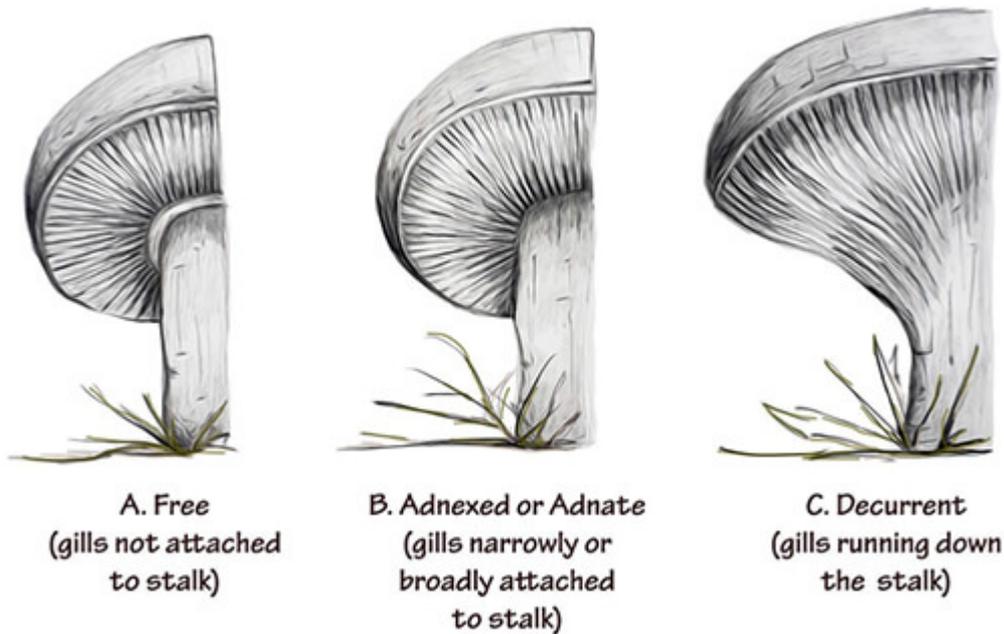
### **The Veil and Ring**

The veil is a tissue layer that extends from the edge of the young cap to the stalk. As the cap expands with age, the veil breaks, forming a ring on the stalk. Some mushrooms form a “universal” veil that completely encloses the young mushroom like an egg. Once this veil is ruptured, it creates a saclike “volva” at the base of the stalk, leaving warts and patches on the cap. *Amanita* species have a volva, and it’s important to dig under the base of the mushroom stalk to determine if the volva is present.

### **Size**

A large cap is six inches or greater. A medium cap is two to six inches across. A small cap is less than two inches. A thick stalk is greater than one inch in thickness; medium thick stalk, 3/8 to one inch in thickness; and thin stalk, less than 3/8 inch in thickness. The size of a mushroom is often a function of its age.





## Gills and Gill Attachment

Some gills are widely spaced, and some are tightly spaced. Some gills are deep and knife-edged, and some are shallow, thick, and blunt-edged (like folds, e.g., chanterelles). Gills attach to the stalk in many ways. Free gills are not attached to the stalk. Adnexed gills are narrowly attached to the stalk. Adnate gills are broadly attached to the stalk. Decurrent gills run down the stalk.

## Gill Color and Spore Print

It's important to note the gill and spore colors when identifying mushrooms. Spore color is determined by taking a spore print. It's easy. This is how you do it:

Take a mature mushroom, and place it on a piece of white paper (dark paper if the gills are white) with the gills facing down. Cover it with a glass or bowl for several hours. The spores will fall from the gills, leaving a distinctive pattern. Boletes and hedgehogs will also produce spore prints. The spore color can also be determined by looking at the spore dusting on the veil, stalk, or cap of the mushroom being identified. The gill colors can change with maturity, so get a range of mushroom ages with your collections when possible.



Spore prints are important diagnostic features of mushrooms.

## **Fragrance and Edibility**

Mushrooms contain a wide diversity of smells and tastes that vary widely in type and intensity. For most edible mushrooms, I've included some favorite recipes in this book and some excellent cookbooks to consider in the References and Websites section.



Many mushrooms, like the morels, are edible and delectable.<sup>2</sup>

## **Habitat**

Where a mushroom is found, when it fruits, and how abundant a crop may be is covered in the “Habitat” sections. There are many factors that go into a mushroom’s fruiting habitat, and with experience, you will begin to understand some of these factors as they pertain to locating your favorite mushrooms in time and space. You may learn to associate certain types of vegetation or disturbances with the mushrooms of your choice in your area.



In the Western United States, forest and mushroom habitats are often as far as the eyes can see.



Edible mushrooms and mushroom hunters are often found in clustered patches and not evenly distributed across the landscape.

### **Similar Mushrooms That Should Be Avoided**

I've included common mushrooms that look similar and could be confused with the fifty-plus mushrooms described in this book. Obviously, these look-alikes should not be consumed because they can make you sick or even kill you. Depending upon a collector's experience and knowledge, there could be a much larger group of "look-alike" mushrooms. In addition, some people have allergic and gastric reactions to mushrooms that other people consume safely. Bottom line is to be safe and

certain of the identification of any mushroom you consume.  
*When in doubt, throw it out!*

---

<sup>2</sup> Some individuals have allergic reactions or stomach distress eating mushrooms that are commonly consumed as edibles. Best to eat a small portion when consuming a “fry”-designated mushroom for the first time. More people get sick from overindulgence or eating rotten mushrooms than actual mushroom toxins.

## **WARNING!**

This book is intended to encourage the reader to go out and discover mushrooms. There are over a thousand mushrooms in the Western United States. This book covers over fifty. This book is not a “know-it-all” guide to harvesting, eating, cooking, and processing wild mushrooms. Nor is this book intended to guide the reader into consuming mushrooms for culinary, medicinal, or mind-altering experiences.

It is important to remember that some mushrooms are poisonous and a few are deadly. I’ve seen deadly mushrooms grow within patches of delicious mushrooms, so examine all specimens. Proper identification is essential. If you are an amateur, find experienced experts to learn from. I will provide some excellent books and online references to learn more details regarding the identification and uses of culinary, medicinal, or mind-altering mushrooms. Many mushroom poisonings are caused by people eating spoiled mushrooms. Mushrooms keep more like fish and less like vegetables. When in doubt, throw it out. And please, until you get experienced, never eat a white-gilled mushroom or little brown mushrooms. Some deadly *Amanitas* have white gills, a veil, and a volva here in the Western United States. They could put you in the “die” category in the book’s title *Fry, Thrive, or Die*.

This book will help educate you regarding some important mushroom species in the Western United States. It does not replace the advice of a physician or qualified health professional. Some people have unique food allergies and sensitivities. The author takes no responsibility and does not encourage anyone to ingest any mushroom solely based on the information in *Fry, Thrive, or Die*. The author and the publisher are not responsible for any adverse effects or consequences from the use of information in this book.



Some mushrooms, such as the *Amanita ocreata*, are deadly poisonous.

## GO FOR A WALK IN THE WOODS

What always makes my day better? Going for a walk in the forest and looking for mushrooms! Sometimes I find just a few, sometimes I find the mother lode, and sometimes I get “skunked.” But I always enjoy the natural beauty in my surroundings.



In the woods with a mountain blond morel.

Walking in the woods is a great activity to do with family and friends. Finding mushrooms is like a treasure hunt to be shared with people. Mushrooms vary widely in color, shape, size, and smell. Some mushrooms grow on litter and dead leaves, some on living roots near the soil surface, and some on rotting wood and standing trees. So it's never boring and always challenging to determine what you have discovered. This book will help.

Furthermore, people aren't the only ones who like finding mushrooms. The woods are full of *mycophagists* (critters that eat mushrooms). Because mushrooms contain protein, minerals, vitamins, and other beneficial compounds, many wildlife species search out and ingest mushrooms. Squirrels, voles, deer, elk, cougars, and bears are just a few of the mycophagists that consume mushrooms. I know this because I have run into them in my forty-plus years of wandering in the forests, and I have seen the remains of their feeding—teeth

marks in porcini, scattered remains of orange chanterelles, and rotten logs and duff torn apart by bears and squirrels looking for truffle fungi. And what do the mushrooms get in return for being eaten? Mushrooms use wildlife to spread their spores in fecal matter that gets deposited across the forest floor.

Okay, by now you know I'm crazy about mushrooms. Millions of people are catching the mushroom "bug." They are incredible organisms. Fungi produce bread, beer, wine, cheese, and medicines that make our world a better place. Some mushrooms glow in the dark, some transform our brains, some are our most expensive meals, and some are the oldest and largest living things on the planet. This book is a celebration of their diverse and remarkable contributions.

So go out and explore. It all starts with a walk in the woods.

## **KIDS LOVE MUSHROOMS**

We are all descendants of hunters and gatherers, and our bodies and minds have evolved for that purpose. Children, over millennia and once they are old enough to forage, were important parts of the survival of family units. Today, the first time kids find a valuable plant or mushroom is likely a time of celebration. Kids love being producers. It gives them a sense of purpose, importance, and excitement. Watch the look of joy on a child's face when they find a morel, porcini, or a reishi, knowing it will be an honored member of the family table or the medicine cabinet. There is a sense of happiness when children learn about their world and discover that their actions have meaning.

It's interesting how different generations feel about mushrooms. When I was a kid, the Amaranthus family would often assemble on Sundays at my Italy-born grandpa's house for dinner. He would make a big meal for his five children, their spouses, and fifteen or so grandchildren, including me. The main dish would invariably have wild mushrooms included. I vividly remember my mother and aunts, who were born and raised in America, painstakingly pulling the mushrooms off the plates of the grandchildren. They feared my grandpa's wild mushrooms would poison us.





I think the fear of mushrooms is primarily projected by the attitudes of adults. My own five kids and eight grandkids have grown up around mushrooms. In our house, there are always some fresh edible, medicinal, or “curious” specimens in the fridge. Medicinal tinctures and teas are in a pot on the stovetop after a morning brew. Dried and frozen fungi are stacked in the pantry and freezer. I have a microscope in my home office, and the kids and grandkids look at specimens and spores when they come to visit. So basically, there is little fear of mushrooms in our family. We raised our kids to hunt mushrooms, and we still go out with the kids and grandkids in the spring and fall. Not all kids love to eat mushrooms, but they all love to get out into the forests and fields with their bags and field gear. They get dirty and find treasures. They see butterflies, wildflowers, and wildlife, and they hear stories of the mushroom hunting past. There is something about hunting and gathering that resonates deeply into the human soul.



## **GROWING UP IN A MUSHROOM FAMILY**

Zack Amaranthus

Anyone who has ever walked through a home improvement store at some point in their life has surely seen an inconspicuous tool called a potato hoe; it is used to pop potatoes out of the ground. It's one of those tools that will leave you guessing, "What the hell would anyone use that for?" It's got a long handle and a short head with curved, four-inch tines. Oddly enough, my family always had seven potato hoes in the garage, yet we never grew potatoes ... ever.

Geographically speaking, our family lived on the side of a mountain surrounded by a forest with a view as far as the eye could see. Not exactly a great place to grow potatoes. My dad being a scientist and me being a curious kid led me to ask the question, "How do these trees grow so tall without anybody watering or fertilizing them?" And to his delight, he answered with just a single word, "Mycorrhizae!" A typical parent would probably have answered that question by talking about the annual precipitation or our geographical location in the Pacific Northwest. Not my dad. He knew there was something going on underneath our feet that was a keystone to the growth of trees. Without even knowing it, my childhood interest had been written with that single word. The relationship between fungi and plants would strangely play a part in my career choice later in life.

My first mycorrhizal exploration came at an early age. The potato hoe, a tool my family dubbed a "truffle fork," finally had a purpose.

To this day, if you ask any one of my siblings, they wouldn't have a clue what a potato hoe was even though they've all handled one a hundred times. A truffle fork, on the other hand, everyone knows that this is a crucial tool to our family. It is a fork, essential to pulling back just enough soil to find the most prized mycorrhizal fruiting body, the elusive truffle.

My parents bought me a toy “truffle fork” for my second birthday.



Zack at two years old holding a truffle.

Our discoveries were not the white or black truffle of culinary fame but a *Rhizopogon* truffle. Our family called them “pogies.” My folks used these fungi to inoculate trees in their forestry inoculation business to improve the growth and survival of tree seedlings. Hunting them was never a crapshoot. We were trained to only look where there was a squirrel pit: a small hole in the forest duff where an animal had dug. When we found one, we would use our forks to examine an area about three inches deep and four inches wide in either direction in search of the small, potato-like truffles. We were careful to replace the forest floor. These trips were meticulously mapped by my dad. He knew which tree species formed truffles and the time of year they would form. When we found truffles, my mom and dad would make a big deal over our treasured discovery, and there was usually ice cream to celebrate a successful hunt.

Seasonally, my siblings and I became hunters and gatherers. It was fun to be out in the woods competing in these “hidden easter egg hunts.” It’s interesting that thirty-five years later, my life revolves around fungi, from producing mycorrhizal products to growing truffle-colonized trees. My life is now dedicated to fungi. I eventually stopped questioning the number of truffle forks in the garage. Those forks lined the wall of a mushroom-loving family.



Zack aged two with a giant porcini.

## **SUSTAINABLE HARVEST OF WILD** **MUSHROOMS**

Throughout history, mushrooms have been important sources of food and medicine. In the Western United States, recreational and commercial harvests have grown dramatically in recent decades. Supplemental income of thousands of individuals working full time or part time in the commercial harvest of chanterelles, boletes, morels, and matsutake has contributed millions to local economies (Amaranthus and Pilz 1996).

Today thousands of recreational and commercial pickers continue to harvest wild mushrooms from public and private lands. Yet there is uncertainty about the ecology of wild edible mushrooms, the effects of climate change, and the intensity of disturbances caused by wildfire, drought, and disease (Perry and Amaranthus 1990). At the center of the management issue is a lack of information on productivity and habitat requirements, interaction of forest health, and the effects of repeated mushroom harvest (Amaranthus 1998).

Some encouraging data exists regarding managing forest habitats to increase mushroom production is possible for some species (Amaranthus et al. 1998). In addition, other data suggest that careful mushroom harvest without excessive disturbance of the forest floor does not negatively affect wild mushroom production (Amaranthus et al. 2000). Because mushrooms and truffles are just the fruits of the mycelium, they can—if done properly—be harvested in a sustainable way by only taking the fruit and leaving the mycelium intact.

More data is needed as wild mushroom harvest continues to expand. Clearly, if wild edible and medicinal mushroom harvest is to be sustained, it must be done by understanding the biological, economic, and social forces behind their harvest. So when you are out collecting your wild mushrooms, pick only the healthy specimens (leave old or rotten fungi in

the woods). Also, use a mesh bag. The holes in the mesh allow fungal spores to fall to the ground and spread across the landscape with you. Don't excessively disturb or rake the forest floor and the fungal mycelium in search of young specimens that are hidden from view beneath the duff layer. Remember also to replace the duff layer on the forest floor after it has been removed.



This matsutake mushroom was carefully excavated and harvested with minimum disturbance to the forest floor and mushroom mycelium.

## MYCO-WHAT? MYCORRHIZAE!



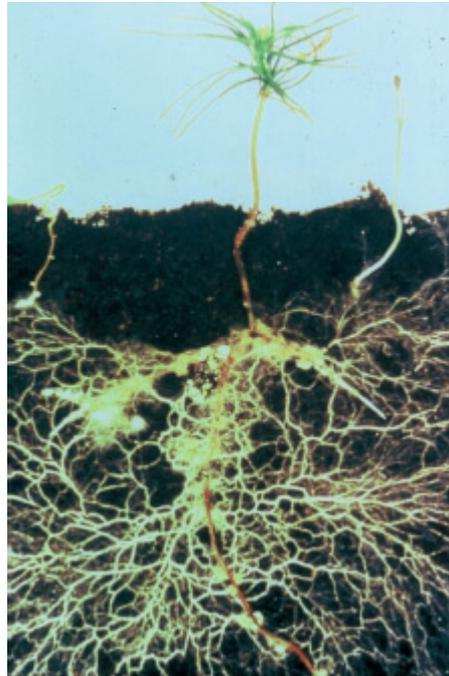
Mycorrhizal mushrooms connected to trees.

Many of the edible mushrooms described in this guide are mycorrhizal. They include chanterelles, boletes, milk caps, matsutake, hedgehogs, black trumpets, truffles, and many morel species. And some of the most poisonous mushrooms—like *Amanita ocreata*, *Amanita phalloides*, and *Gyromitra esculenta*—are mycorrhizal too.

Technical words, like *mycorrhiza*, get thrown around a lot by scientists. Naming things, in scientific ways, is the basis for beginning to understand how things work. But at this point, the real question you may be asking is, “Myco-what?” Scientific terminology and Latin names can be confusing as we look for fungi. None of this must be so technical, so full of jargon and gobbledygook that we cringe at the sound of certain terms like *mycorrhiza*. I am going to suggest, however, that *mycorrhiza* is one term you learn so you can gain a greater appreciation for the mysteries (and the location!) of the mushrooms you are picking.

Mycorrhiza is probably the best-studied plant-microbial relationship. There are over a hundred thousand peer-reviewed

scientific studies in the technical literature. The problem is the scientific literature is difficult to access and understand, especially without the experience of reading technical papers. It is time to explain the basic workings and benefits of this remarkable group of fungi in plain terms.



White mycorrhizal filaments extend from a pine tree grown in a glass box.

### **Myco-What?**

Let's start with some basics. Fungi form a beneficial living relationship with a vast majority of plant species. This is a symbiotic relationship where both species work together to survive and thrive. It's a win-win. We call a root-fungus combination a *mycorrhiza* and its plural, *mycorrhizae*. *Mycorrhiza* literally translates to "fungus-root." The roots of an estimated 85 percent of the world's plant species have this association with these specialized fungi (Rimington et al. 2020).

Mycorrhizal fungi form the network of fungal filaments, or "threads," that permeate into the soil from their home on the plant root. The body of the mycorrhizal fungus consists of microscopic filaments called *hyphae*. An individual *hypha* (singular) is approximately 1/25th the diameter of a human

hair and can grow up to two feet in length! Hyphal strands grow from within and around the root cells of the “host” plant, spreading out into the surrounding soil. These same hyphae can aggregate into a collection of hyphae, called *mycelium*, which forms many of the mushrooms and truffles described in the *Fry, Thrive, or Die* field guide.

The trading of soil water and nutrients, captured by the mycorrhizal fungus for sugars produced by plant photosynthesis, is the foundation for this ancient relationship dating back 460 million years. Mycorrhizae in nature are the rule, not the exception, and they are fundamental to plant nutrition for most plant species. Putting this together in the big picture, this is how the living soil got started and the reason plant life began to flourish across a once-barren earth!

Mycorrhizal fungi are particularly important in accessing phosphorus, nitrogen, zinc, iron, calcium, magnesium, manganese, sulfur, and other important soil nutrients (Clark and Zeto 2008). They also help protect the plant root system against drought and disease and help plants revegetate degraded sites (Amaranthus et al. 1989).



The trees on the right were colonized by mycorrhizal fungi and have better nutrition.

## **Mycorrhizal Fungi Form Mushroom- and Truffle-Fruiting Bodies**

For the mushroom hunter, however, you are most interested in mycorrhizal species that form mushrooms. The species are associated with conifers, oaks, pecans, hazelnuts, beeches, eucalyptus, alders, cottonwoods, poplars, birches, and some tropical hardwoods. When you see a mushroom, you can think of it as the “fruit” of a much larger fungus, much like the apple is to the apple tree.



A mycorrhizal mushroom fruit from a container where the tree is supporting its fungal mycelium.

Well over four thousand species of mycorrhizal fungi occur in forests across the globe. When you walk through the woods and find a mushroom or a truffle, you are probably seeing the “fruiting body” of an ectomycorrhizal fungus.

Aboveground, a mushroom disperses its spores into the air, while belowground, the hidden truffle uses another strategy: it attracts mammals or other animals with a hormonal scent to move its spores around. Once consumed and dispersed, these spores can colonize the sites of new tree roots. Truffle species are also known for their epicurean delicacy, yet not all truffle species are tasty. The nonedible truffles are quite common in Western Oregon and Washington, and their production can actually exceed that of mushrooms on some sites (Amaranthus et al. 2001). Tasty or not, they contain millions to billions of spores, or “fungal seeds,” waiting for a tree root to colonize.

## WHAT MAKES MUSHROOMS MEDICINAL?

Mushrooms have been used medicinally for thousands of years, but it is only recently that scientists have documented some of the specific mechanisms for how mushrooms improve health and vigor. Several well-documented medicinal mushrooms (such as reishi, hen of the woods, lion's mane, oyster mushroom, chaga, and turkey tail) are featured in *Fry, Thrive, or Die*.

Medicinal mushrooms contain certain polysaccharides, polyphenols, and antioxidants that are scarce in other foods. Many have high concentrations of vitamins, amino acids, nutrients, and micronutrients. These beneficial characteristics can help the body reduce inflammation and cholesterol, as well as combat tumors, viruses, and bacteria. If you want to delve into the current research on mushrooms, check out the [mushroomreferences.com](http://mushroomreferences.com) website. It contains hundreds of abstracts and citations of peer-reviewed scientific studies related to the medicinal qualities of specific mushrooms. The website lists studies by mushrooms species, and it is an effective way to keep up with the latest scientific research for chaga, lion's mane, hen of the woods, *Psilocybe*, reishi, turkey tail, and many more.



Some mushrooms, like the hen of the woods, are medicinally important and also delicious to eat.

In this section, I will cover some of the important compounds found in medicinal mushrooms and what they can do for

human health. Then I will guide you on how to prepare them in teas and tinctures. It is important to know how these compounds are released from mushrooms. Some of these compounds are soluble and released in hot water (for example, in preparation of teas) while others are only soluble in alcohol (for example, when making tinctures). Still others are released partially in water but more thoroughly extracted with alcohol, and in these cases, tinctures can be made that extract both water-soluble and alcohol-soluble compounds. There are also some details on the specific compounds, but if you are not interested in such details, you can move on to the “Where Do I Find Medicinal Mushrooms?” section.

### **Polysaccharides**

Mushrooms are known for containing long-chain carbohydrate molecules called *polysaccharides*. Certain polysaccharides (such as beta-glucans, chitin, and arabinoxylan) are known to boost the immune system, inhibit tumor growth, and slow inflammation. Beta-glucans are perceived by the body as foreign invaders. As a result, the body produces an array of defense mechanisms, including production of cytokines, macrophages, and natural killer cells (T cells), which make the immune system more responsive to pathogens. Arabinoxylan is also present in many medicinal mushrooms. It is a major component of dietary fiber, which improves digestion and protects the body from infections. Polysaccharides are water-soluble.

### **Melanin**

Melanin is a pigment produced by most living organisms. For many fungi, it is produced in abundance. Melanin acts as an armor, protecting the fungi from ultraviolet radiation. It works similarly in humans where melanin is present in the hair, eyes, and skin. Melanin from fungal sources can improve the health of the epidermis layer of the skin and help maintain the healthy pigmentation of the skin and hair. It also forms a melanin-glucan complex that scientists have identified as providing high

antiviral protection against a variety of viruses. Melanin is water-soluble.

### **Vitamins B and D, Minerals, and Amino Acids**

Mushrooms are rich in B vitamins: riboflavin (B2), folate (B9), thiamine (B1), pantothenic acid (B5), and niacin (B3). These help the body utilize energy from the food we consume and produce red blood cells, which carry oxygen throughout the body. Medicinal mushrooms are a great source of vitamin D. When mushrooms are exposed to sunlight, they convert *ergosterol* (a sterol produced in mushrooms) into vitamin D. Medicinal mushrooms contain nutrients and minerals (such as phosphorus, copper, potassium, magnesium, zinc, and selenium) that are essential for good nutrition. A variety of medicinal mushrooms also contain essential amino acids (leucine, lysine, histidine, methionine, phenylalanine, threonine, tryptophan, and valine). Vitamins, minerals, and amino acids are water-soluble.

### **Polyphenols**

Polyphenols are a large group of organic compounds prominent in fungi. Polyphenols are considered antioxidants and protect cells from the oxidative damage of free radicals. The antioxidant value of certain mushrooms can be very high. For example, the antioxidant value of chaga is 1,500 times higher than blueberries or blackberries. A long-term study from Spain published in 2021 found that certain foods rich in polyphenols (which include mushrooms as well as coffee, cocoa, and red wine) may be protective against cognitive decline in older adults. Polyphenols can be extracted by both water and alcohol.

### **Ergothioneine and Glutathione**

Mushrooms contain a very high concentration of ergothioneine and glutathione. When these antioxidants are present together, they work to protect the body from the physiological stress that causes aging. Penn State researchers

found that the antioxidants ergothioneine and glutathione may also help prevent Parkinson's and Alzheimer's. Ergothioneine and glutathione can be extracted by both water and alcohol.

### **Triterpenoids**

Triterpenoids are a class of chemicals officially classified as being composed of three terpene units (*terpenes* are aromatic compounds). Many medicinal mushrooms have high concentrations of triterpenoids. Triterpenoids are used for medicinal purposes in many Asian countries for anti-inflammatory, analgesic, antiviral, and antitumoral applications. Triterpenoids are a complex of many beneficial compounds, such as sterols, betulin, and ergosterol. Triterpenoids are best extracted with alcohol.

### **Where Do I Find Medicinal Mushrooms?**

You will be surprised where you might find medicinal mushrooms once you start looking. I have found them in neighborhoods, golf courses, parks, and forests. Ironically, I have spied them in front of doctor's offices, hospitals, and Safeway parking lots too. The city, the suburbs, and the "boonies" all have potential. What you need are trees, downed wood, stumps, or buried logs and branches. Some medicinal mushrooms prefer mature forests; some like oak scrublands; while others are just over the fence in your neighbor's backyard. When you are bored or waiting for someone, go outside and look for them. I guarantee it will be more rewarding than checking your smartphone. The descriptions of species in *Fry, Thrive, or Die* will help you in your quest for medicinal offerings found in a variety of habitats.



Chaga fruiting on a birch tree in a neighbor's yard.



Mushrooms at a growers' market in Oregon that provides fresh and dried medicinal and edible mushrooms year-round.



Artist's conk reishi growing in a mature forest.

## **Making Teas and Tinctures**

Once you have collected your own medicinal mushrooms, and discarded any spoiled or moldy ones, you can begin to prepare your specimens for making teas and tinctures. Large, woody conks—like reishi and chaga—need to be processed into smaller chunks. For fresh specimens, you can split them with an axe or hatchet. For dry ones, simply place them in large ziplock bags that are double-bagged and hit them with a hammer. Turkey tail mushrooms are a little easier and can be cut up with shears or scissors. Your neighbors will likely be wondering what you are doing whacking away on mushrooms in your yard. Sure, they might think you are crazy, but really, do you care at this point?

If you can't find medicinal mushrooms in the wild, you can always buy them at health food stores or online. They come in bulk powder, capsules, and tinctures. Many growers' markets and grocery stores now carry healthy, fresh, and delicious shiitake and oyster mushrooms. In addition, hen of the woods

and lion's mane are wonderful culinary delights and are getting easier to find in gourmet and supermarkets as well. As Hippocrates, the famous Greek physician, said in 440 BC, "Let food be thy medicine and let thy medicine be food."

Fresh or dried medicinal mushrooms can be used as teas or tinctures.



Preparing tinctures with medicinal mushrooms chaga and reishi.

## Teas

A simmer or boil is necessary to unlock the polysaccharides, melanin, vitamins, minerals, amino acids, and some polyphenols compounds found in mushrooms. Boiling the mushrooms for ten minutes releases these compounds and breaks down chitin, which is present in mushroom cell walls. Chitin is the same material that composes crab shells because, as noted before, mushrooms are more closely related to crustaceans and insects than plants. Use one-part mushrooms to twenty-parts water. If you make a big pot, put it in the refrigerator, and the tea will keep for several days.

## Tinctures

Tinctures are generally an extraction of both water- and alcohol-soluble compounds. Pack a glass jar (don't use plastic) with your medicinal mushrooms, and cover with high-percentage alcohol, like Everclear or vodka. Seal the container, and shake it once a day for two to four weeks. When you are

ready, decant the infused alcohol through a filter cloth, and squeeze the remaining mushrooms to extract all the liquid. Take the squeezed mushrooms and cover with water. Boil for fifteen to twenty minutes. This liquid water extract can then be added to the alcohol infusion at a 5:1 ratio. Tinctures are stable and can be kept for at least a year at room temperature. You can add two full droppers of tincture to water, juice, coffee, or any other beverage morning and night.

## **PREPARING AND STORING WILD** **MUSHROOMS**

Mushrooms are fungal “fruits,” and they should be stored and processed like berries or other fruits. When gathering mushrooms, pick only the healthy-looking specimens. These are the young or recently mature mushrooms, like the ones you might select when you go shopping for them in the supermarket. Mushrooms that are buggy, gooey, overly mature, or have a foul smell should be left in the field. That way they are a food source for other animals, and their spores will disperse to seed future mushrooms. Fresh edible mushrooms have a rich earthy smell, each with their own tones and fragrances. Like berries, do not wash mushrooms until you are ready to prepare them. This is a common mistake and a big no-no! You don’t want to turn your wild mushrooms into “mush.”

To prepare, clean each mushroom. This is a time where you can admire your harvest. If there are things attached to your specimens (like soil or needles, twigs, or grass blades), clean them off with a soft brush. Then store the mushrooms in a paper bag in the fridge. Storing them in a plastic or sealed container will quickly make them slimy. Fresh, good-quality wild mushrooms can be stored in a paper bag in the fridge for several days. But remember, your fungal fruits are more like fish than vegetables in terms of length of storage. If your mushrooms do start smelling foul or “fishy,” dispose of them. More people get sick from eating spoiled mushrooms than from eating poisonous ones.

Boletes and morels can be dried and stored for later use. They rehydrate well and taste as good (some say better) as the original fresh mushrooms. For long-term storage, morels and boletes should be sliced (morels in half longways and boletes in quarter-inch-thick slabs) and placed on a dehydrator. In a few hours, they are ready for long-term storage in a sealed container. Boletes will take longer to dry than morels.



Placing morels on a dehydrator tray.

For mature boletes, you can separate the pores (peel the layer of tubes from underneath the cap) easily from the cap and dry them separately. When rehydrated, the dried edible bolete pores are fantastic in sauces and soups. Both morels and boletes rehydrate nicely when placed in warm water for thirty minutes, and the lovely flavors of these fungi will intensify. Some people don't have dehydrators, so they dry their morels by stringing them together with a needle, flossing through the stem, and hanging them, like prayer flags, outside on warm days. You can also chop them fresh and place them in ziplock containers in the freezer. When needed, they are simply thawed and sautéed. Like all mushrooms, they should be cooked before eating.



A dehydrator.

For chanterelles, drying makes them too tough and chewy, so preparation and storage methods are different. To store

chanterelles, they should be thoroughly cleaned with water and broken into one-eighth- to quarter-inch-thick strips for immediate dry-sautéing. Place them in a hot pan without oil or butter for approximately five minutes to drive excess water from the mushrooms. Place the sautéed chanterelles on a towel for air-drying and cooling. Then put them in a sealed container and freeze for later use. You can even use the chanterelle liquid that remains in the pan. You can use it in sauces or freeze it as stock for your yummy mushroom soup.

When cooking fresh wild mushrooms, wash the mushrooms right before you cook them. Mushrooms can be sautéed, roasted, broiled, grilled, barbecued, or boiled. Mushrooms should not be eaten raw. Bon appétit!



Dried morels rehydrate to almost their original size, gracing any meal year-round.

# **MUST-KNOW MUSHROOMS**

## 1. CHANTERELLES AND FALSE CHANTERELLES

Popular, widespread, and abundant, a few good chanterelle patches can fill your refrigerator and freezer with collections. They tend to fruit every year in the same exact spot, so good recon can pay dividends for decades! They taste fruity, and the Pacific golden and white chanterelles are large and dense. There is one close look-alike for the collector with some experience: the false chanterelle (also featured in this book for handy comparison). Get to know it, and eat comfortably and joyfully with friends and family.

This group is distinguished by its trumpet-shaped or wavy, vase-shaped cap and blunt folds rather than thin-bladed gills beneath the cap. The mushrooms in this section can be distinguished from each other by their color and the underside of their cap, which generally have blunted interconnected veins (or, in the case of the black trumpet, is smooth). The false chanterelle is distinguished by the prominent scales on its cap and the contrasting color between the reddish-orange cap and the white to pale-yellow stalk. The yellow foot chanterelle is small, delicate, and has a hollow stalk. Chanterelles and the false chanterelle are mycorrhizal with trees.



Finding chanterelles are like finding pots of gold in the forest.

There are ninety species in the broad chanterelle group worldwide with about forty species in North America. Chanterelles are popular edible wild mushrooms of considerable economic value. I have highlighted four delicious widespread and abundant species: the Pacific golden chanterelle, the white chanterelle, the yellow foot chanterelle, and the black trumpet. The false chanterelle is included because it resembles the Pacific golden chanterelle and occurs in similar habitat but causes gastric distress if consumed.



Chanterelles are popular edibles all over the world and important economically.





## PACIFIC GOLDEN CHANTERELLE

*(Cantharellus formosus)*

The Pacific golden chanterelle (*Cantharellus formosus*) is a very common and highly sought-after edible mushroom found in the Pacific Northwest and Northern California. It is a very large, meaty mushroom in the Cascade Mountain Range and in California, but a smaller and more delicate variety occurs in the coast range of the Pacific Northwest and in the Rocky Mountains. The Pacific golden chanterelle is an important commercial species because of its economic value and abundance. It is tasty in soups or as a sauce over meat, poultry, or pasta. It is popular in specialty markets and restaurants, and you can often find them in the produce section of your local grocery store. But can you afford to buy them? They are indeed spendy when purchased fresh in retail stores. If you go find your own patches of chanterelles in the fall, you can return to the woods year after year in the same place to collect your own golden treasures.

The Pacific golden chanterelle goes by other names—including “golden chanterelle,” “yellow chanterelle,” “girolle,” “pfifferling,” and *Cantharellus cibarius*.

### Cap Characteristics

The cap ranges from small to large (one and a half to seven inches across) and thick. The cap is smooth, not scaly, and colored orange to yellow. The top of the cap is sunken or depressed, funnel-shaped, and usually wavy.

### Underside of Cap

The cap underside is orange, yellow, to slightly salmon-colored with blunt veins. The veins are widely spaced, sometimes interconnected, and generally lighter in color than the cap. The veins also extend down the stalk (decurrent).

### **Stalk**

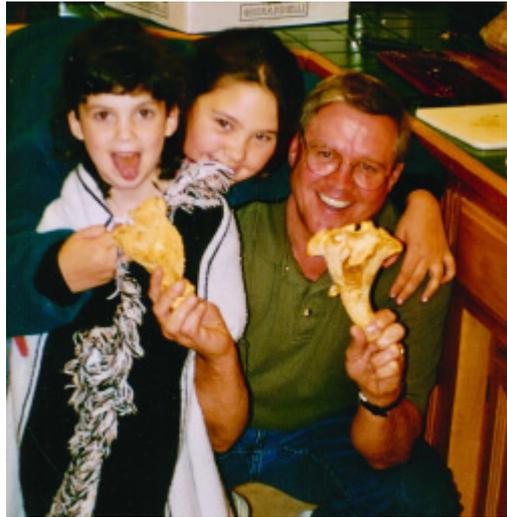
The stalk is generally one to four inches high and the same color or slightly lighter than the cap. Blunt veins, or wrinkles, run down the stalk, often interconnecting. The stalk slightly tapers down from the cap and is solid, not hollow.

### **Fragrance and Edibility**

Pacific golden chanterelles are fragrant and fruity, with hints of apricot and pumpkin. It's an excellent edible mushroom that can be often found in abundance.

### **Habitat**

You can find Pacific golden chanterelles in conifer forests of Oregon and Washington and Northern California. It fruits from July to December. In the Pacific Northwest, it had been classified as *Cantharellus cibarius* (the golden chanterelle from Europe); however, it was determined through DNA testing to be a distinct species, and it has recently been reclassified as *Cantharellus formosus*. Still, *Cantharellus cibarius* can be found in conifer and hardwood habitats in other parts of North America and looks the same as *C. formosus* to the naked eye. Another similar but very large, yellow chanterelle, *Cantharellus californicus*, is found under oaks in California. *Cantharellus subalbidus*, the white chanterelle, often occurs at the same time as the Pacific golden chanterelle but is white and generally found at a higher elevation. Pacific golden chanterelles are mycorrhizal.





## WHITE CHANTERELLE

*(Cantharellus subalbidus)*

The white chanterelle is a common and highly sought-after edible mushroom in the Pacific Northwest and Northern California. The white chanterelle can be quite large and dense. It is popular in specialty markets and restaurants. It is great in soup or as a sauce over meat, poultry, or pasta. Because of its high density, the white chanterelle does not release as much water as the Pacific golden chanterelle when cooked. Some people prefer eating the white chanterelle to the Pacific chanterelle. You will enjoy them both. Fundamentally, they are both fruity and appetizing.

It is also called the “giant white chanterelle.”

### **Cap Characteristics**

The cap is medium to large (generally three to six inches across), thick, dense, and colored white to cream. It is smooth, not scaly, and bruises yellow brown. The top of cap is sunken or depressed, funnel-shaped, and usually wavy.

### **Underside of Cap**

The cap underside is white to cream in color, turning yellowish brown with age. Its blunt veins are sometimes interconnected.

### **Stalk**

The stalk is generally one to four inches high, thick, and the same color as the cap. Its blunt veins or wrinkles run down the stalk and sometimes cross. The stalk also slightly tapers down from the cap and is solid, not hollow.



## **Fragrance and Edibility**

The white chanterelle is fragrant and fruity, much like the Pacific golden chanterelle, with hints of apricot and pumpkin. It is very large, meaty, and delicious.

## **Habitat**

You can find white chanterelles in the conifer forests of Oregon and Washington and Northern California. It fruits from October to December. Some report finding it under tanoak and manzanita in California. It is common in older conifer forests at high elevations. In the Cascade Mountain Range, the white chanterelle often occurs at the same time or a bit later than the Pacific golden chanterelle and often quite abundantly. The Cascade chanterelle (*Cantharellus cascadensis*) is also edible and looks similar in shape to the white chanterelle, but the cap is bright yellow, and it has a bulbous base.



The white chanterelle can fruit abundantly at high elevations across the Pacific Northwest.





## YELLOW FOOT CHANTERELLE

*(Craterellus tubaeformis)*

The yellow foot chanterelle is a small edible chanterelle and is more delicate than the meatier Pacific golden or white chanterelle. It has a thin, hollow stem and is found in the winter and early spring in moist habitats. I included the yellow foot in *Fry, Thrive, or Die* because they are delicious! Sure, you will need to collect handfuls to make a meal out of these delicate and small specimens, but if you are on the Pacific Coast in the winter or spring, you are going to want to get to know and pick the yellow foot!

It is also referred to as “funnel chanterelle,” “winter chanterelle,” and *Cantharellus infundibuliformis*.

### Cap Characteristics

The cap is small in size (generally one to two inches across), smooth, and colored brownish tan to yellowish orange. It is smooth, and the top of the cap is sunken or depressed.

### Underside of Cap

The cap underside has white to yellowish blunt veins. The gills are widely spaced and sometimes interconnected.

### Stalk

The stalk is generally one to three inches high and thin and hollow. Blunt veins or wrinkles run down the stalk.

### Fragrance and Edibility

The yellow foot chanterelle is fruity and delicious. A favorite mushroom to eat, it is excellent in soup, with fish or poultry,

and over rice. It should be cooked slowly to bring out its complex flavors.

### **Habitat**

The yellow foot chanterelle is often abundant in moist environments in the winter and early spring. It is widely distributed under conifer forests, especially in Northern California and the Pacific Northwest. It commonly occurs in similar habitats and timing with hedgehog mushrooms.



## BLACK TRUMPET

*(Craterellus cornucopioides)*

The black trumpet may look sinister, but it is delicious and well worth the effort to hunt and devour. It is one of my favorite edible mushrooms. Slow, gentle cooking brings out the flavors. It is great with chicken, fish, vegetables, and eggs. I hear from friends you can dry black trumpets and rehydrate them for later use. I've never done it (I eat them too fast), but I would love to try!

The black trumpet shape and lack of gills or prominent veins make this mushroom easy to identify and perfect for the beginner to hunt and enjoy. It has no dangerous look-alike species to confuse it with. One of its common names is "trumpet of death," but whoever came up with this name should be banned from the forest. Don't believe it. It is one of the best edibles and finest fungal prizes in the West. You may hear it referred to as "horn of plenty" and "black chanterelle."

### Cap Characteristics

The cap is generally medium-sized, two to four inches across. It is brownish if the conditions are dry and turns charcoal to black when wet. There is a central hollow from the center of the cap to the base of the stalk. The black trumpet resembles the shape of a trumpet at maturity.

### Underside of Cap

The cap underside is gray to brown. It is without gills or distinct veins and can be slightly wrinkled.



## **Stalk**

The stalk is generally two to four inches high, thin, and leathery. It is gray, charcoal, or brown—not yellowish like chanterelles.

## **Fragrance**

The black trumpet has a rich smoky flavor and fruity aroma.

## **Habitat**

The black trumpet is commonly found during the winter, especially on the West Coast from Central California to Southern Oregon (although they can occasionally occur farther north). It fruits abundantly and in clusters under hardwoods, such as oak, tanoak, madrone, chinkapin, and beech. The black, gray, or brown color makes them difficult to spot in the shadows and among leaves. You find one, and then you realize you are standing in a patch of a hundred! The black trumpet is thought to be both a mycorrhizal and saprobic species (it can adapt to both). It grows on the forest floor and likes a dense layer of leaves, needles, and twigs. The mushroom is often coated with forest litter, so you may have to spend some time cleaning your black trumpets before you place them in your bag.



The black trumpet is very disguised—turning brown and tan if it is dry—and difficult to see on the forest floor.





## FALSE CHANTERELLE

*(Turbinellus floccosus)*

The false chanterelle grows alongside many edible chanterelles, and if you are not paying attention to the chanterelles you are picking, it may find its way into your mushroom bag. If you don't catch it before it lands in your frying pan, you or your guests will likely experience gastric pains. The false chanterelle is distinguished by the prominent scales on its cap and the contrasting color between the reddish-orange cap and the white to pale-yellow stalk. The center of the false chanterelle cap and stalk is hollow. This mushroom should be avoided.

It is called by other names—"scaly chanterelle," "vase chanterelle"—and was formerly known as *Gomphus floccosus* until 2011.

### Cap Characteristics

The cap is medium to large in size (generally three to five inches across), with prominent scales. It is vase-shaped and is red to orange on top. The top also is sunken or hollow.

### Underside of Cap

The cap underside has white to yellowish blunt veins or wrinkles extending down the stalk.

### Stalk

The stalk is generally two to four inches high and white to pale yellowish in color. Blunt veins or wrinkles run down the stalk.

### Fragrance and Edibility

The false chanterelle has a mushroomy but not fruity smell. It causes gastric distress.

### **Habitat**

The false chanterelle is widespread. You can find it before or during the Pacific golden and white chanterelle harvesting season. This mycorrhizal species is found in conifer forests across the West but is especially abundant in Northern California and the Pacific Northwest.

### **Similar Mushrooms That Should Be Avoided**

*Turbinellus floccosus*, the false chanterelle described in this section, often grows in the same areas as the chanterelle and looks similar. You should avoid this mushroom because it can cause gastric distress. It can be distinguished from chanterelles by its scaly cap. The *Turbinellus* cap is also darker in color than the stem and not wavy.

The pale version of the false chanterelle is the *Gomphus bonari*, and the tan version is the *Gomphus koffmani*—both are not recommended as edibles. The pronounced scaliness of the cap and the difference in the red-orange color of the cap's top compared to the pale-whitish color beneath distinguishes the *Gomphus* and *Turbinellus* groups from the choice, edible chanterelles.

Another species that a beginner might confuse with a chanterelle and should not be consumed is the poisonous *Omphalotus olivascens*, or the western jack-o'-lantern mushroom. It is orange in color but has knife-edged gills (not blunt veins), and it lacks a wavy cap like a Pacific golden chanterelle. It is found in California. Several other orange *Omphalotus* species are also poisonous and, while not lethal, can cause severe gastric distress, vomiting, and diarrhea. The beginner might also confuse deadly *Cortinarius orellanus* and *Cortinarius speciosissimus* species that have orange to reddish brown caps and yellow to reddish brown gills, not folds like chanterelles.

## Caring for and Preparing Chanterelles

Chanterelles can turn mushy and lose their flavor if they are washed with excessive amounts of water. If you clean your chanterelles well in the field, they won't require much washing. Chanterelles are generally bug-free. Prior to preparation, store your mushrooms in paper or cloth bags in a refrigerator. Dry-sautéing removes some of the water and concentrates the mushroom's flavor. To dry-sauté, first clean and slice the chanterelle. Put them in a skillet on high heat with *no* butter or oil for five minutes. Remove and place on a towel and let cool. Sautéed chanterelles can be used immediately or sealed in containers and frozen for later use. They are great in soups or as a sauce over meat, poultry, and pasta.

For you wild mushroom foodies, here are some other culinary opportunities:

- Mix into a wild mushroom risotto.
- Top a wild game dish like steelhead, duck, or venison.
- Chop, sauté, and incorporate into a hollandaise sauce.
- Slow-sauté and mix into a cheese omelet.
- Bake into a chicken pot pie.
- Add to gravy for an extra stylish sauce.
- Chop finely, sauté in garlic, and place mashed potatoes or white fish on top.
- Add to your favorite soup recipe.

And so many more options!

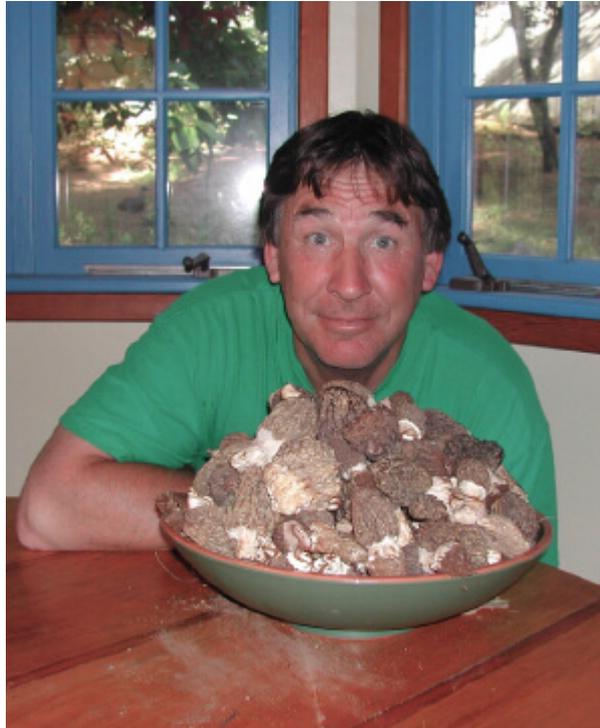
## **A MUSHROOM TRILOGY**

**Gordon Longhurst**

I became hooked on foraging wild foods, especially mushrooms, one wild weekend during my college years in the early seventies. A buddy was building a ramshackle cabin in the coastal rainforests of Oregon, and a bunch of us went over to help him out. We ended up sharing one of the more memorable meals of my life. The feast began to take shape when one of the members of the party caught a four-pound steelhead from the Coquille River. That inspired us to go down on the beach at low tide and harvest buckets of mussels from the rocks along the shoreline. But the crowning glory was the discovery of chanterelles in a nearby woods. The spruce trees were tall, and their canopy created a Hansel and Gretel feeling, like a dark cathedral. The forest floor was a soft carpet of needles and scattered in profusion among the trees were bright-orange chanterelles. It looked like someone had chopped up Halloween pumpkins and flung the brilliant orange pieces everywhere. The mushroom soup, the trout steamed in ferns and lemons, and the mussels cooked in a rich broth of wine, butter, and garlic were fantastic. We were a happy band of hippies.

My friends Mel and Ann, who lived in the backcountry in Northern California, had survived a large forest fire the summer before my wife, Susan, and I went to visit them. It was spring now, and there were morels popping up everywhere among the burned trees, and we easily harvested shopping bags' worth. The four of us then set out to visit Charlotte and Patrick, who lived high in the hills of Mendocino County. Patrick worked at Fetzer Winery and had a great stash of premium wines. Ann had just received a large package of chocolates from her parents who lived in Switzerland. For the next couple of days, we ate stuffed morels, morel quiche, morel omelets, and washed them all down with wine that none of us could afford to buy. For dessert, we ate all the superb Swiss

chocolates our piggy bodies could stand. As we dozed off on the deck watching the gorgeous sunset over Mendocino hills, our only worry was that it might be all downhill after this.



Years ago, living in the forest of Southern Oregon, we were fortunate to discover a perennial matsutake patch behind our house. At the time, the demand for matsutake was very high due to the Japanese market, and for several years, our young son and daughter made their Christmas spending money by picking and selling the “matsies” to wholesalers who were paying \$50 a pound for top quality mushrooms. We all delighted in the treasure hunt, searching for the bumps in the layer of leaves under magnificent madrone trees and then shouting with pleasure as we uncovered the pungent mushrooms. We didn’t mind selling them because we had found them disappointing as a culinary mushroom. Compared to so many other choice mushrooms we loved, they didn’t measure up—until one day, when somebody clued me into grilling them on the barbecue with a little teriyaki sauce, and it was an epiphany. Suddenly we had a dilemma: sell ’em or eat ’em? We compromised and sold the high-value ones and scarfed down the rest. Life was good!



Matsutake motherlode.

## Recipe:

### **CHANTERELLE SOUP WITH RED WINE AND BAGUETTE**

#### INGREDIENTS:

*2 tbs. olive oil*

*2 tbs. butter*

*2 white onions, sliced*

*4 garlic cloves, minced*

*10 oz. chanterelles, cut into 1 in. pieces*

*4 cups beef stock*

*1 cup red wine*

*1 bunch thyme*

*fresh baguette*

*salt and pepper*

#### METHOD:

Melt the butter and add garlic and onion in a soup pan set to medium. Cook to soft and golden about for 10 minutes. Add the chanterelles and cook for another 7–10 minutes depending upon thickness. Stir in the beef stock, wine, and thyme. Season to taste with salt and pepper. Dip your baguette into the soup and enjoy.

## 2. MILK CAPS

Mushrooms bleed? Yes, the milk caps do. The bleeding milk cap and the delicious milk cap are edible, but frankly, they are not the best edible mushrooms. I can't tell you how many times I have collected them then stumbled upon chanterelles and boletes and thrown the milk caps out of my bag. I know it sounds harsh. Sometimes mushroom hunting can be cruel.

The color of the milk each one bleeds when cut distinguishes the three milk cap species included in this book: *red*—bleeding milk cap (*Lactarius rubrilacteus*); *carrot-colored*—delicious milk cap (*L. deliciosus*); and *white*—bearded milk cap (*L. torminosus*). It is important to note if the milk of any milk cap mushroom you collect is white or yellow, *it is not an edible milk cap* and should be avoided. The color of the latex can change over time when exposed to air, so take note of the color immediately after you cut the mushroom. Another distinguishing feature of milk caps is that their stalks break clean and straight like a piece of chalk.



White bleeding milk caps should not be consumed.





## BLEEDING MILK CAP

(*Lactarius rubrilacteus*)

The bleeding milk cap exudes dark-red to purple milk when the gills are broken. This, combined with a green-staining cap and stalk, makes the bleeding milk cap distinctive.

It goes by other names—including “bloody milk cap,” “red-bleeding milk cap,” and *Lactarius sanguifluus*.

### Cap Characteristics

The cap is medium-sized (generally two to five inches across), orangish to reddish brown, and contains an abundance of concentric rings at the top. Green stains streak the cap at maturity.

### Underside of Cap

The cap underside has gills attached to the stem. They are reddish to orange brown and bleed a dark-red to purple latex when cut. It turns green when bruised (note—the color of the milk is very different from the color of a bruise).

### Stalk

The stalk is generally two to four inches high and the same color as the cap, staining green when cut or bruised. The stalk breaks like chalk and is brittle, not stringy. There is no volva, ring, or veil.

### Fragrance and Edibility

The bleeding milk cap has a nutty and a bit fruity fragrance. It is edible but not choice.

### Habitat

Common in fall under conifer forests, especially in the West Coast, the bleeding milk cap is an ectomycorrhizal species that associates with conifers. It can fruit abundantly.



The bright-red bleeding and green staining are distinctive.



## DELICIOUS MILK CAP

*(Lactarius deliciosus)*

The delicious milk cap has orange (carrot-colored) latex when the gills are broken or cut in combination with the green-staining cap when handled or injured; it makes this mushroom distinctive.

It goes by other names—including “saffron milk cap” and “orange juice milk cap.”

### Cap Characteristics

The cap is medium-sized (two to five inches across), often with concentric cap rings, and with a sunken center. It is orangish, orange brown, and can be grayish when young. When handled, the stains green at maturity.

### Underside of Cap

The cap underside has gills attached to the stem. They are orange to orange brown and bleed a bright-orange latex when cut, turning green when bruised.

### Stalk

The stalk is two to four inches high and is the same color as the cap, staining green when cut or bruised. The stalk breaks like chalk; it is brittle, not stringy. There is no volva, ring, or veil.



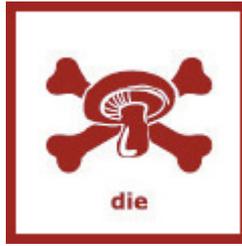
### **Fragrance and Edibility**

The delicious milk cap has a nutty with a hint of pineapple fragrance. The taste is sometimes slightly peppery. It is edible but not choice in my opinion.

### **Habitat**

A mycorrhizal fungus associating with conifers, the delicious milk cap is common in fall in conifer forests. It is widespread and can fruit abundantly in spruce and pine forests.





## BEARDED MILK CAP

*(Lactarius torminosus)*

The bearded milk cap has a whitish to pale-pink to pinkish-orange cap that is hairy at the edges. It bleeds white latex and does not stain green. The cap center is sunken, and it has no volva or ring or veil. It is associated with birch and goes by other names such as “woolly milk cap” and “pink-fringed milk cap.”

### Cap Characteristics

The cap is medium-sized (generally two to four inches wide) and colored whitish to pale pink to pinkish orange. It contains an abundance of concentric rings at the top of the cap and is sunken in the center. The edge of the cap is rolled and hairy at the edge.

### Underside of Cap

The cap underside has gills that are whitish to cream to light pink and bleed white. They are closely spaced and attached to the stem.

### Stalk

The stalk is two to four inches high and the same color as the cap or slightly lighter. The stalk breaks like chalk, not stringy. There is no volva or veil.

### Fragrance and Edibility

The bearded milk cap has a very peppery, acrid taste. It is not recommended as edible—it can cause gastric upset.

### Habitat

Common in fall in conifer forests, especially associated with birch, the bearded milk cap is a mycorrhizal species and generally occurs in mixed birch forests or where birch is planted as an ornamental. It can fruit abundantly.

### **Similar Mushrooms That Should Be Avoided**

Be careful to verify the red or orange color of the latex when the gills are cut or bruised. Don't eat a milk cap species if it bleeds yellow or white and has a very peppery or acrid taste. Other peppery milk caps that bleed white to yellow, like *Lactarius resimus*, should not be eaten.

## Recipe:

### **MARINATED MILK CAPS**

#### INGREDIENTS:

*1 lb. bleeding or delicious milk caps—cleaned, trimmed, and quartered or halved*

*1 tsp. salt*

*1/4 tsp. fresh ground black pepper*

*1/2 tbs. chopped wild thyme or*

*1/2 teaspoon dried thyme*

*3 cloves of garlic, sliced*

*1/4 cup oil (flavorless)*

*1/2 cup extra virgin olive oil*

*zest of a lemon, grated*

#### METHOD:

Heat oil in a saucepan and add edible milk caps. Cook until it is light brown. Add garlic and cook until light brown. Stir in thyme, lemon zest, salt, and pepper. Remove mushrooms from the pan with a slotted spoon and put in a container. Top with the extra virgin olive oil, pressing the mushrooms down so that the oil covers them. Refrigerate. The marinated milk caps should be eaten within a couple of days of preparation. Spread them over your pasta sauce, pizza, or eggs.





### **3. HONEY MUSHROOM**

*(Armillaria mellea)*

The honey mushroom is the largest and one of the longest-living life forms on the planet. Why do so few know anything about it? I suppose if it were a blue whale or a towering redwood and not a fungus, you would. Perhaps the honey mushroom needs an agent to work on its branding. The caps are actually pretty good to eat when they are young. But if you are a beginner, I would not recommend you eat it. It has white gills and a ring on the stem like a couple of deadly *Amanita* species. The honey mushroom is distinguished from *Amanita* by growing “almost always” in clusters or clumps of individual mushrooms from a concentrated base. But I have run into a solitary honey mushroom occasionally in the forest and in the yard.

The honey mushroom is part of the *Armillaria mellea* group and is a long-lived, white-rot fungus. It is both a destructive forest pathogen to conifer and hardwood trees as well as an edible addition to your culinary experience. *Armillaria mellea* encompasses a variable group of ten *Armillaria* mushroom species that have these general characteristics: presence of a yellow-edged ring on the upper stalk; a tough, fibrous stalk that tapers and fuses at the base; white spores; tiny hairs on the cap; and growth in tightly packed clusters at the base of infected trees and old stumps. The honey mushroom is also known as “honey fungus” and “oak root fungus.”

A honey mushroom colony can be thousands of years old.

#### **Cap Characteristics**

The cap is medium to large in size (generally three to six inches across). The color is variable but generally shades of yellowish brown. It has numerous tiny hairs or scales on top.

### **Underside of Cap**

The underside of the cap has gills attached to the stem. They are white to peach to yellowish in color and never turn brown.

### **Stalk**

The stalk is generally long (five to ten inches high), tough, and the same color as the cap. There is no volva. The flesh is white to dingy yellow, and there's a stringy white pith in the stalk.

### **Fragrance and Edibility**

The honey mushroom has a moderately sweet taste with a touch of bitter aftertaste. The mushroom cap is edible, but some people are intolerant of them. So eat a small amount the first time. Use them in any dish, just like you would use store-bought mushrooms. But unlike store-bought mushrooms, the stalks are very tough and fibrous and should be discarded. The tight clusters, with numerous individuals, can often fill baskets of mushrooms for your kitchen table.

### **Habitat**

The honey mushroom is very common in a variety of habitats. This pathogen attacks both conifers and hardwoods with fungal colonies extending over many acres. In fact, it is earth's largest living organism (see the "Ancient Humongous Fungus" section). Fruiting occurs in the fall in dense clusters at the base of conifers, hardwoods, and buried wood. Sometimes it looks like honey mushrooms are growing on the ground, but with careful examination, you will find it is growing out of buried wood below the soil surface. It is common and prominent in forest areas across the Western United States.

### **Similar Mushrooms That Should Be Avoided**

Toxic look-alikes include *Amanitas*—which, like the honey mushroom, also have white gills and a ring. *Amanitas*,

however, have a volva at their base and free gills. To be certain a mushroom is the honey mushroom, make sure the clusters are growing from decayed wood and there is no volva at the base. There are also deadly *Cortinarius orellanus* and *Cortinarius speciosissimus* species that have orange to reddish brown caps and yellow to reddish brown gills.

## THE ANCIENT HUMONGOUS FUNGUS AMONG US



Below the forest floor of the Blue Mountains looms a hidden whale of a creature. The discovery of this humongous life-form by forest pathologists Schmidt and Tatum (2008) made it the largest known living organism on earth—a title that was formerly claimed by the 110-foot-long, 200-ton blue whale. What is it? It's the *Armillaria ostoyae*, a honey mushroom fungus in the *Armillaria mellea* group. Found in a remote part of Eastern Oregon on the Malheur National Forest, it became the largest fungal colony and living organism in the world, spanning an area of 3.5 square miles (imagine 1,700 football fields placed side by side). This single organism is estimated to be somewhere between 2,400 and 8,600 years old and may be the oldest living organism on earth. The honey mushroom wears a variety of “caps.” If you are a tree, it's a pathogen and a deadly killer; if you are a cavity-nesting wildlife species living in a decaying tree, it is a place to call home; and if you are a foraging mushroom hunter, it is dinner.

The team of forest pathologists discovered the ancient fungus and set out to map the extent of its reach. The team grew fungal samples in petri dishes to see if they fused together, an

indication that they were from the same genetic individual. Utilizing DNA fingerprinting, they determined where one individual fungus ended and another began. What they found was that a single genetic fungal colony weighed approximately 35,000 tons—or 175 times the weight of a blue whale.

Most trees benefit from mycorrhizal fungi and mushrooms. The *Armillaria mellea* group of honey mushrooms, however, are pathogens that suck the life out of a variety of tree species. The mycelium of the honey mushroom girdles the trunk of the tree, killing all living tissue. It's a slow-rotting death that can take decades to complete, but when the fungus is finished, the tree has been recycled back into the soil for the benefit of future forests. The fungus then spreads to uninfected parts of the forest at a glacial speed of one to three feet a year.

## Recipe:

### **SAUTÉED HONEY MUSHROOM CAPS**

#### INGREDIENTS:

*1 lb. fresh, young honey mushroom caps (discard the stems)*

*salt and pepper*

*2 tbs. grapeseed or canola oil*

*2 tbs. butter*

#### METHOD:

In a frying pan, heat oil on medium high. Cook caps for 5 minutes until they are light-colored. Add butter and continue to cook the caps for another 5 minutes until mushrooms are golden and caramelized. Make sure your honey caps are thoroughly cooked. Uncooked honey mushrooms can cause an upset stomach. Season with salt and pepper to taste.

## 4. AMANITAS

The *Amanita* group contains some of the most beautiful, deadliest, and most hallucinogenic species of mushrooms. The *Amanita* group includes some of the most delicious edibles too. But differentiating between edible and poisonous species requires a keen eye and considerable field experience. I have not included edible *Amanitas* in this pocket guide because of the difficulty in distinguishing them for inexperienced collectors and for personal reasons—I don't want you to get sick or die if you misidentify an *Amanita* mushroom. Slipping a deadly *Amanita* into a meal has been involved with treacherous murders for millennia, including Roman Emperor Claudius AD 54 and Holy Roman Emperor Charles VI in 1740. I don't want you to end up like Claude or Chuck.

Two species in this section, the death cap and destroying angel, are deadly poisonous. The other two species in the section, the fly agaric and panther amanita, are hallucinogenic and can cause severe gastric distress. There is no harm in handling *Amanita* mushrooms; they must be ingested to be poisonous.

Incidentally, the fly agaric in this section is the poster child for mushrooms, video games, and trinkets all over the world. The classic red cap with white spots is iconic in the marketplace. But is there a connection to Christmas traditions?

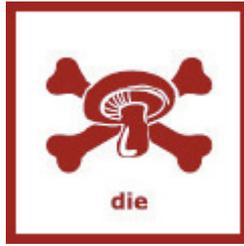
The *Amanita* species, as a general group, have white to very pale yellow gills, and when young, they have a universal veil that encases the mushroom like an egg. As the mushroom grows, the universal veil ruptures, leaving a sac at the base called the volva. The volva is a key feature of *Amanitas*, so it is important to always dig beneath the soil surface of white and free-gilled mushrooms to determine if a volva is present. Another important feature

is that the veil protects the gills and leaves a ring near the top of the stalk. *Amanitas* have gills that are “free” and not attached to the stalk. You should never eat a white-gilled mushroom until you know the deadly *Amanita* species in all their forms.



The fly agaric.





## DEATH CAP

*(Amanita phalloides)*

The death cap is the number 1 killer from mushroom poisoning.

The death cap name says it all. It is beautiful to look at, but if ingested, it is deadly. It is also known as “deadly amanita” and “stinking amanita.”

### Cap Characteristics

The cap is medium-sized (generally three to six inches across) and colored pale green, yellowish green, to olive brown. Its color can fade with age or intense rain. The cap has very scattered white warts or flakes, which are remnants of the universal veil. The cap tends to be bald (without warts) with age, and radial lines are absent at the edge.

### Underside of Cap

The cap underside has white gills that stay white at maturity; they are free from the stem.

### Stalk

The stalk is generally three to five inches long and colored white, sometimes with a hint of metallic green. It has a volva. The veil initially covering the gills evolves to a white to yellowish skirtlike veil on the stalk. Weather or intense rain can wash off the ring.

### Fragrance and Edibility

AVOID CONSUMPTION. DEADLY. It smells pungent and metallic. If ingested, a single mushroom can kill several people. It is the

number 1 cause of fatal mushroom poisonings worldwide. Age and weather can alter the smell of the death cap.

### **Habitat**

This mycorrhizal species only occurs in association with trees. Tree roots can extend into lawn areas, so the death cap is sometimes found in lawns or turfs. It was originally found in Europe but has proved to be highly mobile. With the planting of non-native trees with roots colonized with *A. phalloides*, it is now present in North America, Australia, and South America. It is widespread across the Western United States, occurring frequently under oaks and various hardwood species and with a wide variety of popular ornamentals.



## DESTROYING ANGEL

*(Amanita ocreata)*

The destroying angel is deadly poisonous.

The destroying angel is an appropriate name for the deadly *Amanita ocreata*. The destroying angel is also known as “death angel” and “angel of death.” Notice a theme here?

### Cap Characteristics

The cap is medium-sized, generally three to six inches across. It is white at the edges and white, tan, yellowish, or buff at the center. The cap tends to be bald but can have a thin patch, a remnant of the universal veil. Radial lines generally absent at the edge.

### Underside of Cap

The cap underside has white gills that stay white at maturity; they are free from the stem.

### Stalk

The stalk is generally three to five inches long and colored white, with a volva at the base. It has a universal veil initially covering the gills and evolving to a white to yellowish skirtlike veil high on the stalk.

### Fragrance and Edibility

AVOID CONSUMPTION. DEADLY POISONOUS. It has an unpleasant, sickly odor that may be too faint to detect on a windy day. If ingested, one mushroom can kill. It is one of the major causes of fatal mushroom poisonings worldwide.



## Habitat

The destroying angel is a mycorrhizal fungi that only occurs in association with trees. It is widespread in California, Oregon, and Washington, and it is commonly found under oaks and hazelnuts in California. It generally fruits in the winter and spring. Another poisonous white *Amanita*, *Amanita smithiana* is also found in the Pacific Northwest.

White *Amanitas* are sometimes confused with the common and widespread *Agaricus* species, such as the horse mushroom (*Agaricus arvensis*) and meadow mushroom (*Agaricus campestris*). These two *Agaricus* species have a white stem and cap, but unlike *Amanita* species, they have chocolate-brown gills and spore prints with maturity. *Leucoagaricus naucinus*, the woman on horseback mushroom, resembles the destroying angel in color and size and has free white gills; however, *Leucoagaricus* species have no volva, which is why it is very important to dig up every white-gilled mushroom you collect to inspect for the presence of a volva.

*Amanita* species are sometimes confused with the edible rose-gilled grisette (*Volvariella speciosa*), a popular edible with some Asian cultures. The rose-gilled grisette also has a white stem, a cap, and a volva, and it can look much like an *Amanita*. However, the gills turn a dull reddish to light pinkish with age. It is better to avoid this edible *Volvariella* until you are experienced with identifying toxic *Amanita* species. The rose-gilled grisette occurs on all continents except Antarctica. Recent DNA evidence has reclassified *Volvariella speciosa* as *Volvopluteus gloiocephalus*.





## THE FLY AGARIC

(*Amanita muscaria*)



The fly agaric is the mushroom of legend and lore. It has both a complex chemistry and history.

The iconic fly agaric is a true cosmopolitan species that over the last hundred years has spread across the world, hitchhiking as mycorrhizae on the roots of both conifers and hardwoods. I've seen fly agarics in Central America, Australia, New Zealand, Thailand, and China. Native to the Northern Hemisphere and far Northern climates, the “classic” bright-red cap with white warts spotting the cap has left a mark on many cultures. Gnomes seem to love this toadstool, and you can see statues and trinkets of them together in garden stores from Oregon to Norway to Thailand. Children of all ages use the mushroom to “power up” in the *Mario Brothers* video games. Dogs dress up like the fly agaric for Halloween. No kidding.



But this mushroom goes further back in history. Legend has it that the Viking berserkers ingested the hallucinogenic mushroom to be fearless in battle (Fartur 2019). There is also evidence to believe that the fly agaric inspired the legend of Santa Claus (Main 2013). And this is just the tip of the fly agaric iceberg.

This mushroom is also known as “fly amanita.” The common names have the word *fly* in them because *A. muscaria* has been used for years to control flies (Lumpert and Kreft 2016) in places like Siberia and Slovenia. Pieces of mushroom placed in milk on the windowsill attract flies, which upon ingestion fly off to their death in an intoxicated state.

### **Cap Characteristics**

The cap is medium to large in size (three to eight inches across) and colored bright red to reddish orange. It has scattered white warts or flakes, which are remnants of the universal veil. The cap can fade with age or intense rain, and radial lines are common at the edge.

### **Underside of Cap**

The cap underside has white gills that stay white at maturity; they are free from the stem.

### **Stalk**

The stalk is generally three to six inches long and colored white. The base is bulbous and with a volva. It has a partial veil initially covering the gills and evolving to a white to yellowish skirtlike veil on the stalk. One or more scaly rings can occur at the bulbous base. The lower end of the stalk can turn a dingy yellow at the bulbous base.

### **Fragrance and Edibility**

The fly agaric has a mild earthy smell. Although poisonous, ingestion does not result in death. *Amanita muscaria* is noted for its hallucinogenic properties; the responsible chemicals are the neurotoxins ibotenic acid and muscimol.

## **Habitat**

The fly agaric is widely distributed globally. In the Western United States, it forms a mycorrhizal association with conifer and hardwood trees. The fly agaric is an opportunist and can be found in forests, parks, and urban settings. It is often growing abundantly in clusters and sometimes in circles, known as fairy rings.





## PANTHER AMANITA

*(Amanita pantherina)*



The panther amanita is common and widely distributed across the Western United States.

The panther amanita resembles the fly agaric. It has a volva, ring present at the bulbous base, free gills, and warts on the cap. It differs in that it has a tan or dark-brown cap and can fruit in the spring. This mushroom is also known as “panther cap” and “false blusher.”

### Cap Characteristics

The cap is medium to large, generally three to eight inches across. In coloring, it is tan to dark brown, never red or reddish orange. It has scattered white warts or flakes, which are remnants of the universal veil, and radial lines are found at the edge.



Sometimes the warts on top of the caps of *Amanitas* will wash off in a heavy rain. Be careful to check for a volva at the base.

### **Underside of Cap**

The cap underside has white gills that stay white at maturity; they are free from the stalk.

### **Stalk**

The stalk is generally two to five inches long, colored white, and does not blush red when bruised. The bulbous base has a volva. It has a partial veil initially covering the gills and evolving to a skirtlike veil on the stalk. One or more scaly rings can occur at the bulbous base.

### **Fragrance and Edibility**

POISONOUS. IT SHOULD BE AVOIDED. The panther amanita causes nausea following ingestion. It intergrades with several other *Amanita* species that are tan and brown. It does not contain the deadly amatoxin, but some look-alikes do. The true *Amanita pantherina* contains the psychoactive compounds ibotenic acid and muscimol and is used as a psychoactive substance less often than its distinguishable relative *Amanita muscaria*. The average psychoactive potency of the *A. pantherina* is unknown. The panther amanita has a mild smell when intact, but if the flesh is squeezed, it smells like radish or raw potatoes.

## **Habitat**

A mycorrhizal fungus, the panther amanita can be found growing under hardwood and conifer trees. It is widely distributed in the Western United States and fruits in both fall and spring.

## **Similar Mushrooms That Should Be Avoided**

Highly toxic look-alikes containing amatoxins include *Amanita verna*, *Amanita smithiana*, and *Amanita bisporagera*. The real danger in eating the panther amanita or fly agaric is mistaking it for a deadly amanita, such as the destroying angel or death cap. You only make that mistake once. A single mushroom can kill!

The panther amanita is similar to *Amanita rubescens* (called blushing amanita or “the blusher”), but the panther amanita doesn’t “blush” red or pink when the flesh is damaged, hence the origin of one of its common names—the “false blusher.” Blushing is a key feature in differentiating these species. There are differing reports about the edibility of *Amanita rubescens*, but because of its similarity to other toxic *Amanitas*, it should be avoided.

## MURDER

Claudius was a Roman emperor (10 BC–AD 54) thought to have been murdered through mushroom poisoning (Marmion 2002). Legend has it that a deadly *Amanita* was added to his plate of mushrooms. Who was the killer? Claudius had many enemies. For starters, he had executed his third wife, Messalina, for adultery and married his niece Agrippina. The most likely suspects appear to be either Agrippina or her friend Locusta. But why? With Claudius's death, Agrippina's nephew Nero would ascend to become emperor, placing this as one of the greatest culinary crimes that would change the course of history.

Mushrooms were considered a delicacy for many Roman elites at that time. In fact, one *Amanita* species was highly prized by a host of Roman emperors and is called Caesar's amanita (*Amanita caesarea*). It is widely distributed in the Western United States and Southern Europe. The Caesar's amanita should be avoided unless you really know the *Amanita* group because several similar-looking *Amanita* species are deadly poisonous. Some of the *Amanitas* you spot in the woods of the Western United States may be one of the *Amanitas* added to Emperor Claudius's plate the night he died—the destroying angel (*Amanita ocreata*) or the death cap (*Amanita phalloides*).

The death cap packs a mighty poisonous punch. One medium-sized mushroom can kill three to four people. Today, the death cap and the destroying angel cause most mushroom poisoning deaths. About forty people a year suffer from severe mushroom poisoning in the United States, with approximately three deaths per year. Once ingested, the death cap and destroying angel cause diarrhea, nausea, vomiting, and with time, liver and kidney failure.

Asian Americans are the most frequently poisoned by the death cap because it can be mistaken for a popular and edible Asian mushroom called the paddy straw mushroom (*Volvariella volvacea*). The amatoxin in the death cap and

destroying angel is not affected by cooking, so sautéing, baking, or broiling does nothing to prevent the impact of ingestion. It is interesting to note that the death cap is not native to North America. It most likely arrived on trees imported from Europe in the early twentieth century. Today it is widespread.

I've gathered and have eaten the edible Caesar's amanita. I was careful to identify all the diagnostic characteristics of each mushroom that was cooked. The first time I found some, I was with seven of my mushroom hunting friends, and we were hunting mushrooms up the North Umpqua River outside of Roseburg, Oregon. The cabin we were staying at was near a campground. The large, orange-red caps lining the margin of the campground were easy to spot: free gills, a volva, and a smooth, dark-orange to orange-red cap lacking warts. I thought, "My first Caesar's amanita!" But did I have the guts to cook them and eat them with friends over the steelhead salmon a friend had caught for dinner? The Caesar's amanitas had an orange-red cap (darker orange red toward the center of the cap), the cap surface was smooth, no scales, cap margins were conspicuously striated, and free gills were pale golden yellow. Even with the careful observations and decades of hunting and eating mushrooms, I was, frankly, a bit nervous about eating the Caesar's amanita. The Caesar's amanita was delicious with the fish. But would I do it again?



## ANCIENT HALLUCINOGEN



The fly agaric has a long history of use as an intoxicant and entheogen by indigenous people.

There is considerable documentation that the fly agaric mushroom was used as an intoxicant and entheogen by the indigenous peoples of Siberia and the Sámi, in the northern regions of Norway, Finland, and Sweden. The usage in Siberia seemed to be for ceremonial purposes (Wasson 1979, Feeney 2022). There has been much speculation on the historical use of this mushroom by other cultures, including the Viking berserkers (Fartur 2019).

Reported methods for how to weaken the toxicity and the hallucinogenic effects of *A. muscaria* include parboiling the mushroom twice with water. Others report that drying, then soaking in lemon juice, milk, or yogurt can reduce the nausea and uncomfortable reaction following ingestion. The fly agaric continues to be used ceremoniously in northern parts of Europe and Asia by the native people.

## **AMANITA MUSCARIA AND CHRISTMAS TRADITIONS?**

It seems strange, when you think about it, that so many of our Christmas traditions have an unusual story line—flying reindeer, a tree with red ornaments and packages, a laughing man dressed in a red coat with white buttons making his epic trip from the North Pole every year. We celebrate each winter by stringing colored decorations on a conifer tree, then we wait for the jolly old man to descend down the chimney to deliver us our gifts—gifts wrapped in red and white delivered from a flying sleigh! How did our holiday customs come to be? We could write Santa a letter and ask him directly, but let's save the postage and dig a little deeper into the historical references to this legendary fungus, the fly agaric.



Saint Nicholas did not start out being Santa Claus. He was a fourth-century saint from Greece known for his generosity and gift-giving. It wasn't until the nineteenth century that the poet Clement Clark Moore wrote a poem that helped transform the good saint into his modern image. In Moore's 1822 poem, "A Visit from St. Nicholas," he combined elements of Medieval European Christianity, Eastern Orthodox Church, and Dutch folklore to create the mythical poem. Moore, perhaps

unwittingly, left clues by referencing ancient Nordic culture and shamanic tradition that would become an iconic symbol of modern Christmas: the eight flying reindeer.

“Whoever heard of reindeer flying, except as shamanic vehicles?” asks Carl Ruck, a professor at Boston University and expert on rituals. He continues, “It is well established reindeers have fondness for [*Amanita muscaria*] mushrooms.” Research has shown that reindeer do seek out the *Amanita muscaria*.

Deputy Editor of the *Pharmaceutical Journal* Andrew Haynes wrote in 2010 that animals deliberately seek out the red-and-white-spotted mushroom in their habitats, and they seem to experience altered states of behavior. For humans, a common side effect of the fly agaric mushrooms is the feeling of flying, so it’s interesting the legend about Santa’s reindeer is that they can fly. Perhaps in extreme Northern climates, humans and reindeer eat the fly agaric to escape the monotony of long, dreary winters.

The winter solstice has been a time of festivity and celebration for thousands of years with dancing, music, meals, and gatherings long before Christmas celebrations in traditional Christian sense. *The Huffington Post* (December 16, 2016) devotes a detailed description regarding the magical history of Yule and pagan winter solstice celebrations. This same *Huffington* post article chronicles that pagan cultures of Central Europe, for example, celebrated the Yule midwinter festival around the winter solstice. The ancient Romans held the festival of Saturnalia in late December in honor of the god Saturn. But of greater fungal interest is a practice in Siberian and Arctic regions (a suburb of the North Pole), where in December, shamans drop into the locals’ homes, giving away presents of vision-inducing mushrooms.

Doug Main describes eight ways that magic mushrooms explain the Santa Story (Live Science 2013). His article raises the speculation: Is Santa the modern equivalent of a shaman who ceremonially uses certain mind-altering plants and fungi

to commune with a natural world of wonder? Real accounts indicate that in recent history, shamans or priests—who were connected to the pre-Christian traditions—would collect *Amanita muscaria*, dry them, and then give them as gifts on the winter solstice. Drying the *Amanita muscaria* was traditionally done by hanging the red-and-white mushroom from conifer trees. It is interesting that drying *Amanita muscaria* helps reduce the impact of the nauseating effect of ibotenic acid while preserving the mild-altering effects of muscimol (Feeney 2010).

Dr. Carl Ruck, a Boston College professor interviewed in *Newsweek* (December 24, 2012), believes “that perhaps Siberians who ingested the mushrooms hallucinated that the grazing reindeer were flying? At first glance, one thinks it’s ridiculous, but it’s not. Whoever heard of reindeer flying? I think it’s becoming general knowledge that Santa is taking a trip with his reindeer.” He continues, “The Christmas tree is a motif that you find in Nordic mythology of Christmas. It has to do with the solstice; gifts under the tree might well be a reference to the way the mushroom grows around the sacred tree. The red and white mushrooms are ‘gifts’ found under a conifer tree.”

Some scholars refute the Santa–*Amanita muscaria* roots of Christmas. It is, without question, an unprovable hypothesis, and it entirely depends upon your propensity to speculate. But perhaps it would be refreshing to have the Christmas holiday experience be a time of wonder, self-reflection, healing, and contemplation instead of the commercial bombardment that it has become today.

## AMANITA TOXINS



Know your mushrooms before you ingest any mushroom with white gills that do not attach to the stem (free gills).

The destroying angel and death cap contain amatoxins (along with *Amanita smithiana*, *Amanita verna*, and *Amanita bisporagera* and perhaps a few others). Amatoxins are no joke; they cause severe liver and renal failure. Severe reactions occur many hours after ingestion, so by the time you start feeling sick, the amatoxins have already been absorbed into your system, and you don't have many survival options. Amatoxins are also present in some deadly *Galerina* and *Lepiota* (e.g., *Lepiota brunneoincarnata*) species, so know your mushrooms before you eat any!

The fly agaric and the panther amanita do not contain amatoxins. They contain ibotenic acid and muscimol that affect mental perception but do not attack the liver and renal tissue. Ibotenic acid has side effects that may cause nausea and uncomfortableness. Muscimol is considered the chemical with the primary mind-altering properties (Feeney 2010). Some ibotenic acid can convert to muscimol by drying to a temperature between 165°F and 185°F. Adding dried fly agarics to lemon juice or fermenting in milk or yogurt is also said to help bacteria detoxify the fly agaric (Tsunoda 1993).

## **5. PARASOLS**

The parasols are big, majestic, and easy to spot. The parasols are a large family that include delicious as well as poisonous species. I have included three important parasol mushrooms in this guide—one simply called the parasol (which is a culinary favorite), the shaggy parasol (which is very good but for a few people causes gastrointestinal side effects), and one called the false parasol (which is poisonous and must be avoided).

Common to all parasols is the presence of a veil covering the young gills and forming a ring on the stock. While you may confuse this characteristic feature with *Amanitas*, the parasols do not have a volva around the base of the stem, which is why it is always important to carefully dig up the stalk of mushrooms you are considering for consumption to check for a volva. The most common characteristic differentiating the parasol and shaggy parasol from the poisonous false parasol is the color of the gills. The parasol and the shaggy parasol have white gills, while the false parasol has greenish gills or a rare green spore print. If you are considering consuming a parasol mushroom, you will want to take a spore print of your specimens to see if the print is white or green.





## PARASOL

*(Macrolepiota procera)*

One of the most delicious of all mushrooms, the parasol is tall with a large, thin cap. The flesh of this stately species does not turn orange or red when rubbed or cut. The parasol mushroom goes by other names such as *Lepiota procera* and *Agaricus procerus*.

### Cap Characteristics

The cap is medium to large in size (three to eight inches). It is drumstick-shaped when young and flattens at maturity. Smooth and brown at first, with age it forms shaggy scales on a tan to grayish cap. The center of the cap remains brown.

### Underside of Cap

The cap underside has white gills that stay white at maturity, not greenish; they are free from the stem. A veil is present when it is young.

### Stalk

The stalk is tall (generally six to twelve inches high), thin (less than 3/8 inch thick), and has a prominent double-edged ring on the stalk. The base is without a volva. The flesh does not stain red or orange when rubbed or bruised. The stalk surface is covered with delicate brown scales.

### Fragrance and Edibility

The parasol mushroom has a nutty sweet aroma that some people say remind them of maple syrup. It is one of the best wild edibles. The caps are delicious when sautéed in butter or coated with bread crumbs and fried. Use it in any dish just like

store-bought mushrooms. But unlike store-bought mushroom, the stalks are tough and fibrous and should be discarded.

### **Habitat**

Often abundant, the parasol can be found growing near conifers, roads, pastures, parks, and grassy areas. You can find them in the summer and fall.



## SHAGGY PARASOL

(*Chlorophyllum rhacodes*)

The shaggy parasol is thicker and shorter than the parasol mushroom. The flesh of the shaggy parasol turns orange or reddish when bruised or cut. I find it delicious, but some people get an upset stomach after eating. The shaggy parasol goes by other names such as “leppie” and *Lepiota rhacodes*.

### Cap Characteristics

The cap is medium to large in size (three to seven inches). It is egg-shaped when young, flattening somewhat with maturity. Smooth and brown at first, it forms prominent shaggy scales on a tan to grayish background with age. The center of the cap remains brown.

### Underside of Cap

The cap underside has white gills that stay white at maturity, not greenish; they are free from the stalk. A veil is present when it is young.

### Stalk

The stalk is short (generally two to four inches high) and about a half inch thick. It is shorter and thicker than the parasol mushroom. The bulbous base is without a volva. The flesh stains orange, red, or maroon when rubbed or bruised. The stalk is without scales and has a prominent double-edged ring.



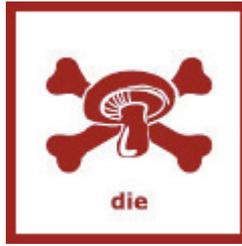
## **Fragrance and Edibility**

The shaggy parasol has a mild earthy, pleasant fragrance. Many people eat the shaggy parasol, which is generally considered a delicacy; however, some people have a gastrointestinal reaction. For first-time consumption, eat only a small amount, and cook it on high heat to reduce the potential for an adverse side effects.

## **Habitat**

Often in clusters, the shaggy parasol can be found growing abundantly anywhere—woods, orchards, roadsides, pastures, parks, bark piles, and grassy areas. It can be found in spring, summer, and fall.





## FALSE PARASOL

*(Chlorophyllum molybdites)*

Eating the false parasol is a major source of mushroom poisonings in the Western United States. It looks like the parasol mushroom but has distinctive greenish gills and a green spore print. The false parasol is also known as “green-spored *Lepiota*,” “Morgan’s lepiota,” and *Lepiota molybdite*. It is also aptly called “the vomiter.”

### Cap Characteristics

The cap is medium to large in size (four to twelve inches). In coloring, it is whitish to pinkish brown with coarse, brown scales. It is drumstick-shaped when young but flattens with maturity.

### Underside of Cap

The cap underside has white gills that turn dark and green at maturity. It has a rare green spore print, and the gills are free from the stem.



The false parasol looks a lot like the parasol but has green spores and green spore print.

## **Stalk**

The stalk is four to twelve inches tall and slender to medium in thickness. It has as a double-edged ring. The stalk is without scales, and the base is swollen but not bulbous. It has no volva. The flesh is white but sometimes stains orange or reddish brown.

## **Fragrance and Edibility**

IT IS POISONOUS. DO NOT CONSUME. The false parasol has an earthy smell. It causes vomiting and diarrhea one to three hours after consumption. The false parasol is conspicuous in lawns and urban areas, and for this reason, it is a major source of food poisoning because it can be mistaken for the parasol, shaggy parasol, and shaggy mane mushroom. Poisonings can be severe, though no deaths have been documented.

## **Habitat**

Often in clusters and gregarious, the false parasol is common in lawns and pastures but can be found anywhere. It fruits in the spring, summer, and fall and thrives in hot, dry weather.

## **Similar Mushrooms That Should Be Avoided**

The *Lepiota subincarnata* is a poisonous *Lepiota* that contains deadly amatoxins. The cap of the *Lepiota subincarnata* is light red to red brown and cream in color closer to the margin. The gills are whitish, and the flesh is white to pinkish toward the top. The stem may be slightly larger at the base, cream-colored with patches of the cap color. The odor is somewhat fruity, and the taste is unpleasant. It has been documented to grow in lawns and parks in North America. Toxic look-alikes also include some *Amanita* species. They also have an ornamented cap like the parasol mushroom and have white free gills at maturity. The *Amanita* species have a volva at their base; the parasols do not.

## Recipe:

### **BREADED PARASOL**

Try this breaded and fried parasol recipe. Parasols are also good sautéed, baked, and as an addition to soups.

#### INGREDIENTS:

*1 egg*

*2 oz. flour*

*1/2 cup bread crumbs*

*frying oil*

*salt, as preferred*

*1/2 lemon*

#### METHOD:

Clean the parasols without water. Remove and discard the stems. Whisk egg with a pinch of salt and pour into a plate. Add flour to a second plate. Coat mushrooms with the egg mixture, then in the flour. Fry in oil until they develop a crisp golden texture. This will take around 2 minutes on each side of the cap. Serve with a squeeze of lemon.





## **6. AMERICAN MATSUTAKE**

*(Tricholoma murrillianum)*

The American matsutake—revered by the Japanese—is sweet, spicy, and ... pricy. Don't sauté it; it ruins the complex matsutake flavor! Baked or grilled is the way to savor. The American matsutake (*Tricholoma murrillianum*) has a distinctive spicy and cinnamon smell. The stem and cap separate in thin, stringy sections and have a cinnamon color with age. The gills are notched at the attachment with the stem. Be careful not to confuse it with poisonous *Amanita* species that, unlike matsutake, have a volva and free gills.

The American matsutake is also known as “matsutake,” “matsi,” “pine mushroom,” and *Armillaria matsutake*.

### **Cap Characteristics**

The cap is medium to large in size (two to nine inches). Its margin is in rolled at first, upturned with age. The surface is dry white to light yellow, bruising a light cinnamon color with age. The flesh breaks into stringy pieces.

### **Underside of Cap**

The cap underside has white and crowded gills that turn a light cinnamon color with age. They are notched at their attachment to the stem.

### **Stalk**

The stalk is two to six inches long and medium in thickness—greater than a half inch. It is tough and stringy and has a cottony veil when young that persists as a ring on the stalk.

## Fragrance and Edibility

American matsutake smells like a combination of wet earth, sweet spice, cinnamon, and pines. It's very distinctive. The unique and complex flavor of the matsutake is lost by sautéing. It is better baked, grilled, or roasted. The Japanese have revered this mushroom for over a millennium for its complicated smell and flavor (and supposed aphrodisiac qualities). Young, unopened specimens can sell for several hundred dollars a pound during some holidays in Japan. The Japanese matsutake *Tricholoma magnivelare* is very similar to the American matsutake. Lots of American matsutake get shipped to Japan where demand exceeds domestic production. Since the matsutake has a stringy texture, you can pull thin, one-eighth-inch strips from the mushroom stem and cap. Grill or roast it till it turns light brown. I've seen matsutake eaten raw on top of salads in Japan, but I'm not sure if it would please a typical American palate. The matsutake is chewy but has a unique taste that lingers on your senses. I often add a splash of soy or teriyaki sauce when serving matsutake with meat or other vegetables.



The matsutake is a desirable and expensive commodity in Asian markets.

## Habitat

DNA evidence presented in 2017 indicates there are three matsutake species in North America: one in the Eastern United States (*Tricholoma magnivelare*); one in the Western United

States (*Tricholoma murrillianum*); and one species from Mexico (*Tricholoma mesoamericanum*). The American matsutake is widely distributed in conifer forests in the Cascades and Rocky Mountains. It also occurs frequently with hardwoods like madrone, manzanita, chinquapin, and tanoak along the California and Oregon coastal mountains. American matsutake tends to fruit in sandy, well-drained soils and fruits from August to February in the Western United States, depending upon climate and elevation.



The American matsutake fruit in patches, known as "shiros," year after year in the same location.

During the 1980s and 1990s, American matsutake prices often peaked, creating a gold rush mentality in Western forests (Amaranthus et al. 1998). Makeshift camp communities and buyers would flock to harvest areas. Conflicts over prime fruiting patches sometimes occurred, and it was typical for harvesters to carry guns for protection and fire shots in the air to warn others to stay away. Concerns regarding over harvesting matsutake was high, but research showed that careful excavation of the mushroom without raking the soil surface had no impact on matsutake production (Amaranthus et al. 2000).



Commercial harvest of matsutake had a gold rush fervor when prices soared to \$100-\$200 per pound.

### **Similar Mushrooms That Should Be Avoided**

Some poisonous *Amanita* species are also white but have a volva at the base beneath the soil surface and free gills. I have seen the destroying angel *Amanita* fruit a foot away from a cluster of American matsutake. Clearly, it is important to carefully inspect every mushroom while you pick and again before you eat it.

### **Fun Facts about *Matsutake***

- The matsutake is ectomycorrhizal, with a wide variety of conifers and hardwoods. But on the microscope, I have frequently seen the mutualistic mycorrhizal relationship turn into a saprophytic relationship when the host tree begins to decline. The matsutake fungus then decomposes the fine roots.
- In the Japanese language, *matsu* means “pine” and *take* means “mushroom.” The matsutake is closely associated with the red pine tree in Japan.
- For over a thousand years, the matsutake has had special meaning in Japanese culture. In the Imperial Court in

Kyoto, the matsutake was so sacred that women were not allowed to utter the word. Large, young, and unopened specimens in Japanese markets can fetch several hundred dollars a pound. The matsutake is not only considered as a symbol of health and happiness but also has a phallic shape when young that is believed to be an aphrodisiac when consumed.

- *Allotropia virgata*, also known as candy cane, is a beautiful candy-stripped achlorophyllous plant that indicates matsutake mycelium in the soil. The candy cane root feeds on the matsutake mycelium, taking the nutrients it needs. The candy cane stem emerging from the forest floor is a reliable indicator that the fungal mycelium of matsutake is present, and the opportunity for a matsutake mushrooms occurs when moisture and temperatures are good for fruiting.



*Allotropia virgata*, the candy cane plant, is both beautiful and a useful indicator of the presence of American matsutake in the Cascade Mountain Range.

# THE JAPANESE AMERICAN MATSUTAKE EXPERIENCE

Eric Ballinger



My first memories of matsutake were sitting at the countertop of my grandparents' kitchen, sipping the *dashi* broth of my Grandmother Kazuko's matsutake soup. The curls of steam lifted the scent of this mushroom to all corners of their home. My grandparents always seemed to have an abundance of these fragrant fungi, but to what extent, I had no idea. And where did they come from?



In the Japanese American community of the Columbia Gorge of Oregon, every family had their special culinary contribution. My grandparents' specialty was picking, preparing, and sharing matsutake mushrooms. My grandmother would make *nishime*, a matsutake stew—combined with *satoimo*, *kamaboko*, *konnyaku*, chicken, carrots,

and *daikon*. And for the New Year's celebration *Mochitsuki*, she would make *matsutake gohan* to share with the Toda and Ogawa families on the other side of the Columbia River. The rustic recipes were brought from the old country.

Every fall, my grandparents would return to the rain-soaked woods of the Cascades. Their tools were keen eyes, patience, red-handled wooden dowels, a cloth rice bag, a knife, a brush, and a curious *yonsei* (“fourth-generation grandson”)—me. We would clean the matsutake mushrooms on the back of the covered porch and prepare them for a bus ride to Ontario, Oregon, for the Hinatsu family. In return, the Hinatus would send back a hundred-pound bag of onions and potatoes they grew on their farm. Perhaps a freshly caught salmon would appear as word got out that my grandparents had returned from the woods. It could be a box of perfect yellow Asian pears from Shig Imai's orchard.



Matsutake mushrooms have been used in Japan since the Neolithic period (8000–3000 BCE) in the final period of the Stone Age. Within my own family in Oregon, the history is much more recent. My Great-Grandfather Hidehiko Morioka arrived in the Hood River area in the late 1890s from Haga, Japan, in Okayama Prefecture. They cleared land for orchard production and farming and secured their own plots of land in Dee, Oregon. According to my grandfather, Harry Takeshi Morioka, it was a friend from Japan—Nobu Imai—who taught the families how to locate and pick matsutake mushrooms in the mountains of Oregon.

The attack on Pearl Harbor on December 7, 1941, dramatically changed the life of West Coast Japanese communities. With the subsequent passing of Executive Order 9066 by Franklin D. Roosevelt on February 19, 1942, my family—along with approximately 120,000 other West Coast people of Japanese descent—was forced to move into ten different concentration camps around the United States.

My family was sent to Tule Lake concentration camp in California and Minidoka concentration camp in Idaho, where they were kept behind barbed-wire fences. Most of the concentration camps were in arid, desolate areas full of dust and wind. They lost their freedom to wander through the woods. They lost their freedom to hunt matsutake, the very thing that defined and grounded them—the activity that connected them to the earth and to their community. My family members lost their properties, their livelihoods, their communities, their rights, their pride, and their honor.

After the end of World War II, my Japanese American family decided to return to the Columbia Gorge in Oregon. The families who returned were met with resistance and overt racism. They started picking up the pieces of their lives and rebuilding from scratch. As my grandparents' little Mazda truck rolled along the old roads through the wilderness, my grandfather would be playing Hawaiian music on cassette tape. My Grandmother Kazuko would be squeezed in the back cab, insisting that she was comfortable but always asking for the volume to be turned down. They would park the truck down the road from their starting point and backtrack through the woods, so as to not be followed (this was during the 1990s, when matsutake prices were at a high because of commercial demand). When other pickers asked if we had found any matsutake, we would reply, "Enough for soup." There were places in the woods we would not venture. As my grandmother would say, "That's where the Migaki family goes ... we don't go down that way." There was understanding and respect out there in the woods.

My grandparents eventually started to share some of their stories with me in their later years. As the oldest grandchild, perhaps they knew that I would be the keeper of the family history. Perhaps I was just in the right place at the right time. Regardless, matsutake hunting is one of the traditions that has survived the generations. As an adult, I have found my own matsutake hunting grounds, and every fall, I return to them with my own family. My daughter, a Gosei, fifth-generation Japanese American, always seems to find the first matsutake of the season!







## **7. THE PRINCE**

*(Agaricus augustus)*

A royal prize of a mushroom fit for a king, the prince (*Agaricus augustus*) is striking and hard to miss. Worthy of its noble name, it is tall in stature with a large, golden brown cap covered in scales. It is noted for its strong almond smell and flavor. This is a tasty mushroom and prized by mushroom hunters all over the world. The royalty in your castle—in fact, the whole kingdom—should experience *Agaricus augustus*.



The prince has chocolate brown spores at maturity.

### **Cap Characteristics**

The cap is large in size (four to twelve inches). Usually blocky at first, it becomes convex to broadly convex or nearly flat when mature. The top of the cap is dry and whitish-colored, with a dense covering of brown to dark-brown fibrillose scales. It bruises yellow at the edges.



The cap of the prince is covered with brown fibrillose scales.

### **Underside of Cap**

The cap underside has gills that are white to gray when young and turn chocolate brown to black when mature, never pink; they are free from the stem. A veil is present when it is young.

### **Stalk**

The stalk is thick (greater than a half inch), tall (four to eight inches), and scaly with a large, skirtlike ring. The flesh is white and firm. There is no volva at the base.

### **Fragrance and Edibility**

The prince has a sweet and almondy fragrance and taste. It is delicious and considered as one of the best edible mushrooms.

### **Habitat**

Often gregarious, the prince can be found growing near conifers, roads, paths, gardens, parks, and grassy areas. Common on the West Coast, especially west of the Cascades and in the Coast Range, it can be found both summer and fall. A similar species, *Agaricus julius*, can be found in the Rocky Mountain Range.

### **Similar Mushrooms That Should Be Avoided**

Toxic look-alikes include *Amanita* species, such as the death cap and destroying angel. These species have a volva at their base and white gills at maturity. They can emit a bad odor. They are described in more detail in this guide. Smith's amanita (*Amanita smithiana*) also has free gills and scaly stem with a ring, but the gills and spores are white, not dark chocolate brown like the prince, and it smells like old socks, not almondy. A few other similar species can be eliminated by noting the prince's white-gray gills turning to chocolate brown, never pink.

## A PRINCE OF A STORY

Tim Giruadier



I had just moved to Port Townsend, Washington, and was renting a tiny A-frame perched atop a heavily forested glacial moraine. The first year I was there, I made a vegetable garden, which was no easy feat because the soil was largely comprised of rock from the moraine. After a month or so of growing vegetables, the largest mushroom button I'd ever seen (perhaps to this day) pushed up from the tilled soil. It was spectacular, and I enjoyed watching it grow every day.

It didn't take long for the landlord to come up and see what I was up to. When he saw the mushroom growing in the garden, he immediately recognized it and said, "That's one of the good ones. It tastes like almonds, you should eat it!" To myself, I thought, "I'm not going to eat that just because you say so." A few days later, a neighbor came over, and I showed him the mushroom and said, "It's supposed to taste like almonds." To which another friend said, "Yeah, cyanide smells like almonds," and he laughed at me.

By then I was curious, and I looked in the *Mushrooms Demystified* book to identify it. It was the prince *Agaricus augustus*. I sautéed it in butter and salt, and sure enough, it did

taste like almonds. It was like it was sautéed in almond extract. I was truly amazed, and this was the mushroom encounter that got me hooked on learning about mushrooms and preparing them. Since then, I've occasionally found *Agaricus augustus*, primarily in the Oregon Coast Range, but none have compared to the size and flavor of this big beauty from Washington State.

## Recipe:

### **ASPARAGUS AGARICUS AUGUSTUS**

The addition of the prince makes this easy stir-fry meal worthy of royalty. Serve it over rice. (And just for fun, try repeating “asparagus *Agaricus augustus*” as fast as you can ten times.)

#### INGREDIENTS:

*1 bunch asparagus, chopped*

*1 large cap of the prince, chopped*

*4 broccoli flowerets*

*3 tbs. chopped green onion*

*2 tbs. olive oil*

*2 tbs. balsamic vinegar*

*2 tbs. butter*

#### METHOD:

Fry mushroom in olive oil for 3 minutes at medium-high heat. Add asparagus and cover for 4 minutes, stirring occasionally. Add broccoli and balsamic vinegar, and cover for 3 minutes, stirring occasionally. Add butter and green onion, and cook for 3 minutes, stirring occasionally.



## **8. SHAGGY MANE**

*(Coprinus comatus)*

Shaggy mane (*Coprinus comatus*) mushrooms are easy to identify—a popular edible and a great choice for the beginning forager. But there is a catch. They are perishable and liquefy in a couple days into an inky mess. So leave specimens that are beginning to degrade in the field. Only pick young, bright specimens, and plan to eat the shaggy manes within a day after you collect them. But wait, there is another catch. You should not drink alcohol when eating shaggy manes (there is an allergic reaction to mixing the two). I love shaggy manes with eggs in the morning. And remember—abstain from alcohol. Come on, you can do it for breakfast!

These distinctive mushrooms can be identified by their bright-white, cylindrical cap when they are young that turns gray with age. The caps of older specimens turn to ink, beginning from the bottom of the cap and moving up. There is no volva at the base (always check by carefully digging up the stalk).

The shaggy mane is also known as “shaggy ink cap,” “lawyer’s wig,” and “shaggies.”

### **Cap Characteristics**

The cap is large and tall (four to ten inches) and shaped like a cylinder when young. It is very shaggy with large, light-brown scales on a bright-white cap. It transforms from a cylinder to a bell shape with age. The cap digests itself starting at the edges and moving up, turning the flesh into an inklike consistency.





## **Underside of Cap**

The cap underside has a crowded gill layer free from the cap. White when young, they turn gray and then into an inky-black mess with age.

## **Stalk**

The stalk is hollow, long (four to nine inches), and white. A veil is present, forming a loose ring on the lower part of the stalk. There is no volva at the base.

## **Fragrance and Edibility**

Shaggy manes have a subtle earthy smell and flavor. They are delicious when freshly picked, but they won't keep for long. Eat them as quickly as possible, and toss them out before they turn into an inky slime in your refrigerator.



Shaggy manes decompose rapidly, so harvest only freshly intact cylindrical caps. These specimens are too mature to harvest.

I have included a recipe below for shaggy mane-crustured parmigiana. Shaggy manes are also good in soups and with risotto.

Many people claim to experience an allergic reaction from eating shaggy manes and drinking alcohol. It is prudent to avoid alcohol when eating shaggy manes.

## **Habitat**

When conditions are right, you can find shaggy manes in a diversity of settings: forested areas, parking lots, lawns, compost piles, compacted soils, and other areas of disturbance. Shaggy manes' fruiting occurs in the late summer and early fall, often along roads and trails. They are gregarious just before a hard frost.

## **Similar Mushrooms That Should Be Avoided**

The common inky cap *Coprinopsis atramentaria* is edible but causes an adverse reaction when combined with alcohol. It contains an amino acid that interferes with the metabolism of alcohol, causing alcohol toxicity. The common inky cap is differentiated from the shaggy mane by its lack of distinctive scales on the cap.

## **Fun Facts about Shaggy Manes**

- Inky cap mushrooms, like the shaggy mane, have been used as ink for centuries. Numerous online recipes and YouTube videos demonstrate how to make ink from shaggy manes and other ink cap species.
- So what's up with the ink? Inky caps drop their spores by autodigestion. When spores on the crowded gills are ready to be released, the mushroom produces an enzyme that digests the flesh, causing the cap to turn to ink and curl upward. This exposes the gills to the wind, which disperses the spores. When it is all said and done, the whole cap becomes just a gob of inky goo.



Shaggy manes use autodigestion by turning to ink and thus exposing its spore mass to the wind.

- Even though shaggy manes are easily broken and delicate when handled, I have seen them pushing up through asphalt forest roads. It's perplexing—how can such a delicate mushroom break up an asphalt road surface? Simply astounding!

## Recipe:

### **SHAGGY MANE-CRUSTED PARMIGIANA**

#### INGREDIENTS:

*shaggy mane mushrooms, sliced lengthwise*

*all-purpose flour for breading*

*eggs whisked with a splash of milk*

*grated fresh Parmigiano Reggiano*

*chopped fresh parsley*

*salt and pepper to taste*

*grapeseed or canola oil*

*lemon wedge for serving*

#### METHOD:

Season the egg mixture with a pinch of salt and pepper, and combine with chopped parsley. Dip the shaggy manes into the flour, then into the parsley egg mixture, and sprinkle on Parmesan cheese.

In a large cast-iron skillet or nonstick surface big enough to hold the shaggy manes, heat oil until hot. Add the shaggy manes to the pan and cook for 4 minutes. Once the mushrooms are golden brown on one side, use a spatula to gently loosen them from the pan.

Flip the mushrooms and cook for 4 minutes on the other side or until the mushrooms are completely crisp and the crust is golden brown. Transfer the mushrooms to a wire rack or a paper towel to cool for a minute and remove excess oil. Serve immediately with lemon wedges or just by themselves.

## 9. PSILOCYBES



Gold caps, *Psilocybe cubensis*.

Psilocybin mushrooms, or *Psilocybes*, contain psychoactive substances and are commonly known as “magic” mushrooms. They have been used for millennia and continue to be used by numerous cultures in spiritual, religious, and recreational contexts. Well-documented ancient sites in Spain, North Africa, and Mesoamerica contain “magic mushroom” stones and motifs dating back thousands of years (Samorini 1992, Akers et al. 2011).

As revealed by the Forest Service website article “Teonanacatl Mushrooms: Flesh of the Gods,” early Spanish explorers described the firsthand observations of ceremonial use of psilocybin mushrooms by the Aztecs in AD 1502. Interest in psilocybin mushrooms as a recreational drug increased during the 1970s and 1980s. This was inspired, in part, by the May 13, 1957, *Life* magazine article, “Seeking the Magic Mushroom,” which featured R. Gordon Wasson relating his experience with the mushrooms in Mexico. In the 1970s, individuals such as Timothy Leary and Terrence McKenna promoted psilocybin use in the “hippie counterculture.”

Though illegal for decades, research and general interest in psychedelics are “mushrooming” today. Numerous studies are underway using psilocybin for treating medical issues such as post-traumatic stress disorder (PTSD), addictions, depression, anxiety disorders, and cognitive decline. Laws are being considered to allow the regulated and medical use of psilocybin in some states. The popularity and availability of psilocybin mushrooms, both wild and cultivated, have made them widely harvested and consumed across the globe.

Paul Stamet’s book *Psilocybin Mushrooms of the World* is a comprehensive guide to numerous species if readers are looking for an in-depth examination of the psychoactive mushrooms. Michael Pollan’s book and Netflix documentary *How to Change Your Mind* is a relevant and deep dive into the body and mind effects of psilocybin mushrooms.

The four species of psilocybin mushrooms in *Fry, Thrive, or Die* are hallucinogenic. Other psychedelic mushrooms can also be found in the Western United States, such as *Psilocybe azurescens* (very potent) and some *Panaeolus* species. The experience of using psychedelic mushrooms is strongly dependent upon the *dose* (for example, a 0.3-gram microdose versus a 5-gram “heroic” trip), *set* (frame of mind of the user), and *setting* (the social and physical environment where the experience takes place). Laughter, enhancement of colors, lack of concentration, and muscular relaxation are common side effects. Heightened anxiety, leading to a “bad trip,” can be the result of an unpleasant and unfamiliar setting. Higher doses can result in hallucinations and the inability to distinguish fantasy from reality. Many users find it preferable to ingest psychedelic mushrooms in a serene, natural environment and with friends who can provide support.

The biggest risk of consuming psychedelic mushrooms collected in the wild is confusing psilocybin mushrooms with the many varieties of little brown mushrooms that are poisonous and even lethal. Psilocybin mushrooms should not be confused with other poisonous smaller brown mushrooms

with dark gills. The deadly *Galerina marginata* is a “little brown mushroom” that resembles the *Psilocybe* group but has rusty-brown, not purple, spores. Poisonous *Psathyrella*, *Lepiota*, *Pholiotina*, and *Inocybe* species are somewhat like psilocybin mushrooms and must be avoided. For more intensive descriptions of little brown mushrooms, see David Arora’s *Mushrooms Demystified*. Remember, when in doubt, throw it out.



## **GOLD CAPS**

*(Psilocybe cubensis)*



Gold caps.

Gold caps (*Psilocybe cubensis*) are potent psychedelic mushrooms and a popular choice for cultivation by indoor gardeners. While there has been some recent relaxation in the penalties of possessing small amounts of psilocybin mushrooms, they are still illegal in most US states and in many countries.



Several strains of gold caps are cultivated indoors in containers.



Gold caps are also known as “golden teacher,” “golden halos,” “cubes,” “bare head,” “cubensis,” and “magic mushroom.”

### **Cap Characteristics**

The cap is small to medium in size (generally a half inch to four inches in width). With a conic shape when young, it flattens as it matures. Smooth and sticky, the cap is brown and becomes pale to almost white at the margin, turning golden brown with age. When bruised, the cap turns blue. The cap can turn the same color as the gills because of falling spores from the gills of mushrooms located above.

### **Underside of Cap**

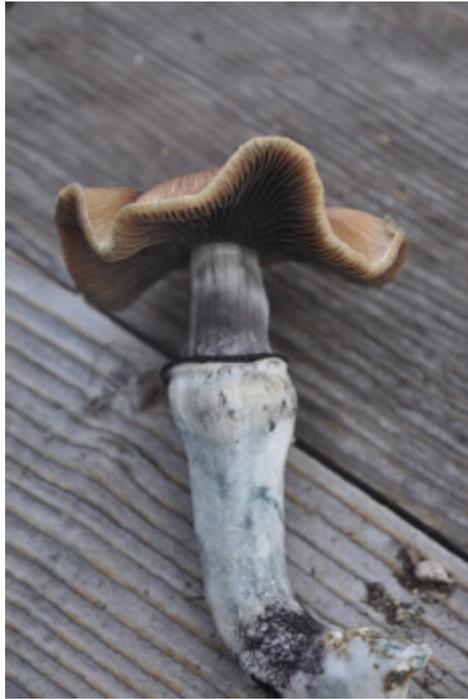
The cap underside has gills that are never yellow brown or rusty brown. The gill attachment is narrowly attached to almost free attachment. They are cream-colored before turning dark gray to purple gray to purple black with maturity. The gill margins often remain whitish. The spore print is always an important diagnostic check and should be purple gray and purplish black. The veil under the cap is cobwebby when young.

### **Stalk**

The stalk is generally medium in length (two to five inches) and medium in thickness. It is white and hollow and stains blue. A universal veil when young leaves a well-developed ring on the stalk. The veil can turn the same color as the gills because of falling spores underneath the cap.

### **Fragrance and Edibility**

Gold caps have a light, sweet, woody smell and a taste reminiscent of baked pumpkin seeds. The concentration of psilocybin varies widely depending upon the strain, typically .5–2 percent of the dry weight of the mushroom. Doses vary depending upon the concentration of psilocybin in the strain. Typically, 0.2–0.5 dried grams would be considered a microdose. A usual “recreational” dose is considered 1–2 grams, while a strong to “heroic” dose ranges 2–5 grams.



Blue staining on a strain of *Psilocybe cubensis*. The concentration of psilocybin can vary by strain.

### **Habitat**

Gold caps are common in Mexico and in tropical and subtropical areas. It occurs on dung, manure, and compost in its native habitat. Widely cultivated in the Western United States under artificial conditions, both indoors and outdoors, it is the most well-known *Psilocybe* species due to its ease of cultivation and wide distribution.



## LIBERTY CAP

*(Psilocybe semilanceata)*

The liberty cap (*Psilocybe semilanceata*) is found widespread across the Northwest. While it has a lower psilocybin content than the gold caps, it still carries a mind-expanding punch. Though it grows naturally in the wild, the possession of this mushroom is illegal in most US states and many countries.

The liberty cap is also known as “magic mushroom.”

### Cap Characteristics

The cap ranges from tiny to small in size (generally less than one inch). It is shaped like a cone or a bell and has a knob or a nipple-like protrusion on the very top. The cap is brownish when moist, but the moisture fades to tan when dry. It has bluish and olive-colored stains and has radial lines at the edge.

### Underside of Cap

The cap underside has gills narrowly attached (adnexed) to almost free. They are cream-colored gills before turning dark gray to purple, black, and brown with maturity. The spore print is always an important diagnostic check and should be dark purplish brown. The partial veil under the cap is cobwebby and quickly disappears with age.

### Stalk

The stalk is slender (less than 1/8 inch), generally two to four inches long, and either slightly lighter or the same color as the cap. It usually stains blue, olive, or tan with handling.



## **Fragrance and Edibility**

Liberty caps have a mild cheese and mushroom smell. They can be hallucinogenic, depending on the dose. The psilocybin content of liberty caps is lower than that of gold caps.

## **Habitat**

You can find liberty caps in grassy areas. Saprophytic, it feeds off decaying grass roots. It occurs in moist temperate environments and is often found adjacent to areas containing sheep or cow dung, although not growing directly on the dung. It is widespread globally and occurs frequently in the Pacific Northwest west of the Cascade Mountain Range.





## WAVY CAPS

(*Psilocybe cyanescens*)

Wavy caps (*Psilocybe cyanescens*) are potent psychedelic mushrooms native to the Northwest United States. This species has a high psilocybin content. And if you have this mushroom in your collection bag, you are breaking the law in most US states and countries around the world.

Wavy caps are also known as “wood chip psilocybe,” “bluing psilocybe,” “potent psilocybe,” and “magic mushroom.”

### Cap Characteristics

The cap is small to small/medium in size (generally one to two and a half inches across). In coloring, the cap is caramel to reddish brown, darker when moist but fades to tan when dry. Dome-shaped when young, it turns flat and wavy as it matures.

### Underside of Cap

The cap underside has cream-colored gills that turn purplish gray to purplish brown with maturity—never yellow brown or rusty brown. The gill attachment is narrowly attached (adnexed) to almost free. The spore print should be purplish gray and purplish brown. The partial veil under the cap is cobwebby and quickly disappears with age.



The underside of the wavy cap is cream-colored to purplish gray and purplish brown, never yellow brown or rusty brown.

**Stalk**

The stalk is slender (less than 1/8 inch), generally two to four inches long, and either slightly lighter or the same color as the cap. It usually stains blue, blue green, or tan with handling.

**Fragrance and Edibility**

Wavy caps have a mild mushroomy smell. It is a potent psychedelic mushroom.

**Habitat**

You can find wavy caps in wood chip areas, landscaping, mulched garden, and edges of wooded areas. It fruits gregariously in patches of hundreds to even thousands of mushrooms, generally in the fall when temperature first starts to drop significantly. Saprophytic, it feeds off decaying woody and mulched substrates. It is widespread in California and in the Pacific Northwest; it also occurs in Europe.



## STUNTZ'S BLUE LEGS

(*Psilocybe stuntzii*)

Stuntz's blue legs (*Psilocybe stuntzii*) are psychedelic mushrooms that grow in conifer wood chips and bark mulch, woody debris, or new lawns in the Pacific Northwest. Discovered on the campus of the University of Washington by Dr. Daniel Stuntz, this psychedelic mushroom has a lower level of psilocybin than the other *Psilocybes* described in this section. Now, I will say this one last time—the possession of psilocybin mushrooms is illegal in most US states and many countries. If you decide to collect it for consumption, be careful because this *Psilocybe* closely resembles the highly toxic *Galerina marginata*. Spore prints are always advised. Stuntz's blue legs are also known as “blue ringers.”

### Cap Characteristics

The cap is tiny to small (usually half inch to one and a half inches) and generally two to four inches long. Its olive-green coloring fades to a pale olive brown or pale yellowish brown. It stains greenish blue when handled. The cap is darker when moist but fades when dry and is lighter toward the center. It is conic when young, expanding to umbonate or flat with maturity. The margin is striate when moist.

### Underside of Cap

The cap underside has gills attached or narrowly attached (adnate or adnexed). Yellowish brown at first, they turn violet brown or chocolate brown to dark violet. The mature spore print is dark violet brown. It is important to take spore prints on Stuntz's blue legs so as not to confuse it with other toxic

mushrooms. The mature gills are violet brown or chocolate brown to blackish violet.



## **Stalk**

The stalk is slender (less than 1/8 inch thick) and stuffed with pith, becoming hollow with age. The base of the stalk is slightly enlarged. There is a fragile ring on the stalk that stains blue green. The stalk also stains blue green when handled.

## **Fragrance and Edibility**

Stuntz's blue legs have a mild mushroomy smell. It is a psychedelic. The psilocybin content of Stuntz's blue legs is lower than that of gold caps or wavy caps.

## **Habitat**

You can find Stuntz's blue legs in wood chip areas, landscaping, mulched gardens, new lawns, and the edges of wooded areas. This mushroom can fruit gregariously in patches of hundreds to even thousands of mushrooms, generally in the fall when temperature first starts to drop significantly. Stuntz's blue legs feed off decaying woody and mulched substrates. They are wide-spread in California and in the Pacific Northwest and can occur from August through November.

# MUSHROOMS LESSONS LEARNED

**Dr. Megan Frost**



Dr. Megan Frost sneaks up on a large inky cap.

My love affair with mushrooms began only after I discovered my connection to the earth and the universe. Currently in my early forties, that connection feels so apparent, palpable, and ubiquitous. But growing up, I was indoctrinated with the belief that I was separate from this earth. I grew up in a place and time where it was a sign of prosperity to no longer need to grow your own food. With women finally accepted in the workplace and both of my parents working, processed food obtained under the fluorescent lights of a grocery store was the only food I knew. My introduction to mushrooms was as a pizza topping that my parents would order. I was indifferent toward them, and the idea that a person would walk into a forest, collect, and then eat mushrooms was fantastical. Additionally, I was raised in the Midwest, and the outdoor activities we flocked to revolved around sports. While that got us outside, it was onto fields of homogenous grass well groomed to standard heights. Nature was something to be cleared and controlled so that humans could live comfortably.

As I grew older and moved to Oregon, I was immersed into a place and culture that revered nature. I remember meeting my first Oregon friend who suggested hiking miles into a camping spot, and I wondered how I was going to carry my new five-person tent that far. I had not known there were places in the United States you could hike miles and then sleep. I also embarrassingly recall moving in with new roommates who wanted to plant a garden in the backyard—a foreign concept to me—and I had to watch them secretly out of the corner of my eye as they planted the vegetable starts. I did not know how to plant a garden. Over time, I began to feel at home in Oregon, connecting to the people and the world around me more than I ever had before. I also learned that button mushrooms sliced onto a pizza were not the only mushrooms out there.

As friends and farmers markets acquainted me with the vast array of mushrooms that could be consumed for enjoyment, my connection to the universe began to reveal itself to me. I realized I was not separate from the earth, but part of it. The mycorrhizal network epitomized the interconnectedness of the universe, allowing plants to communicate and transfer water and nutrients amongst one another. The decomposition of forest litter and wood by fungi unveiled how there is no death, just a transition to new life. These lessons led to a newfound understanding of my own physical, chemical, historical, and spiritual bonds to the universe, and this made me feel connected, yet insignificant. I awakened to the fact that the universe maintains a homeostasis regardless of what happens to my physical body. This brings me great comfort.

I had moved to Oregon to begin my surgical career. Over time that has evolved to focus on the surgical treatment of cancer. I learned the above lessons from mushrooms while simultaneously being exposed to death and suffering. Both my career and my understanding of the universe has advanced. I got to a point in my career where I was proud of how well I was able to treat a person's cancer based on our medical definitions, but I felt that I was inadequate in treating the person as a

whole. I did not have the time nor opportunity to discuss at length how people feel emotionally and physically during or after treatments—what it was like to live with the fear of cancer always weighing on you, or how we could optimize one's death and make it as peaceful as possible.

I was ecstatic when I learned that Psychedelic Assisted Therapy (PAT), using psilocybin (which is a compound found in a mushroom), could be a tool to help my patients feel the same connection to the universe that mushrooms had taught me. That awareness of the relationship between us and the universe can help one cope with chronic pain, anxiety, and depression as well as alleviate fears surrounding cancer recurrence and death. I enrolled in a training program to learn more about PAT and how to integrate it into a person's health care. While we are just now on the cusp of PAT being legal, the lessons I have learned from this course and from mushrooms and nature are already allowing me to be more attuned to what my patients need to heal.

Like the mycorrhizal network links different plants, our bodies are coupled with plants through the cycle of oxygen and carbon dioxide. There are infinite links between our bodies and nature because we are simply a part of nature—not above it. And like a tree that dies in the forest can be decomposed by fungi to bring new life, when our physical bodies die, it is just a transition of our physical matter into the rest of the universe. That matter will be redistributed into innumerable new ways of life. Having this knowledge, I am better equipped to help my patients as I no longer view success only as stopping a cancer and preserving a life. I can be present with my patients and listen for what is important to them, focus on their quality of life, and help them to accept that death is not a failure or an ending but a part of our existence.

Every time I eat a mushroom, I taste the earth. Every time I see a mushroom growing, I am reminded of the interrelatedness of our universe. Mushrooms have been my teacher.

# PSILOCYBIN MUSHROOMS—A REFLECTION

**Dr. Pamela Kryskow, MD**

Psilocybin mushrooms are a remarkable ally for humans in our journey. I have seen them heal people carrying the suffering burdens of life. In our work with palliative patients, they assist in the healing of old and new traumas so people can focus on living instead of dying. They assist us to become better versions of ourselves, shedding layers and triggers that no longer serve us. They allow us to become more thoughtful, kinder, more creative. The journey with psilocybin mushrooms allows us to be better humans and better coinhabitants of planet Earth.



Dr. Pam.

Dr. Kryskow is a Vancouver Island University adjunct professor, University of British Columbia clinical instructor, and Psychedelic Association of Canada founding board member.

# THE STUTZII SECRET

David Steinfeld



These tree seedlings concealed thousands of tiny secrets.

It was in the late 1990s when I first learned of a mushroom called *Psilocybe stuntzii*. I was walking with my friend through a field of tree seedlings collecting mushrooms for his start-up business. Mike was looking for a specific group of mushrooms—those that form mycorrhizae on the roots of trees, important for reforestation and restoration projects. Since we were growing trees in our nursery, it was sometimes easier for him to come by and collect these mushrooms right out of our nursery beds instead of traveling into the forests to look for them. When Mike would come by, I would take a few minutes out of my busy schedule to look for mushrooms and catch up on life with him. As we strolled through the nursery beds, Mike would spot a mushroom deep between the trees and stop and pick it, then we would return to our lives.

In those days, we sowed conifer seeds in rows on the surface of the soil and covered them with a layer of sawdust. This practice protected the seeds while they germinated and created an environment for optimum germination. We had miles of sawdust-covered beds. Since mycorrhizal mushrooms had not yet formed on these beds, Mike would walk right by them. On one visit, however, Mike bent down and picked a very small mushroom that was growing out of the sawdust and began to

scrutinize it. He put it down and picked another. And another. Then he looked up and said to me, “Dave, this little mushroom is psychedelic—*Psilocybe stuntzii* to be exact. They like to grow on sawdust.” Then he looked across the field for as far as we could see and said, “Dave, you have a nursery full of magic mushrooms!”

I let this sink in for a minute and then realized that there were millions of these mushrooms in our nursery, enough to light up the city I was living in. I replied, “Mike, we cannot tell a soul about this, or we’re screwed! Every hippy in the valley will be in here, including some of our employees, looking for these things! It will be a mess.”

So ... it became our secret.

I need to frame this moment in the culture of the time for you. We were going through a reefer madness period at work and in society, it seemed. It was a time when no one talked about smoking pot, let alone admitting we had ever tried it at some point in our lives. I had worked for years with fellow Forest Service employees, and marijuana was never brought up around the lunch table. It was too dangerous a topic—one that could hurt your reputation and possibly your job. I had given up smoking pot years before to become a family man, but on rare occasions, I would get high with friends. I remember sitting in a group of managers one day discussing whether we should impose random drug tests on our employees, which would include me. I knew I would likely flunk such a test because of the long half-life of THC. We were all a bit scared but dared not talk about it.

So explain to me then, why was I often seen out on my lunch breaks walking along the sawdust-covered beds? And why, when I returned to my office, did I have a pocket full of fungi? If you had met me at the time, you would have observed a harried middle manager, dealing with whatever was in front of him. But if you could have gotten into my head, you would have found a guy adrift in the doldrums of midlife. Every

minute of my day was accounted for, and I was exhausted deep down. I hated being in management. I wasn't sure what life was all about. I just needed a breath of wind to fill my sails, and that was what the secret of this little mushroom brought me.

On the days I collected mushrooms, I would bring them home and lay the caps on a white piece of paper. And after a day, I would remove them and have a poster full of purple spore prints. I would post these sheets of paper on my office wall at home and imagine that I had captured the soul of these mushrooms. And while I played with the idea of marrying souls, I never tried. I had never taken psychedelics, and while I needed a little breeze in my life, I did not want the hurricane an unpredictable dose of mushrooms might deliver! There is little doubt I could have used a strong breeze at that point in my life, but I would have had to do it by myself. And I was too scared to do it alone. No, my relationship with *Psilocybe stuntzii* was different—it was one based on awe and respect and possibilities lost. But really, it was just the little secret in my coat pocket that brought a thrill to one man's simple life.

## THE STONED APE HYPOTHESIS



The Stoned Ape Hypothesis is a theory pioneered in 1992 by Terence McKenna in his book *Food of the Gods*. McKenna postulated that psilocybin use caused the primitive *Homo erectus* brain to rapidly process and reorganize information that led to a rapid improvement in language, art, technology, and cognition. Basically, psilocybin enabled *Homo erectus* to evolve to *Homo sapiens*. Could it be that early humans were harvesting and eating magic mushrooms that grew out of the manure of the animals they were following? Did the higher consciousness induced by psilocybin also improve speech, community organization, and imagination that characterized human evolution? McKenna believed so.

Terrence McKenna died in 2000. His life was as interesting as the ideas he generated. He was an author, ethnobotanist,

philosopher, and passionate advocate for psilocybin use. His journey was wide and twisting. He was a butterfly collector in Indonesia, a hashish smuggler in India, a magic mushroom grower in Northern California, and a shaman in Hawaii. His enthusiasm for psilocybin mushrooms began on a trip with his brother Dennis in the Columbian Amazon in the early 1970s. While he maintained his passion for the Stoned Ape Hypothesis throughout his life, his theory was rebuffed by the scientific community of his day as “extremely speculative.”

But was McKenna “on to something” or just “on something”? New research into the mechanics of psilocybin and the human brain has led to a renaissance of McKenna’s Stoned Ape Hypothesis. Studies are underway at New York University and Johns Hopkins University to see if psilocybin use can profoundly alter consciousness and induce physical changes in the brain. Other recent studies document a surge in activity in the primitive brain network associated with emotions, which is one of the reasons why psilocybin is currently being studied for patients suffering from anxiety, depression, addiction, post-traumatic stress disorder (PTSD), and existential distress following a terminal cancer diagnosis. Studies from Johns Hopkins University medicine indicate psychedelic treatment with psilocybin relieves major depression (Griffiths 2020) and existential anxiety associated with a terminal cancer diagnosis (Griffiths 2016). Studies underway at New York University, such as the Psilocybe Cancer Anxiety Study and a Double Blind Psilocybe treatment study for alcohol dependence, are just examples of continuing research on the subject.

Psilocybin enhances new connections in parts of the brain related to memory and emotions while reducing activity in the area calling the shots—the default mode network, or DMN. Researchers have described the DMN as the CEO of the brain, where chaos is contained and order is maintained. Without it, the brain would be off its leash, and the ego would be dissolved. This sounds terrible, and it can be terrifying, but perhaps there are times in a person’s life to let the brain have a

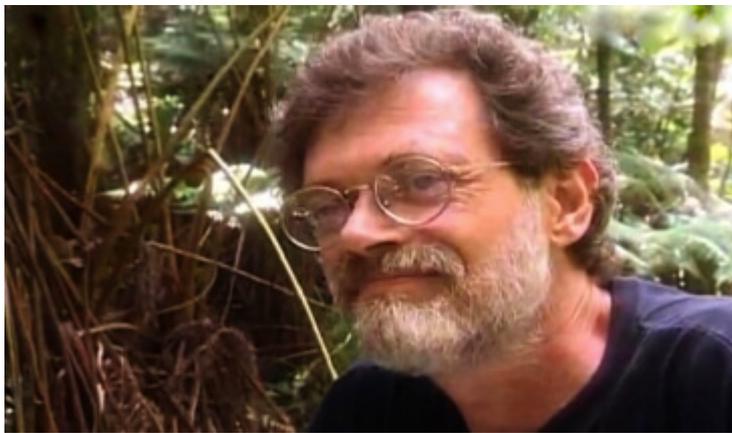
little freedom. Researchers at Yale (Kwan 2021) have found that new neural pathways and perceptions are stimulated in the brains of study participants on psilocybin, which might explain why they report being more connected to the world and less attached to their own bodies during these guided mushroom trips. Psychedelics seem to facilitate a level of mental flexibility that unlocks hardened habits associated with addiction and depression.

In the animal world, there are numerous examples of intoxication. Birds eat fermenting berries. Moths seek psychoactive flowers to drink the nectar. Humans have sought intoxicating beverages for hundreds of thousands of years. The Aztec and Mayan use of psilocybin mushrooms is well documented. Reindeer and shamans eat psychoactive *Amanita muscaria* in Siberia. There are indications that the Neolithic man, eight thousand years ago, consumed hallucinogenic mushrooms. In Africa, Algerian cave painting of Tassili include a depiction of a shaman with mushrooms sprouting all over his body. Tassili is the oldest known petroglyph depicting the use of psychoactive mushrooms (Soukapova 2011). In Eastern Spain, the Selva Pascuala rock shelter contains abstract drawings suggesting the use of hallucinogenic mushrooms a millennia ago. The five-thousand-year-old iceman Otzi, recovered from glacial ice in the Italian alps, was carrying three mushrooms on his body. Though the mushrooms were not hallucinogenic, one species was believed to be used as an anti-inflammatory or antibiotic and the other species as a fire starter.

But where is the evidence for the Stoned Ape Hypothesis? Perhaps such a theory can never be proven. Yet scientists have no consensus for the doubling to tripling of the human brain size between five hundred thousand and one hundred thousand years ago. Could it be that consumption of these mushrooms affected the human brain and was the catalyst that sparked early humans into imaginative behavior, community bonding, and spirituality? Many believe the Stoned Ape

explanation is too simplistic and unsophisticated to have much merit. They may be right. But I have come to appreciate how little we know about fungi and how much there is left to learn. Is Terence right about our hunter and gatherer ancestors munching on magic mushrooms as they foraged their way across Africa? Could be. Did these small mushrooms trigger evolution of the human mind? I suppose it depends upon how far you are willing to speculate and how free you are willing to let your mind roam.

### Terence McKenna



I met Terence at a mushroom conference tucked away in the Cascade Mountain Range a few years before he passed. He was an engaging, passionate, and sincere man who introduced himself to me as “shaman.” Terence had a Cheshire cat smile and was obviously enjoying the conference presentations. This was a gathering of mushroom fanatics in a freewheeling celebration of the earth, soil, medicine, music, plants, decomposers, problem-solving, networked consciousness, and spiritual insight held on a Halloween weekend at the peak of mushroom season! The forests around the hot springs, where the conference was being held, contained a plethora of diverse mushrooms that we laid out on picnic tables for display at the end of each day. These included delicious edibles (like chanterelles, boletes, cauliflower mushrooms, and lion’s mane) and some mind-altering *Psilocybes*, which found their way into a tea that brewed in a large cauldron on the back porch of the

lodge. Let's just say the Halloween party that evening was festive and memorable.

Note—Paul Stamets, mycologist and psilocybin expert, explains the Stoned Ape Hypothesis in many YouTube videos.



## **10. OYSTER MUSHROOM**

*(Pleurotus ostreatus)*



This edible mushroom can be found in the woods as well as in supermarkets. It is a workhorse species—used to clean up pollution, eaten for taste and health benefits, made into vegan leather, and molded into an alternative building material. What do you say about a fungus that is delicious to eat but also able to degrade cigarette butts and crude oil? That can be sautéed into an amazing stir-fry or grown into packaging material as an environmental replacement for Styrofoam? You'd likely say that it is a fantastic fungus!

The oyster mushroom (*Pleurotus ostreatus*) is a white-rot fungus that grows primarily on dead hardwood stumps and logs and fruits in a distinctive shelflike manner. The oyster mushroom (the name probably comes from the oyster shape of the cap) is the common name for a group of species or varieties (pearl, golden, king) with very similar characteristics, referred to collectively as *Pleurotus ostreatus*. For the typical mushroom hunter, it is not important to differentiate between these species and varieties since they all are edible. The oyster mushroom goes by a variety of names—including “pearl oyster mushroom,” “tree mushroom,” “tree oyster,” and “hiratake.”

### **Cap Characteristics**

The cap is medium to large in size (generally three to six inches). The color is generally white, tan, gray, or brown in the wild. Some commercially produced oyster mushroom varieties have pink, green, or blue coloration. The range of color of this mushroom species is truly astonishing. The cap is also bald.





Commercial kits for oyster mushroom production include a pink variety.

### **Underside of Cap**

The cap underside has gills that are white to cream to pale gray. There is no veil, ring, or volva. The gills are attached off-center to the stalk, and the spore print is white or pale gray.

### **Stalk**

The stalk is short, thick, off-center. It is tapered and fused at the base. Sometimes the stalk is absent. It has a yellow-edged ring on the upper stalk.

### **Fragrance and Edibility**

This mushroom has a slight seafood fragrance. The oyster mushroom is a tasty and popular edible. The mycelium grows aggressively in controlled sterile environments. Commercially produced, oyster mushrooms are available in many grocery outlets. Use it in any dish just like you would use other store-bought mushrooms.



Oyster mushroom mycelium growing on rye grain.



Oyster mushroom growing indoors in a controlled humid environment.

## **Habitat**

The oyster mushroom is very common and widespread in the fall in a variety of habitats. Fruiting is often abundant; you can find the oyster mushroom growing in dense shelflike clusters at the base of hardwoods stumps and dead hardwood trees. Commonly found on willow, oak, alder, and orchard trees

throughout the Western United States, it fruits abundantly indoors as well in controlled humid environments.

### **Similar Mushrooms That Should Be Avoided**

Toxic look-alikes include *Amanitas*—which, like *Pleurotus*, also have white gills. *Amanitas*, however, grow in soil (not on wood) and have a volva at their base and free gills. *Amanita* caps are not off-center from the stalk. Angel wings (*Pleurocybella porrigens*) are similar-looking to oyster mushrooms and are edible but fruit on the dead wood of conifers, not hardwoods. Angel wings are white, smaller, thinner, and flimsier than oyster mushrooms. Jack-o'-lantern mushrooms, *Omphalotus* species, grow in similar habitat and are off-centered from the stalk but have yellow to bright-orange caps.

## VERSATILE FUNGUS



Oyster mushroom mycelium selected to degrade cigarette butts.

The oyster mushroom is not only delicious but also rich in fiber, antioxidants, nutrients, vitamins, and minerals. Recent studies indicate this mushroom is antitumor and immune-supportive. This is due to specific polysaccharides, known as beta-D-glucans. It also contains lovastatin, which is a type of statin that can lower cholesterol. Sixteen recent medicinal studies with oyster mushrooms are available at [mushroomreferences.com](http://mushroomreferences.com).

The mycelium of this remarkable fungus breaks down toxic chemicals. Easy to grow, the oyster mycelium is being used to clean up pollution in “myco-restoration” projects. Oyster mushroom mycelium is voracious, eating its way through wood, paper, garbage waste, and even petroleum products (Sheldrake 2020). The mycelium excretes powerful enzymes and has an insatiable appetite to break down carbon bonds in toxic chemicals. The fungus can also absorb toxic heavy metals, such as mercury that may be present in toxic waste, so they can be disposed of safely.

Oyster mushroom mycelium is also being utilized in imaginative ways to produce structural materials. Mycelial networks like those produced by oyster mushrooms (and other rot fungi such as reishi and turkey tail) are extremely strong, fine, and interwoven. They produce materials from waste

materials that are light and sturdy, resist water and decay, and can be formed into numerous structures. These structures are a natural mycelial alternative to Styrofoam, plastics, animal leather, and certain agriculture products (see [ecovative.com](http://ecovative.com)). There is great interest in a variety of industries. For example, Adidas has a new proof-of-concept shoe—Stan Smith Mylo—that is made from mycelium-based Mylo material.

I've grown this mycelium in molds in my home and been amazed at how quick and easy it was to create lightweight objects. I've grown an assortment of mycelial objects, such as pots for plants, coasters, toys, and teddy bears for the grandkids.



A mycelial teddy bear grown in a mold using sterile wood waste.

Once you have the appropriate mycelial culture, all you need is some fine bark or wood shavings, a pressure cooker to sterilize the substrate, some flour and water to activate the culture, a sterile area to grow out the mycelial network, and an oven to dry the material. Hopefully, we will soon see a world that looks for alternatives to plastics. I believe mycelium from species such as reishi, turkey tail, and the amazing oyster mushroom is part of the solution. There are lots of interesting companies working with mycelium-based products on the web, such as [ecovative.com](http://ecovative.com), [mylo-unleather.com](http://mylo-unleather.com), and [buildwithrise.com](http://buildwithrise.com).

## Recipe:

### **COCONUT OYSTER MUSHROOMS WITH GINGER AND SCALLIONS**

#### INGREDIENTS:

*1 in. piece ginger root, chopped fine*

*3 garlic cloves, chopped fine*

*1 can (13.5 oz.) coconut milk, unsweetened*

*2 tsp. curry powder*

*1 tbs. soy sauce*

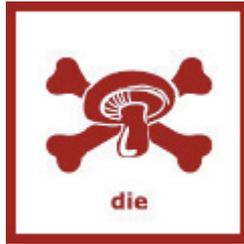
*12 oz. chopped oyster mushroom*

*1/2 cup mild chili peppers*

*2 scallions, chopped thin*

#### METHOD:

Bring ginger, garlic, coconut milk, soy sauce, and curry powder to a simmer in a frying pan. Add oyster mushrooms, and stir and coat well. Simmer mixture, stirring occasionally until most of the coconut milk is evaporated—about 30 minutes. Add peppers and cook for 5–10 minutes. Season with salt to taste. Serve in a bowl and top with scallions.



## **11. DEADLY GALERINA**

*(Galerina marginata)*

The problem with little brown mushrooms (LBMs) is that they all look pretty much alike. One of the most toxic LBMs is the deadly galerina (*Galerina marginata*), which contains the same amatoxins as the destroying angel and death cap *Amanitas*. It can make you very sick or even kill you if consumed. The deadly galerina has a “rap sheet” like most LBMs: cap is small and tan or brown, stem is slender, and it grows on wood and bark. The spore print is brown. It is very tough to distinguish from other LBMs!

It is also known as *Galerina autumnalis*, “funeral bell,” “autumn skullcap,” and “autumn galerina.”

### **Cap Characteristics**

The cap is small in size (usually about one inch). It has radial lines on the edge and is colored tan to brown or yellowish. The surface is bald and sticky when wet.

### **Underside of Cap**

The cap underside has gills that are crowded and attached to the stem. The spore print is an important diagnostic check and is rusty brown or brown in color. The veil is present in young specimens.

### **Stalk**

The stalk is generally one to four inches high and slender (less than 1/4 inch thick). A veil is present, first covering the gills then forming a small ring on the upper stalk that sometimes disappears with age.



## **Fragrance and Edibility**

DO NOT CONSUME. DEADLY POISONOUS. The deadly galerina smells like flour (farinaceous). It contains the same amatoxins as two *Amanitas* described in this guide (the destroying angel and the death cap). In general terms, avoid eating little brown mushrooms (LBMs). The edibility of most little brown mushrooms is unknown, and many may be toxic.

## **Habitat**

The deadly galerina is a saprobe that grows on wood or buried wood. Be aware—if the wood is buried, it might appear as if it is growing in soil. Common and widespread throughout the Western United States and the Northern Hemisphere, the deadly galerina has a long fruiting season and can fruit several times from mycelium in the same log or stump throughout the year.

## **Similar Mushrooms That Should Be Avoided**

The deadly *Galerina marginata* resembles the psychedelic liberty cap (*Psilocybe semilanceata*) and several other *Psilocybes*, such as *Psilocybe stuntzii*. Caution, experience, and expertise are necessary to avoid consuming the deadly galerina along with *Psilocybes*. I have seen the deadly galerina growing on wood chips inches away from *Psilocybe stuntzii*. Unlike the *Psilocybes*, which have purple-brown spores, the deadly galerina has rusty-brown or brown spores. So if you are out collecting, always carefully inspect every mushroom in your basket you intend to eat. It is a good idea to conduct spore prints on mushrooms that are questionable. Poisonous *Psathyrella* and *Inocybe* species are also somewhat similar to the deadly galerina. For a more detailed description of little brown mushrooms, see David Arora's *Mushroom's Demystified*. When in doubt, throw it out.

## **12. TEETH FUNGI**

Easy, nutritious, and delicious, the teeth fungi are easy to identify, important for your health, and downright fantastic edibles. The downward-pointing spines, or “teeth,” define this otherworldly group of forest fungi. The four teeth fungi I describe in this section are fun to find and quite tasty. The hedgehog looks much like a chanterelle in color and texture, but it has spines instead of folds beneath the cap. The bear’s head and the comb hericium form a branched array of magnificent icicles, while the lion’s mane is a dense mass of long, majestic spines originating from a single base. Many teeth fungi, such as lion’s mane, are being investigated for their health and medicinal qualities.





## HEDGEHOG

(*Hydnum repandum*)

The hedgehog's (*Hydnum repandum*) white to pale-orange cap and spines on its underside makes the hedgehog easy to identify. It has no look-alike poisonous fungi, so it is a great choice for the beginning forager.

The hedgehog is also known as “sweet tooth,” “wood hedgehog,” and “belly button hedgehog” (*Hydnum umbilicatum*).

### Cap Characteristics

The cap is small to medium in size (two to six inches). It is white to pale orange to orange—very similar in color to the golden chanterelle. It has a dry surface that sometimes develops scales with age. A related species, the “belly button hedgehog” (*Hydnum umbilicatum*) has a “navel” hole in the middle of the cap and is smaller and thinner than *Hydnum repandum*. It is equally good to eat.

### Underside of Cap

The cap underside is white to pale orange in color, with spines, or “teeth.” Distinctive!

### Stalk

The stalk is generally two to four inches long and white to pale orange. It is smooth, has no veil, and brittle, not stringy or leathery.



## **Fragrance and Edibility**

The hedgehog has a fruity fragrance and sweet and nutty flavor. It is delicious and one of the best edible mushrooms. The underneath spines can accumulate litter and soil, so clean it with a brush before placing it in your bag or basket.

## **Habitat**

Often clustered, hedgehogs can be found in abundance. The species prefer coastal and mild climates in winter and early spring. It is widely distributed in conifer forests and occasionally occurs near oaks. A mycorrhizal forest species, it is often found in association with yellow foot chanterelles.

## **Some Similar Mushrooms That Should Be Avoided**

None!





## LION'S MANE

*(Hericium erinaceus)*



Lion's mane can get quite large, and it fruits on the same log or stump year after year.

The lion's mane, with its ghostlike spines, is simply breathtaking to behold. Do you see a ghost or the old man's beard? It is another great choice for beginning foragers because of its distinctive appearance and the fact that it has no look-alike poisonous fungi to confuse it with. Sister fungi to the lion's mane are bear's head and comb hericium.

The lion's mane is also known as "old man's beard," "bearded tooth," and "pom pom du blanc."

### **Form and Size**

Lion's mane has a single cluster of spines hanging from a single dense base. Medium to large, it often reaches several pounds in weight. The spines are one to three inches long at maturity.

### **Color**

The color is white flesh and spines. It can develop a yellowish to orange-brown tinge with age.

### **Fragrance and Edibility**

The lion's mane has a faint fish odor similar to shellfish. It has a crab or seafood taste and texture and is delicious.

## Habitat

Lion's mane occurs in Northern California, Oregon, and Washington on oaks and other hardwoods. Also found in other parts of North America, Russia, and Europe, it occurs on living hardwoods in wounds, dead standing hardwoods, hardwood logs, and stumps. It fruits in the same dead standing or dying hardwood, log, or stump year after year. Lion's mane is now commercially cultivated and available in many growers' markets, restaurants, and supermarkets. One of the best edible mushrooms, it can be marinated, sautéed, barbecued, stir-fried, or baked. Add clean and sliced lion's mane to meat, fish, pasta, or seafood substitute dishes. It is a well-documented medicinal mushroom that can also be dried and made into powder capsules, tea, or tincture.



Lion's mane is also commercially cultivated and becoming more common in markets and restaurants.



Or collect your own.

### **Some Similar Mushrooms That Should Be Avoided:**

None!

### **Lion's Mane Medicinal Properties**

There has been an explosion of research and health products surrounding the lion's mane mushroom and its extracts. The bottom line—it's good for your brain. Recent research has shown that lion's mane has a variety of health benefits and contains seventy beneficial metabolites. Much of these benefits surround improving human brain function and treating or preventing human neurological and cognitive decline (Lai et al. 2013, Obara et al. 2008). If you are one of the millions eating fresh lion's mane or the supplements made from it, you already know that!

Scientists have found that lion's mane may protect against dementia, reduce mild symptoms of anxiety and depression,

and help repair nerve damage (Khan et al. 2013). The [mushroomreferences.com](https://mushroomreferences.com) website contains the abstracts of thirty-seven recently published scientific studies on lion's mane. Many of these studies focus on neuropathways, cognitive function, depression, and anxiety. A variety of compounds present in lion's mane, such as water-soluble hericenones and erinacines, have been found to induce synthesis of nerve growth factor, which the brain uses to maintain neuron sensory performance (Phan et al. 2014).

While lion's mane studies point to improvement of memory and concentration, lion's mane also has strong immune-boosting, anti-inflammatory, and antioxidant properties (Chong et al. 2019). It has been shown to lower the risk of heart disease, cancer, ulcers, and diabetes in animals. While the current research is promising, more human studies are needed to develop practical health applications for lion's mane and its extracts.

There has been an expansion in the availability of lion's mane products in recent years. Capsules, powders, extracts, and fresh fruiting bodies grown on grain or sawdust are widely accessible in stores. You have many options to find the delivery method that best meets your dietary and lifestyle needs.



Paul Stamets with lion's mane and the author with hen of the woods.

*Lion's mane contains constituents that can be nutrients for your neurons and immune system.*

—Paul Stamets





## BEAR'S HEAD

*(Hericium abietis)*

A welcomed addition to the menu, the bear's head grows in the same spot every year and can be harvested annually on your "happy bear's head day." Bear's head is another great choice for beginning foragers because it is easy to identify and has no look-alike poisonous fungi. It is distinguished from lion's mane by its multibranching clusters of spines hanging from multiple branches. It is similar to its sister mushroom comb hericium but is larger, denser, and grows on conifers, not hardwoods.

Bear's head is also known as "goat's beard" and "conifer coral."

### **Form and Size**

The bear's head does not have a cap but has numerous branched clusters of spines hanging from cascades of branches. Medium to very large, it can often reach ten pounds and sometimes as large as thirty to forty pounds. The spines are 1/4 to 1/2 inch long.

### **Color**

The color is white for the flesh and spines. It can develop a yellowish to yellowish-orange tinge with age.



The bear's head is a welcome addition to the kitchen. Mature specimens develop a yellowish tinge but are still good to eat.

### **Fragrance and Edibility**

The bear's head has a mild fish odor. It is delicious and similar to fish in taste and texture. Add clean and sliced bear's head to meat, fish, pasta, and soup dishes. It can be marinated, sautéed, barbecued, stir-fried, or baked.

### **Habitat**

Common in Northern California and the Pacific Northwest, the bear's head is a saprobe that lives on dead standing conifers, conifer logs, and stumps. It fruits in the same place year after year.

### **Similar Mushrooms That Should Be Avoided**

None! Bon appétit.



## COMB HERICIUM

*(Hericium coralloides)*

Like a beautiful Christmas tree covered in a December snowstorm, comb hericium is more open and delicate than its sister fungi, bear's head and lion's mane. It is another great choice for beginning foragers and has no look-alike poisonous fungi.

The comb hericium is also known as "coral hedgehog," *Hericium ramosum*, and *Hericium americanum*.

### Form and Size

The comb hericium does not have a cap. Instead, it has numerous long-branched clusters of delicate spines hanging from an open framework of multiple branches. It is generally smaller than the bear's head, and the spines occur in rows along an open, branching network. The spines are 1/2 to 1 1/2 inches long.

### Color

The flesh and spines are white and can develop a yellowish to yellowish cream or buff with age.

### Fragrance and Edibility

The comb hericium has a faint fish or crab smell. It is delicious and more delicate than lion's mane and bear's head, but not as fleshy. It should be slowly cooked.



## **Habitat**

Common in the Western United States, this saprobe occurs on dead standing hardwoods, hardwood logs, and stumps. It fruits in the same place year after year.

## **Some Similar Mushrooms That Should Be Avoided**

None!

## Recipe:

### **SAUTÉED HEDGEHOG**

#### INGREDIENTS:

*1 lb. hedgehog mushrooms*

*1 tbs. butter*

*1 tbs. olive oil*

*1 clove garlic (optional)*

*1 tsp. fresh thyme*

*1 tbs. chives, minced*

*salt to taste*

#### METHOD:

Place clean, sliced hedgehogs in a frying pan with butter or oil and sauté for 5 minutes. As simple as that! Add a pinch of salt, thyme, and chives, and feast on a delicious combination of fruity and nutty flavors.

## Recipe:

### **LION'S MANE "CRAB" CAKES**

#### INGREDIENTS:

*2 lbs. fresh lion's mane mushroom*

*1 egg*

*1 cup bread crumbs*

*1 medium sweet onion, diced*

*1/4 cup mayonnaise*

*1 tbs. Worcestershire sauce*

*1 tsp. Old Bay seasoning*

*1 tbs. Dijon mustard*

*salt and pepper to taste*

*2 tbs. olive oil*

*fresh lemon (optional)*

#### METHOD:

Shred lion's mane into small pieces similar to the size of flaky crab. In a large bowl, combine egg, mayonnaise, onion, Worcestershire sauce, Old Bay, Dijon mustard, salt, and pepper. Mix in lion's mane and bread crumbs and form into equal-sized patties about 1/2 to 3/4 inch thick. Sauté in olive oil over medium heat for 2-3 minutes on each side until golden brown. Add a squeeze of lemon (optional).

## 13. BOLETES



The king bolete, *Boletus edulis*.

The edible boletes are scrumptious ... enough to make Italian Americans dress up in suit jackets and polished shoes to forage in the forest (see “My First Mushroom Hunt: Porcini” section). While some boletes are poisonous, they are distinct and avoidable. *Fry, Thrive, or Die* can help keep you from dangerous look-alikes.

The boletes have a fleshy cap and central stalk, similar to many mushrooms but are distinctive beneath the cap by having a spongy layer of pores instead of gills. The pores are small tubes that contain the spore, or “seeds,” of the bolete mushrooms. Boletes are mycorrhizal with trees, so they are found in forest environments and quite common across the Western United States. There are many species of boletes. I have included six common species that include three edible and three poisonous mushrooms; they are all equally distinctive species.

To identify the wider array of bolete species, refer to *Mushrooms Demystified* by David Arora, which covers the group in over fifty pages of comprehensive detail. Identifying this wide array of bolete species will take years of study and experience. Suffice it to say, learn to identify the porcini, the admirable bolete, and the manzanita bolete. They are delicious! Avoid boletes with red pores, a red stalk, or those that bruise blue.





## **PORCINI**

*(Boletus edulis)*

The porcini does not have red pores or red flesh. It does *not* bruise blue under the cap or on the stem. The stalk is never bright yellow or red. It is one of the world's most prized edible mushrooms, and Italians are crazy about this mushroom.

Porcini is also known as “king bolete,” “cep,” “steinpilz,” and “penny bun.” The spring version in the Cascade Mountain Range is known as “spring king,” or *Boletus rex-veris*.

### **Cap Characteristics**

The cap is medium to large in size (generally three to nine inches across). It is colored yellow brown to reddish brown. It can be white when young beneath the forest duff layer, and it has smooth texture. A large porcini can weigh a couple pounds. One mushroom can be a meal!

### **Underside of Cap**

The cap underside has a sponge layer. White and minute when young, the pores turn yellow brown to olive brown with age. The pores also do not bruise blue.

### **Stalk**

The stalk is three to six inches long generally and an inch or more in thickness. It is often somewhat bulbous at the base, especially when young. The stalk is white or brown, never yellow or red. The top is finely netted. It has no veil. The base of the stalk is not bright red or rhubarb in color. The flesh is never red or turns blue when cut or bruised.

### **Fragrance and Edibility**

The porcini has a mild, pleasant mushroomy fragrance. It is delicious fresh or dried and rehydrated, and it has a very nutty flavor. If the sponge layer under the cap is old or buggy, cut them out and toss them out. If the porcini is young and solid and the pores are whitish or yellow brown (and are in good shape), cook them with the mushroom or cut them out and use them fresh or dried in risotto, pastries, soups, and sauces. For later use, porcini can be cut into quarter-inch thick slabs and dried in a dehydrator. Store in an airtight container. Rehydrate in a pan of warm water for thirty minutes then cook. The porcini taste is concentrated by drying and rehydrating.

I love porcini cut in quarter-inch slabs, basted in olive oil, and baked for fifteen minutes then topped with good cheese and prosciutto. Another delicious way to prepare porcini is to dip quarter-inch slices in egg batter and bread crumbs, and fry in olive oil for five minutes. There are more recipes at the end of the bolete section.

### **Habitat**

The porcini is mycorrhizal, so it occurs in forest areas and the margins of the tree root systems. Conifers such as fir, pines, and spruce in higher elevation forest are prime habitats, but porcini also occurs sometimes in lower elevations in oak, birch, and madrone habitat. Fruiting occurs in the fall about four weeks after the first drenching rains. In the Western United States, there is a May/June higher-elevation fruiting of a porcini called the “spring king bolete” (*Boletus rex-veris*), and it looks identical to the fall porcini but is now considered a different species than *Boletus edulis*.

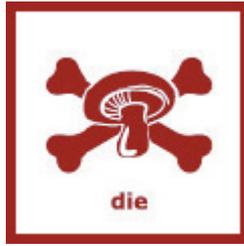


The spring king (*Boletus rex-veris*) looks identical to the fall porcini and is also delicious. It also gets less buggy than the fall porcini. Spring king taste and preparation are similar to the fall porcini.

**Similar Mushrooms That Should Be Avoided:**

Avoid the bitter bolete (the cap underside turns blue when bruised, and the stalk is partly or completely red or rhubarb in color). The red-pored bolete and Satan's bolete are also poisonous, and they stain blue.





## **SATAN'S BOLETE**

*(Rubroboletus satanas)*

The Satan's bolete is conspicuous. It has a bright-blue staining when bruised under the cap and on the stem. It has red pores when mature and a very bulbous base.

The Satan's bolete is also known as "devil's bolete" and *Boletus satanas*.

### **Cap Characteristics**

The cap is medium to large in size (generally three to ten inches across). It is dull grayish and olive gray in color and has velvety texture. This cap bruises blue quickly when squeezed or cut. The specimens are sometimes very large, and individuals can weigh several pounds.

### **Underside of Cap**

The cap underside has a sponge layer. The pores are yellow to red and stain blue when bruised.

### **Stalk**

The stalk is three to six inches long generally and an inch and a half or more in diameter. It is very bulbous at the base. The top of the stalk is finely netted. It has no veil and is brown to bright red in color, turning blue quickly when cut or bruised.

### **Fragrance and Edibility**

AVOID CONSUMPTION. POISONOUS. This Satan's bolete has a putrid smell when mature and can cause severe gastric distress if eaten.



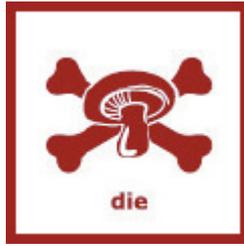
You are hunting porcini, and you see a large bump in the forest floor, your heart soars ... then comes crashing to earth or below when you discover it is Satan's bolete.

### **Habitat**

Satan's bolete is mycorrhizal, so it occurs in forest areas and the margins of the tree root systems. Conifers such as fir, pines, and spruce in higher-elevation forest are prime habitats. Fruiting occurs in the fall about two weeks after the first drenching rains. Satan's bolete also occasionally occurs in lower elevations in oak and madrone habitat.

### **Similar Mushrooms That Should Be Avoided**

Avoid the red-pored bolete and the bitter bolete.



## RED-PORED BOLETE

*(Rubroboletus pulcherrimus)*

The red-pored bolete has orange to red pores and dark-red to purplish stalk. It rapidly stains blue to black when bruised under the cap and on the stem. The base is without a bulb.

It is also known as “slender red-pored bolete” and *Boletus erthropus*.

### Cap Characteristics

The cap is medium to large in size (generally three to eight inches across, occasionally as large as ten inches). It is reddish to purplish brown in color and has lots of fiber and scales on top. This cap bruises blue quickly when handled or cut.

### Underside of Cap

The cap underside has a sponge layer. The pores are orange to red and stain blue when bruised.

### Stalk

The stalk is three to six inches long generally. The stalk is thick, an inch or more. It is not bulbous at the base. The top is finely netted red. There is no veil, and it is orange to red brown in color, turning blue or blue black quickly when cut or bruised.

### Fragrance and Edibility

AVOID CONSUMPTION. POISONOUS. The red-pored bolete has a mild smell and can cause severe gastric distress if eaten. It is the only bolete that has been documented to kill someone.



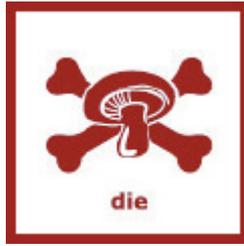
## **Habitat**

The red-pored bolete is mycorrhizal, so it occurs in forest areas and the margins of the tree root systems. Conifer forests are prime habitats. Fruiting occurs in the fall. Also known to occur in association with tanoak, it is widely distributed across the Western United States.

## **Similar Mushrooms That Should Be Avoided**

Avoid the Satan's bolete. The blue or blackish staining, slenderer stem, and lack of bulbous base distinguish the red-pored bolete from Satan's bolete. The bitter bolete is similar and also causes gastric distress. The bitter bolete has a tan or buff cap that is cracked on top.





## **BITTER BOLETE**

*(Caloboletus rubripes)*

The bitter bolete has a red stalk, without netting, and has a tan or buff cap that develops cracks with age. The red stalk and the blue staining of the bitter bolete will keep you from mistaking it for the porcini.

Other common names include “red-striped bolete” and “red-stemmed bitter bolete.”

### **Cap Characteristics**

The cap is medium to large (generally three to eight inches across, occasionally as large as ten inches). It is tan or buff in color and not sticky or slimy. It cracks with age and bruises blue when cut.

### **Underside of Cap**

The cap underside has a sponge layer. The pores are yellow and stain blue quickly when bruised.

### **Stalk**

The stalk is three to six inches long generally and an inch or more in thickness. It is thicker but not bulbous at the base. The entire stalk is red or rhubarb in color. The top is not finely netted. There is no veil. The flesh is whitish to pale yellow, turning blue quickly when cut or bruised.

### **Fragrance and Edibility**

The bitter bolete smells unpleasant. Cooking does not improve the smell or taste. Very bitter, it is not deadly poisonous but causes gastric distress to some people.

**Habitat**

The bitter bolete is mycorrhizal, so it occurs in forest areas and the margins of the tree root systems. Conifer forests are prime habitats, but it can also occur in oaks. Fruiting occurs in the fall. It is widely distributed across the Western United States.

**Similar Mushrooms That Should Be Avoided**

Avoid the red-pored bolete and the Satan's bolete.



## MANZANITA BOLETE

*(Leccinum manzanitae)*

The manzanita bolete does not stain blue when bruised, does not have red pores or a red stem, and has pronounced brown or black dots (scales) on the stems. The cap is sticky or slimy when wet, and it occurs commonly in the fall under manzanita or madrone.

The manzanita bolete is also known as “madrone bolete.”

### Cap Characteristics

The cap is generally medium in size (three to six inches). It is sticky or slimy when wet and often has leaves or needles stuck to the cap.

### Underside of Cap

The cap underside has a sponge layer. The pores are white or grayish to olive and do not stain blue when bruised.

### Stalk

The stalk is generally medium to long (three to eight inches) and greater than half an inch thick. It is white with pronounced brown and black dots (scales). There is no veil. The flesh is white. Mature specimens sometimes darken to a purplish gray when handled.

### Fragrance and Edibility

The manzanita bolete is edible. It is not as nutty-flavored as the porcini, but the preparation and storage are similar to the porcini.



## **Habitat**

The manzanita bolete is mycorrhizal and occurs in specific association with manzanita and madrone root systems primarily in California and Oregon. Fruiting occurs in the fall. A similar aspen bolete (*Leccinum insigne*) and birch bolete (*Leccinum testaceoscabrum*) occur under aspen and birch trees respectively and have the pronounced brown-and-black dots on the stem like other *Leccinum* species. The aspen and birch boletes are also edible.

## **Similar Mushrooms That Should Be Avoided**

Avoid the bitter bolete, red-pored bolete, and Satan's bolete. *Leccinum manzanitae* does not have red pores or red flesh and does not stain blue.





## ADMIRABLE BOLETE

*(Aureoboletus mirabilis)*

The admirable bolete does not stain blue when bruised. It has pronounced velvet top and greenish-yellow pores. The cap is not sticky or slimy when wet. It is the only bolete that occurs on logs or buried wood.

The admirable bolete is also known as “velvet-topped bolete” and “bragger’s bolete.”

### Cap Characteristics

The cap is medium in size, generally two to seven inches across. Its color is maroon brown or red brown. The cap not sticky or slimy when wet and has a soft, velvety top.

### Underside of Cap

The cap underside has a sponge layer. The pores are yellow and greenish yellow and turn dark yellow when bruised; they do not stain blue when bruised.

### Stalk

The stalk is generally medium to long (three to seven inches) and greater than half an inch thick. The stalk has a similar color as the cap, maroon brown or red brown, with a conspicuous fine netting. There is no veil. The flesh is dull white to yellow brown.

### Fragrance and Edibility

The admirable bolete has a pleasant and mild lemony smell. It is a good edible and has a lemony flavor. Preparation and storage are like that of the porcini.

## **Habitat**

The admirable bolete fruits in logs and buried wood. The wood habitat indicates it could be saprophytic, but some reports indicate this bolete is mycorrhizal with hemlock whose roots also associate with rotting wood. It is widespread in California conifer forests and throughout the Pacific Northwest.

## **Similar Mushrooms That Should Be Avoided**

Avoid the red-pored bolete, bitter bolete, and Satan's bolete. The velvety top, bright yellowish or greenish pores, and growth on wood location make the admirable bolete distinctive.

## MY FIRST MUSHROOM HUNT: PORCINI



My first mushroom hunt was in the fall of 1964. I was eight years old. I got to spend considerable time with my Grandpa Ernesto in East Los Angeles. Grandpa was an Italian immigrant from the little town of Caluso in the Piedmont area of Northern Italy. Like a lot of Italians of his generation, he was a lover of mushrooms. He had spent many hours collecting mushrooms in the “old country.” In fact, he would tell me how he worked for a family that had trees that produced truffles. I would imagine trees filled with chocolate truffles but later learned they were Italian white truffles. Ernesto would haul soil from trees that were known producers of white truffles and transplant the soil near trees that were not producing truffles in hopes the soil transfer would induce fruiting.

Grandpa’s friends in his Los Angeles neighborhood were also Italian immigrants, and they spent time playing bocce, smoking cigars, and talking how good the food was back in Italy. One day I heard them talking about going to hunt “little pigs.” I was disgusted at the thought they were really going to hunt baby pigs. Turns out, “little pigs”—or *porcini* (*Boletus edulis*) in Italian—literally means “piglets.” It is a term that was first used by the ancient Romans to describe porcini.

That autumn, the porcini were “popping” in the San Bernardino mountain area of Southern California, and it was time to go on the hunt. As Ernesto’s grandson, I was welcome to come. My grandpa dressed in his finest clothing for the hunt. He donned his dress coat, fedora hat with feather, and his polished Italian shoes. The car pulled up bright and early with three of my grandpa’s Italian friends dressed in their “finest” for the hunt. They looked like they were going to a wedding or a funeral, which was an indication of how important this event was in their lives.

The windy road and the cigar smoke were nauseating, and I was happy for each stop to get out of the old car and breathe fresh air and explore the woods. Every stop, I found a few tiny brown mushrooms of little interest. But the “guys” were really encouraging me to find porcini with every step. Early afternoon, with my grandpa’s help, I stumbled across a large bump cracking the soil surface. He handed me his forked metal rod that he also used to pull weeds in the garden. I popped the porcini out of the ground, and it lay on its side. I could see a plump, white stem and a big, reddish-brown cap. It seemed huge to me. To see the joy in my grandfather’s eyes and the merriment of his friends was a memory I will never forget. Four old Italian men, in the mountains of America, celebrating a young boy’s coming-of-age discovery. They made me feel like I had won the lottery. I was on my first treasure hunt in the forest!

When we got home, Grandpa let me slice up the porcini in thin steaks. I had never used his big, sharp knife before, and he showed me how not to cut off my fingers. I dipped each porcini slice in egg and bread crumbs, and Grandpa fried them in olive oil. I can’t say it was my favorite-tasting meal at eight years old, but the joy of eating something that I had found in the woods was unforgettable. Grandpa devoured his slices. I had brought home dinner! I remember Grandpa gave me a big bowl of spumoni ice cream after dinner. I felt like a “king.”

## PORCINI CULINARY USES



These young king boletes are just right for the kitchen.

Porcini is a tasty addition to all your favorite Italian dishes:

- In spaghetti sauce
- In sauces and soups
- Fried after dipped in egg and bread crumbs
- As a topping for chicken, steak, or fish
- In any pasta recipe, especially risotto and gnocchi
- Caps coated in olive oil and grilled
- Chopped fine and cooked to a paste to serve on bread or with bruschetta
- A topping for pizza

Recipe:

## **PORCINI MUSHROOM WITH GRILLED CHEESE**

**Chef James Daw**



### INGREDIENTS:

*porcini mushrooms, roughly 3 oz.*

*slices of good sourdough bread*

*3 tbs. of basil mayonnaise*

*4 slices of Tillamook white cheddar cheese*

*4 slices of prosciutto*

*2 tbs. butter*

### METHOD:

Preheat oven to 325°F. Slice porcini into quarter-inch slices and rub with olive oil. Place on sheet pan and cook for 15 minutes. Assemble the sandwich: bread, mayo, cheese, prosciutto, porcini. Butter the outside of the bread, and cook over medium heat until golden brown.

## Recipe:

### **SIMPLE PORCINI RECIPE**

Here's a *simple* recipe that really makes the porcini flavors pop. If you use dried porcini, rehydrate it for 30 minutes in warm water then drain.

#### INGREDIENTS:

*4 cups porcini mushrooms*

*2 cloves of garlic*

*3 tbs. olive oil*

*4 cups ripe tomatoes*

*2 tbs. Italian herbs like basil, oregano, thyme*

#### METHOD:

Warm the olive oil over medium heat. Mince the garlic, and sauté for about 3 minutes with your desired herbs. Chop the porcini mushrooms, and add to the garlic and herbs. Cook for about 5 minutes or until it looks like the mushrooms have released all their water. Add the chopped tomato and their juice, reduce the heat to low, and simmer for 20 minutes. Add some white wine if the mix gets too dry. Add to any meal and/or as an appetizer with bread.

## 14. MOREL AND FALSE MORELS

### **Morels: What, Where, and When?**

Morels are diverse, delicious, and stealthy. They are magic in your mouth. The joy of finding one in the forest or field is equal to the incredible dishes you can dream up in the kitchen. The various species camouflage themselves, but the more you hunt, the easier it is to find these treasures. I love being a hunter and gatherer, especially when it comes to morels. I love debating the types of morels, where I think they will occur, and when the harvest season will arrive. I do this with my friends, family, or for that matter, anyone who will listen. Morels are treasured by gourmet chefs and relentlessly hunted by morel maniacs. They are perhaps the most striking, highly prized, and widely sought after of all the aboveground-fruiting fungi. Have you ever bought morels? You probably choked when you saw the price. But you know what, they are worth every penny!



Morel hunting is an artform that is handed down from generation to generation.

They can be prolific fruiters but sometimes difficult to find since they blend in so well with their environment.

You can be staring at a piece of ground and not see them—then suddenly, like magic, you see one. Then you walk around a bit, and you see another one, and another one, and then it dawns on you that you had been standing in a large patch of morels for minutes before seeing a single one. It's humbling.

### **What Are the Types?**

The names of various morel species have been surrounded in controversy for at least two hundred years. With new molecular testing of the morel (*Morchella*) genus, most agree there are perhaps eighty to one hundred species of morels worldwide, and many grow in the Western United States (Pilz 2007). In my mind, most Western morels fall into three broad groups based on color: whites, yellows, and blacks. Unfortunately, it's not that simple. Color is not always static. Morels can have gray, pink, green, or tan tones that show up at certain times in their growth cycle. Colors can also intergrade and change across habitats. Simply using white, yellow, and black colors to identify a morel species will not get you a positive identification. Still, most morels can be sorted into these basic groups, or *clades* (a term used to group organisms that have evolved from a common ancestor). Molecular evidence indicates that white, yellow, and black clades can contain one to several dozen species.



### Gray morels in early stage of *Rufobrunnea* clade

Morels don't always fall simply into white, yellow, and black color schemes. Gray morels, like these, are commonly found, as well as pink, green, and tan tones for some species and developmental stages.

For simplicity's sake, let me describe the dominant white, yellow, and black clades in more detail and how they differ. But before I do that, you are probably wondering if you really need to know the difference between the clades. Heck no! But if you are as obsessed with morels as I am, you will find it fun and interesting to know the distinctions. And when you do, you can debate with your friends on such matters as to whether the mountain blonds taste better than the burn morels or whether there were more black morels this year than the last. But if you find these discussions boring, skip to the "Where Are They?" section.



The clades—*Rufobrunnea*, *Esculenta*, and *Elata*—also known as whites, yellows, and blacks, depending on your need to blabber scientific terms.

### ***Rufobrunnea* Clade (Whites)**



The mountain blonds (morels) have vertically arranged pits, and the ridges of the pits are lighter than the pit.

In the Cascade Mountain Range, the mountain blond morels (also called blondies or whites) are a member of the *Rufobrunnea* clade. In this clade, the pits are generally arranged vertically up and down the cap, and the ridges of the pits are silvery white or buff, but never dark. The *Rufobrunnea* clade bruises brownish orange to pinkish where it has been touched—a characteristic for which the fungus is named. The shape of the cap is conical and often pointed at the top.

Another characteristic that distinguishes white clade from the *Elata*, or black clade, is the absence of a sinus—yes, morels can have a sinus—which appears as a “trench” at the connection of the cap to the stem. The mountain blond morel in the Cascades and the Western United States are mycorrhizal with true firs, pines, and perhaps other conifers. Globally, it is likely that some whites are also saprotrophic.

### ***Esculenta* Clade (Yellows)**



The pits of the *Esculenta* clade, or yellow morels, do not line up vertically and generally occur in association with hardwood trees.

The *Esculenta* clade, or yellows, are yellowish-brown to light-brown morels that occur with hardwoods like madrones and cottonwoods. The ridges are buff and never dark at maturity. The pits are irregularly arranged, not vertically aligned like the mountain blonds, and the sinus is absent. The shape of the cap is rounded or somewhat “ovoid,” not conical or pointy like the white clade. The yellow clade is primarily mycorrhizal with certain hardwoods in the Western United States.

### ***Elata* Clade (Blacks)**



With the *Elata* clade, or black morels, the cap ridges are darker than the pits.



There is an indentation, or “sinus,” where the black cap (right) connects to the stalk.

The *Elata* clade is a big group. Black morels, as their name implies, are dark brown (or even lighter when young) to black and have ridges that are darker than the linings of the pits. They have a conical or cylindrical top but not as pointy as the mountain blonds, and they are not rounded like the yellow clade. The pits are partially vertically arranged, and the sinus is always present. The black clade does not generally blush red.

In the Western United States, the *Elata* clade can be further divided into “natural blacks,” “disturbance blacks,” and “burn morels.” The natural blacks form a mycorrhizal association with conifers that occur in undisturbed or natural settings. The disturbance black morels are associated with sites that have been impacted by soil compaction, logging, tree mortality, erosion, and other types of disturbances. They are often found along logging skid trails, downed wood, or sides of roads. The burn morel is associated with fire and are often found near areas that have been recently burned (one or two years following a fire), and it fruits in burn piles or areas impacted by wildfires. Burn morels are saprophytic and

can be very abundant following fires in many areas of the Western United States.



A plethora of black morels from a burned area.

### **Where Are They?**

Morels can occur everywhere and anywhere. Thirty-four morel species have been found in Europe, thirty-two species in Asia, and twenty-one species in North America (Pilz 2007). They are hunted internationally—Africa, China, Hawaii, Australia, Mexico, Canada, India, Israel, Java, New Zealand, Turkey, Sweden, Belgium, just to name a few countries. Wherever you travel, you will eventually run into someone who knows of a local morel source because morels are all over the fricking place. Yet ironically, they are often tough to find because they are camouflaged into the landscape and forest floor. Some species are global, while others are endemic to a specific habitat, region, or disturbance type. Morels occur from sand dunes to boreal forests. They are remarkable in terms of their “ecological elasticity,” meaning they can be found in wilderness areas as well as cityscapes from the tropics to the boreal forests. For the saprophytic morels, a disturbance—such as fire, logging, tree death, soil

disturbance, or the addition of landscape bark—can trigger abundant fruiting.

Morel spores travel far. The fire morel, for example, fruits prolifically over short periods of time (one to two years), and the spores they produce are light and can travel hundreds of miles. Humans also move morel spores around. This type of mushroom “trafficking,” I believe, has been commonplace and widespread throughout human history. For example, the Italian Bronze Age iceman Otzi had three kinds of mushrooms in his possession when he was discovered after “chillin” for thousands of years in glacial ice (Pientner et al. 1998). For humans traveling long distances, sun-dried morels would have been a logical food to pack, and they would have unsuspectingly spread morel spores along their journey. In addition, morel spores would have found fertile ground in areas where migrating peoples had created disturbances, such as burns and vegetative removal. It seems that morels, like humans (or perhaps because of humans), have achieved a certain level of global domination.



Humans and morels have developed a symbiotic and joyous relationship.

**When Do They Occur?**

Morels fruit following a cool winter period during springlike conditions. A general rule of thumb is that morels pop when snow has melted, soil is warming, and humidity is still high. Abundant and prolonged fruiting requires persistent conditions of high humidity, rainfall, and warm temperatures. Often there are indicator plants that signal morels are fruiting. Different geographies have differing indicator plants. The flowering of *trillium* in the mountains of the Pacific Northwest is a well-known indicator. At lower elevations, it can be “when the lilacs are in bloom” or “when oak leaves are the size of mouse ears.” The presence of certain cup fungi and false morels can be an indicator that morel fruiting is eminent. Morels emerge virtually full-sized from the ground, bent at a ninety-degree angle like a jackknife. They will grow a bit when they are above the soil surface if the conditions are favorable.



Morels generally emerge from the ground at a ninety-degree angle and are virtually full-sized.

In the Northern Hemisphere, early fruiting generally occurs at lower elevations and southern slopes, which are the first to warm up. As spring progresses, fruiting advances to the higher elevations and northern slopes, where fruiting can be as late as the beginning of summer.

Hot temperatures and low humidity eventually terminate fruiting by drying out and shriveling the morels. At any location, the fruiting season typically lasts from two to four weeks before conditions are no longer favorable for morel production.

So good luck with your morel hunting. Hope “springs” eternal.



The size of the morel is not proportional to the size of the human that finds it.

## **Edibility**

The sky is the limit for how you prepare morels for consumption. Morels are savory and delicious and can be a great substitute for meats in a recipe. But you should never eat the black, yellow, or white morels raw. They may contain trace amounts of compounds that cause gastric distress. With cooking, these compounds are vaporized. Morels can be dried whole or sliced longitudinally and dried. To use, rehydrate in water for thirty minutes until they regain their original size and concentrated flavor. If you don't have a drier, chop dry morels (do not wash), and stuff into baggies or a plastic container and place in the freezer. When you need them, simply unthaw and cook.

## **Similar Mushrooms That Should Be Avoided**

As I will be discussing later in this section, there is a group of mushrooms that you may confuse with true

morels because of their similarity in appearance. They are appropriately called “false morels” and include species such as *Gyromitra infula* and *Gyromitra esculenta*, elfin saddle (*Helvella lacunosa* and *H. vespertina*), and *Verpa bohemica*.





## NATURAL BLACK MOREL

*(Morchella elata clade)*

The natural black morel mostly fruits on unburned soils or in undisturbed environments. The name originates from commercial harvesters who refer to the natural black being collected from conifer forests under “natural” conditions.

The natural black morel is also known as “black morel,” “a natural,” and *Morchella elata*.

### Cap Characteristics

The cap is medium to large in size (generally three to six inches). When young, the coloration is steely gray to dark grayish brown turning black with age. The cap is honeycombed with pits and ridges. The ridges are generally darker than the pits. Vertical arrangement of the pits is highly variable. The cap is broadly rounded or ellipsoidal, not lobed or shaped like a brain or saddle, and it hangs over the stalk forming a sinus (a trench at the connection of the cap to the stem). It extends down, attaching nearly the length of the stalk when sliced longitudinally.

### Stalk

The stalk is generally one to three inches long, is one hollow chamber, and ivory to light tan in color. It is smooth when young and turns somewhat grainy with age.

### Fragrance and Edibility

Natural black morels smell earthy, woody, and nutty. They taste meaty and smoky and are highly prized by commercial

and recreational pickers. (Probably a big reason why you bought this book.)

### **Habitat**

Globally distributed, the natural black is associated with conifers in the Western United States. It mostly fruits in unburned soils or undisturbed “natural” environments. Like all morels, it blends into the forest and makes discovery challenging and rewarding. The natural black morels fruit when the winter snow is gone, the soil is warming, and the humidity is high. South slope and lower elevations fruit first in the spring. Higher elevations and north slopes fruit later in the spring or early summer.

The disturbance black morel is also in the *Morchella elata* clade and looks much like the natural black morel. The disturbance black morel occurs in areas where trees are in declining, dying, or recently dead. For example, massive disturbance morel harvests accompanied the Dutch elm disease 1971–1975 as it spread West across the United States. The disturbance black morel was reliably found at the bases of dying or recently dead elms. Compacted areas and areas where vegetation has been removed are also good habitat for the disturbance black morels. Declining or dying root systems seem to encourage fruiting of this fungus.



## **FIRE MOREL**

*(Morchella elata clade)*

The fire morel often has a smaller and pointy cap.

The fire morel occurs on burned soils usually one or two years after the event. These can be areas of wildfire or slash-and-burn piles. The fire morel is usually smaller than the natural black morel. It is also known as “black fire morel,” “burn morel,” and “angusticeps.”

### **Cap Characteristics**

The cap is small to medium in size (one and a half to four inches). It is sometimes greenish when young and dark brown to black at maturity. The cap is honeycombed with pits and ridges. The ridges are generally darker than the pits, and the pits are not vertically arranged. It is an elongated, conic cap with a rounded apex, not lobed or shaped like a brain or like a saddle. The cap hangs over the stalk, forming a sinus, and extends down, attaching nearly the length of the stalk when sliced longitudinally.

### **Stalk**

The stalk is generally one to three inches long and is one hollow chamber. It generally stays white with age, never brown. Smooth when young, it turns somewhat grainy with age.

### **Fragrance and Edibility**

The fire morel has an earthy, nutty, woody fragrance. It is highly prized by commercial and recreational pickers and is meaty when cooked.



## Habitat

The fire morel is common over the Western United States. It can be prolific in forest fire areas a year or two after the burn. It is found in burn piles, especially around the margins of the piles. Like all morels, it blends into the forest floor, charcoal, and burned debris, making discovery challenging and rewarding. The fire morels fruit after snowmelt, when the soil is warming and there is still high humidity. The massive fires in the Western United States have created short-term habitat for the fire morel. Commercial morel hunters study fire burn maps to chart their reconnaissance missions for spring-fruiting areas.



Fire morels in Alaska. How do you know you are having a good morel hunting day? When you must fill your pants with morels to get them all out of the woods.





## YELLOW MOREL

*(Morchella esculenta clade)*

The yellow morel occurs in association with riparian trees and hardwoods generally at lower elevations. It is also known as “esculenta,” “common morel,” and “red-brown blushing morel.”

### Cap Characteristics

The cap is medium to large in size (generally three to seven inches). Occasionally, you can find a ten-inch cap. (You should be so lucky.) Its color is creamy white when young and turns rusty yellow or dingy, reddish brown with age. The cap is honeycombed with pits and ridges. The ridges are generally lighter than the pits, and the pits more rounded than elongated, not lined vertically up and down the cap. The shape is oval to subcylindrical or slightly tapered at the top. The cap is not lobed and not shaped like a brain or like a saddle. It is attached to the stalk and does not form a sinus. It extends down, attaching the length of the stalk when sliced longitudinally.

### Stalk

The stalk is generally two to four inches long, hollow, and off-white to ivory or cream in color. The base enlarges with age with a pleated or gathered appearance.

### Fragrance and Edibility

The yellow morel has a nutty, woody smell. Highly prized by commercial and recreational pickers, it is delicious fresh with all mushroom dishes. It is meaty and tasty in butter, in cream, baked, stuffed, and sautéed.

### Habitat

The yellow morel mostly fruits in riparian environments and with hardwood trees such as ash, cottonwood, alder, madrone, and willow. It also occurs in oak forests and fruit orchards. It fruits at lower elevations generally when compared to the natural black and mountain blond morels. Prolonged fruiting requires persistent conditions that support morel growth, such as warming temperatures, rainfall, and humidity. It fruits early in the spring.



## **MOUNTAIN BLOND**

*(Morchella rufobrunnea clade)*

The mountain blond occurs in association with mountain conifers on undisturbed or unburned soils. Other common names include “western blond morel,” “blondie,” and “white morel.”

### **Cap Characteristics**

The cap is medium to large in size (three to seven inches). In coloring, it is gray when young, turning to ivory with maturity. It bruises brownish orange and cinnamon to pinkish where it has been touched (a characteristic for which the fungus is named). The cap is honeycombed with pits and ridges. The pits are vertically arranged, and the ridges are generally lighter than the pits. The cap is columnar, pointy, and conical. It is not lobed or shaped like a brain or a saddle. It is attached to the stalk and does not form a sinus. The cap extends down, attaching the length of the stalk when sliced longitudinally.

### **Stalk**

The stalk is generally two to four inches long, hollow, and ivory to tan in color. Smooth when young, it turns somewhat grainy with age.

### **Fragrance and Edibility**

The mountain blond has a fresh fish, nutty, woody fragrance. It is a highly prized edible by both commercial and recreational pickers.





The mountain blond morel.

## Habitat

The mountain blond is associated with conifers in the Western United States. It mostly fruits in unburned soils or undisturbed “natural” environments. Generally, it fruits just a bit later than the natural blacks in the Cascade mountains. Once you spot one, check your patch in earnest; they often occur in clusters.





## THIMBLE MOREL

*(Verpa bohemica)*

The thimble morel resembles a true morel with its honeycombed cap. The key to identifying it from a morel is to slice it longitudinally and examine how the cap is attached to the stalk. If it is just attached to the very top of the stalk, it is *Verpa bohemica*, the thimble morel. The cap fits like a thimble on stalk's top. The sides of the cap hang off the top of the stalk like a skirt. But be careful bringing it to the dinner table. Some people have an adverse gastric reaction to eating the thimble morel if it is not cooked at a high temperature or if it is eaten in abundance.

The thimble morel is also known as “thimble cap,” “wrinkled thimble morel,” “early morel,” and “early false morel.”

### Cap Characteristics

The cap is small to medium in size (one to three inches) and amber to yellow brown in coloration. The cap is wrinkled vertically and honeycombed like a true morel. The cap is not lobed and is shaped like a brain or a saddle. The cap fits like a thimble at the top of the stalk and hangs over it like a skirt. The cap does not extend down and attach to the stalk; it is only connected at the top of the stalk when cut in cross section.

### Stalk

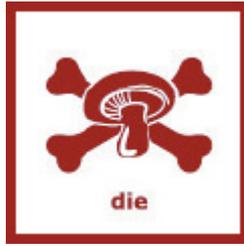
The stalk is generally two to five inches long, hollow, and white or pale yellow in color. It has light cottony stuffing in the stalk, and the flesh is brittle and fragile.

### Fragrance and Edibility

The thimble morel does not taste as good as a true morel. Some people have an adverse reaction to it if it is not cooked at a high temperature or if they eat several. It may contain trace amounts of monomethyl hydrazine that cooks off at high temperature (rocket fuel).

### **Habitat**

The thimble morel is found along streams, forest areas, or forest margins especially in the Pacific Northwest. It fruits in late winter and early spring, usually a couple of weeks before the true morels emerge.



## FALSE MOREL

*(Gyromitra esculenta)*

The false morel is deadly poisonous when eaten raw. It is fairly easy to distinguish from a true morel, but if you are a beginner mushroom hunter, you will want to get to know the false morel and keep it away from the dinner table. The cap looks like a brain, and it is *not* honeycombed with pits like the true morel.

The false morel is also known as “brain mushroom,” “lorchel,” “elephant ears,” “turban fungus,” or “beefsteak morel.”

### Cap Characteristics

The cap is medium to large in size (three to six inches) and amber to reddish brown in coloration. The cap is very wrinkled but *not* honeycombed. It is very lobed and shaped like a brain.

### Underside of Cap

The cap is connected to the stalk, so the underside of the cap is not visible.

### Stalk

The stalk is one to three inches long, white, and primarily smooth, without prominent ridges. Usually, there are two or more cavities inside the stalk instead of one hollow cavity like the true morels. The flesh is brittle.



## **Fragrance and Edibility**

Avoid consumption. Deadly poisonous when raw. The false morel has a fruity and nutty fragrance. *The Scandinavians and Eastern Europeans eat this mushroom with careful preparation and cooking.* In my view, it is not worth the risk even when it is parboiled or cooked to make it less dangerous. The active poison is called gyromitrin (for those few who passed college chemistry: N-methyl-N-formylhydrazine), which is metabolized to monomethyl hydrazine (or rocket fuel!) in the body. Gyromitrin is a toxin that destroys red blood cells in humans. It is toxic to the central nervous system and damages the liver and gastrointestinal tract. The name of this mushroom, *Gyromitra esculenta*, is very misleading. *Esculenta* means “delicious.” As a guy who has helped name a few mushrooms, I find this unnerving. So if you find rocket fuel yummy and want to destroy your liver ... this delicious *Gyromitra* is for you!

## **Habitat**

The false morel is found in forest areas or forest margins at higher elevations. It usually fruits at a similar time as morels: spring and early summer. Collect true morels instead!





## WESTERN ELFIN SADDLE

*(Helvella vespertina)*

The western elfin saddle is another odd-looking mushroom that has a cap shaped like a saddle and is not honeycombed like the true morel. Many reports indicate that elfin saddles can cause severe stomach upsets unless thoroughly cooked.

The western elfin saddle is also known as “elfin saddle,” “slate gray elfin saddle,” and *Helvella vespertina*.

### Cap Characteristics

The cap is small to medium in size (one and a half to three inches) and has slate gray to black coloration on top. It is saddle-shaped, bald, and wrinkled. The edge of the cap is connected to the stalk in several sections. It is *not* honeycombed, and the flesh is thin and brittle.

### Underside of Cap

The cap underside is gray to gray brown and bald.

### Stalk

The stalk is two to six inches long. It is white to streaked gray and gray brown in color and is deeply ribbed and pocketed, extending up into the cap area.

### Fragrance and Edibility

It is poisonous raw. The western elfin saddle’s odor is not distinctive. It causes severe gastric distress with some individuals. Many reports indicate that elfin saddles cause stomach upsets unless thoroughly cooked. My advice—avoid

elfin saddles since little is known about their short- and long-term effects; plus they have poor texture and taste.

**Habitat**

The western elfin saddle occurs under conifers in Northern California, Pacific Northwest, and the northern Rocky Mountains. Solitary or gregarious, it fruits in the fall or winter.

## Recipe:

### **MOREL GNOCCHI WITH PEAS AND PROSCIUTTO**

**Chef James Daw**

#### INGREDIENTS:

*2 potatoes*

*1/3 cup flour*

*2 egg yolks*

*salt and pepper*

*4 tbs. dried morel powder*

*4 oz. of morels*

*1/4 cup of fresh peas*

*strips of prosciutto, julienned*

*1 shallot, diced fine*

*3/4 cup heavy cream*

*2 tbs. olive oil*

*1/4 cup white wine*

#### METHOD:

Boil potatoes in salted water until tender, but not mushy. Drain and allow to rest until warm. Put through a ricer and add the egg yolks. Add flour and morel powder. Gently mix. Do not overwork the dough. Roll out on floured table, forming a log roughly 1/2 inch thick. Cut logs in 1/2-inch lengths to form gnocchi. Bring a pan of salted water to boil, and add the gnocchi for 1–2 minutes until they rise to the surface in several batches, allowing the water to return to a boil between cooking batches. Set aside when done.

Heat a 10-inch sauté pan over medium-high heat. Add olive oil and allow to heat up. Add morels and shallots. Cook for 3–4 minutes, then deglaze the pan with white wine. Cook for 2 minutes, then add the gnocchi. Cook for 2 minutes, and add the heavy cream. Reduce the cream for 3 minutes. Add peas and prosciutto, and season with salt and pepper. Garnish with shaved Parmesan or dots of goat cheese.



## 15. TRUFFLES

Humans have a long and rich history with truffles—a history as splendid and appetizing as truffles themselves. It started with the ancient Sumerians and Greeks, extended through the Renaissance, the French Revolution, and the World Wars. Today truffles are often produced in plantations and shipped worldwide to grace the tables of the finest restaurants on the planet. The truffle doesn't look like much: a small, potato-sized tuber that hides beneath the soil surface as a mycorrhizal associate on the roots of certain trees. But as inauspicious as these fungi may appear, they can fetch upward of a thousand dollars per pound, decorating the plates of the rich and famous and those looking for a unique culinary experience.



The French love the French black truffle even if this one came from a plantation in Australia.

The Western United States is blessed with hundreds of truffle species, which only a few native species are deemed to be of culinary value. The best, most abundant, and most expensive are the two Oregon white truffle species. The fall Oregon white truffle (*Tuber oregonense*) and the spring Oregon white truffle (*Tuber gibbosum*) are both commercially harvested. While the French black truffle (*Tuber melanosporum*) is native to Europe, it is presented in this section because truffle plantations are established

in Pacific Northwest and because of their economic and culinary importance.

The two most notable truffles globally are the French black truffle and Italian white truffle from Southern Europe. The French black truffle is being produced in truffle plantations across the Western United States to varying degrees of success. *Fry, Thrive, or Die* includes the Oregon white truffles, collected from wildlands, that are commercially important and are a culinary pleasure when mature.



French black truffle (left) and Italian white truffle (right).

Historically, the French black truffles and Italian white truffles have come from wildland collections. However, an increased demand for the black truffle and decreasing wildland production have sparked an interest to grow them as a cultivated crop. The French black truffle is now being cultivated on the roots of hazels and oaks in truffle orchards of Northern California, Western Oregon, Washington, and Idaho. Over a hundred truffle orchards have been started in the Western United States, and while there have been varying degrees of success, several dozen orchards are now producing truffles. Australia, Italy, and Spain have established black truffle orchards with some yielding the French black truffle in great quantities (see the “Hazel Hill Truffle Orchard in Australia” essay). The Italian white truffle has never been cultivated successfully and relies exclusively on wildland collections in Italy and Croatia.

Truffles give off a pheromone-like molecule like a pig in heat, and for this reason, male pigs were historically used to sniff out truffles. The problem is ... pigs enjoy truffles as much as humans, and they have been known to bite off the fingers of their handlers during truffle harvest. This is not a legend. In Italy, at a truffle hunting contest, I saw several truffle hunters with missing or partially missing fingers. This is one of the reasons why truffle hunters prefer dogs to pigs. But there is another reason too. Truffle hunters are secretive, so riding around with a dog in your car is an everyday scene. Have a pig in the back seat of your Fiat, on the other hand, and people are certain about what you are up to!



Pig digging for truffle.

Once a truffle treasure has been found, the hunter gently digs it up, being careful not to handle it too much. Fresh truffles need to be consumed within a couple days of harvesting since their flavor and scent are lost quickly. Rapid, careful handling and shipping are necessary to enjoy the full pleasures of the truffle.



Truffles grown in Australia for shipment to Hong Kong.

Truffles are best when used in dishes where their unique aromas can be absorbed in the starches or lipids of the foods being prepared. They are commonly grated over warm dishes like pasta, polenta, potatoes, and rice, but they are also magnificent with crab, lobster, scallops, and beef. The list of the foods that truffles can enhance is potentially endless. But be aware of how you store them. If you place truffles in the refrigerator next to items such as eggs, cream, butter, or rice, you may find that these items will also begin to smell like truffles.

### **A Very Brief, “Underground” History of the Truffle**

- Aristotle, the ancient Greek philosopher, thought that truffles were a result of thunderbolts hitting the earth.
- Medieval Roman Catholic Church excluded the consumption of truffles because they believed eating truffles led to promiscuous behavior. The debate lingers on over whether there are truly aphrodisiac qualities to truffles.
- Napoleon and the French restored the truffle to its rightful place among the delicacies of exquisite meals. The French continue to celebrate its virtues.
- The golden age of truffles occurred in the nineteenth century. An insect (*Phylloxera*)

devastated the vineyards of France, killing the vines. Truffle-bearing oak trees were planted in their place, resulting in huge truffle harvests. This was the golden age of truffles when truffle production flourished in the planted oak forests that dominated the landscape.

- The great decline happened when truffle production reduced dramatically in France and Southern Europe. Production in France has declined 96 percent from its peak in the late nineteenth century to the present (1883—1,500 tons; 1920—500 tons; and 2004—50 tons). Many factors led to the decline. These include habitat loss through two World Wars; acid rains in Europe from 1950 to the mid-1970s; rural people stopped harvesting forest undergrowth for wood heat, creating more undergrowth, which is not conducive for truffle production; proliferation of non-truffle-bearing plants in traditional oak stands; and warmer, drier conditions associated with climate change. Many of these factors continue to threaten future wildland production.
- Truffle plantations started in the 1980s. Nurseries were established to produce the French-black-truffle-colonized tree seedlings. Roots of specific tree seedlings were inoculated with the truffle spores, and the resulting colonized roots of seedlings were planted into soils and landscapes specifically designed and managed to optimize truffle mycelial development. Truffle fruiting can take five to seven years, sometimes longer, sometimes not at all. Trained dogs assist in the harvest when truffles are ripe. Success has been mixed, depending upon the level of care, attention to soil, environmental conditions, and the expertise of the growers.



Oak trees in a truffle orchard.





## OREGON WHITE TRUFFLES

*(Tuber gibbosum and Tuber oregonense)*

The Oregon white truffle grows below the soil surface in association with young Douglas fir forests on slopes below two thousand feet in elevation. The spring Oregon white truffle fruits from January to June, and the fall Oregon white truffle fruits from October to February. The soil and climate of the Northwest are similar to Piedmont and Tuscany in Italy and suitable for white truffle production. The Oregon white truffles get high marks for their culinary value. They are similar in aroma to the Italian white truffle but only when harvested mature. Indiscriminate raking of plots often yields an immature, nonaromatic truffles that have limited marketability and damages the reputation of the Oregon truffle market. Truffle hunting involves timing, technique, and experience. A skilled dog can determine when a truffle is ripe. That's when the odor of the Oregon white truffle is musky, spicy, fruity, savory, and smells like cheese. The same pheromone-like substance emitted by the white truffle to attract animals may have a similar effect on humans. Mature and aromatic Oregon white truffles sell to restaurants at \$400 to \$500 a pound—a quarter to half the price of the Italian white truffles, but still spendy!

The Oregon white truffle is also known as the “Oregon winter white truffle.”

### **Exterior Surface Characteristics**

The Oregon white truffles are small to medium in size (generally one half to three inches) and tan, buff, or brown in color. They have smooth surfaces without warts or

ornamentation. The spring and fall Oregon white truffles look very similar and are largely differentiated by their different fruiting seasons.

### **Interior Characteristics**

The solid interior is marbled with white veins. For the spring white truffle (*Tuber gibbosum*), the interior color is white when immature and becomes reddish brown to dark brown with maturity. For the autumn-fruiting white truffle (*Tuber oregonense*), the interior color is more reddish and orange brown with orange patches.

### **Stalk**

It has no stalk.

### **Fragrance and Edibility**

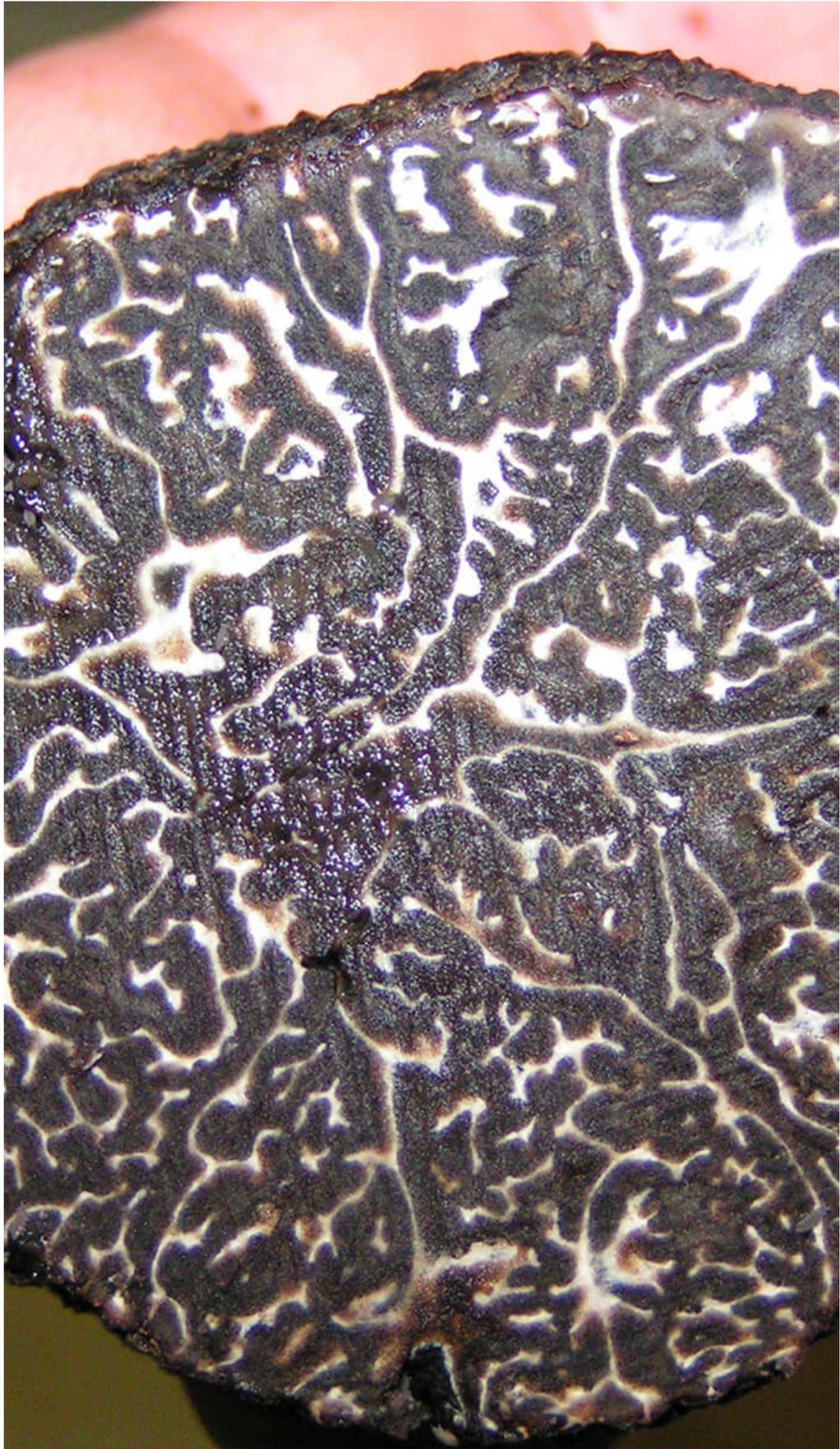
The smell of the Oregon white truffle intensifies with age and maturity. When it is mature, the fragrance is complex and difficult to define. Words such as *bright*, *spicy*, *garlic*, *onion*, *honey*, and *savory* have been used to describe the mysterious flavors and scents of the truffle. Fresh truffles need to be consumed within a few days of being harvested since their flavor and scent are quickly lost. All truffles are best when used in dishes where their unique aromas can be absorbed in the fats and starches of the foods being prepared. Popular herbs to pair with truffles are parsley, rosemary, thyme, basil, and oregano. Some chefs rank the Oregon white truffle, when mature, alongside the prized and expensive Italian white truffle.

### **Habitat**

The white truffle is mycorrhizal and occurs in association with the roots of Douglas fir. Widespread in Oregon, especially in the coast range, it is most present in young to medium-aged Douglas fir that stands at lower elevations (below two thousand feet) and Christmas tree plantations. The spring Oregon white truffle fruits from January to June, and the fall Oregon white truffle fruits from October to February.

## **Similar Mushrooms That Should Be Avoided**

There are hundreds of truffle species in the Western United States. Only a few are considered good edibles. None are known to be poisonous. A warning however: young *Amanita* species emerge from a volva, or egg sac, beneath the soil surface and can be mistaken by inexperienced mushroom collector as a truffle because of their shape and location.





## **FRENCH BLACK TRUFFLE**

*(Tuber melanosporum)*

French black truffle in cross section.

The French black truffle is native to Southern Europe and accounts for most of the native production in France, Spain, and Italy. Because of its high price and scarcity, it is being produced in dozens of plantations in California, Oregon, and Washington. Still in its early stages, truffle production in the Northwest is highly variable. The French black truffle has a dark-brown to black skin (peridium), which differentiates it from the Oregon white truffle, which is light brown. It also has warts or bumps on the outer surface, whereas the Oregon white truffles are smooth.

The French black truffle is also known as the “black diamond,” “Périgord truffle,” and “black truffle.”

### **Exterior Surface Characteristics**

Most French black truffles are two to five inches in size and generally round to oval in shape. The French black truffle is dark brown to black at maturity, with pyramidal “warts” or ornamentation on the surface.

### **Interior Characteristics**

The interior is initially white, then darkens as it matures. Bright-white veins permeate the interior and turns darker with age.

### **Stalk**

It has no stalk.

## **Fragrance and Edibility**

The French black truffle has a strong odor. The smell of the truffle intensifies with age and is a complex, hard-to-describe combination of wet earth, pepper, dried fruit, and a hint of chocolate and sulfur. Some chefs rank the French black truffle as the epitome of culinary experience. It is used in dishes featuring fish, shellfish, pork, steak, cheese, pasta, and risotto. Eat freshly shaved over nearly cooked or warm dishes.

## **Habitat**

The French black truffle is mycorrhizal and occurs in truffle plantations in the Western United States. It is associated with hazels, oaks, and other hardwoods.

## **Similar Mushrooms That Should Be Avoided**

There are hundreds of truffle species in the Western United States. Only a few are considered good edibles. None are known to be poisonous.

## HAZEL HILL: BLACK TRUFFLE PLANTATION EXTRAORDINAIRE



Dr. Nick Malajczuk with the French black truffle in Australia.

In the 1990s, Australian mycologist Dr. Nick Malajczuk had an ingenious idea: grow French black truffles in the Southern Hemisphere. His vision was to produce fresh truffles from June through August in the Australian winter, exactly when they were in short supply in the Northern Hemisphere. The reason he thought this would work is because Australia is dominated by eucalyptus forests, which have not evolved to host-competing fungi that could limit French black truffle production. Nick searched for areas with climates like parts of France where black truffles grew in abundance and eventually settled on land near a small town in Southwest Australia called Manjimup. It was nestled among orchards, wineries, and picturesque rolling hills that contained stately karri and jarrah eucalyptus forests.

Nick found a few investors to support his venture and purchased fifty acres that he called Hazel Hill. He began by growing a range of oak and hazel seedlings in a local greenhouse, inoculating them with a variety of black truffle spores he had gathered from France. Then in 1997, Nick began planting the orchard on a grid and carefully installed

experiments with different treatments. He wanted to understand if he would see a difference in the level of truffle production if he changed the structure, chemistry, and other characteristics of the soils. He tried a variety of experimental treatments that included soil amendments, soil moisture regimes, cultural practices, and canopy management. Fortunately for me, I was flown over from the States on several occasions to help monitor the root systems of the planted trees for the presence of the black truffle mycorrhizae. We found that some treatments really encouraged mycorrhizal proliferation, while others did not. In 2003, the first truffle was discovered by Nick's trusty dog named Guinness. It was a great celebration years in the making. A triumphant feast followed.



Hunting black truffles with a dog at Hazel Hill, Australia.

Over time, the most successful treatments were implemented across all of Hazel Hill. In the summer of 2006, Hazel Hill produced a whopping 1,300 pounds of black truffles, which found their way fresh to restaurants around the world at a season never available previously. Working at Hazel Hill was a mushroom experience of a lifetime. We would walk up and down the rows of trees with a dog, flagging the areas the dog sniffed and scratched, which would indicate that a truffle lay beneath the surface. Later we would return to the flagged areas with a small trowel, smell the earth for the black truffle scent, and pop the black truffle from the ground. After our bags were full, it was into the processing barn for weighing, cleaning, and shipping.



Black truffles as black bumps in the soil at Hazel Hill.

In 2014, black truffle production at Hazel Hill exceeded twelve thousand pounds. Hazel Hill had become perhaps the most productive truffle plantation in the world. Now called Truffle Hill, the site sells a range of products beyond fresh black truffle, such as truffle oil, truffle aioli, truffle tapenade, truffle honey, truffle salt, and truffle risotto. It also allows a limited number of people each year the chance to enjoy a truffle hunting experience and learn how to find mature truffles that are ready for harvesting. With the success of Truffle Hill, dozens of truffle plantations have sprung up in the southernmost regions and on the east and west sides of the Australian continent. Most of these plantations are producing black truffles, but none have produced close to the quantities seen at Truffle Hill.

## ITALIAN TRUFFLES ARE PRETTY, PRETTY GOOD

Jack Ingvaldson

We had traveled to Alba, Italy, for the famous annual fall harvest festival celebrating the Italian white truffle *Tuber magnatum*. My wife, Kim, and I were in the company of Dr. Mike Amaranthus; his wife, Eileen; and Dr. Jim Trappe, the recognized godfather of mycology at Oregon State University and a world expert on truffles. (Jim has discovered over a hundred new truffle species.)

Alba, Italy, is the sister city to Medford, Oregon, our neighboring city; so when we arrived, we were met by the Alba mayor and treated like royalty. We were hosted to a lunch, which gave us a hint of what was to come. Featured was beef with shaved white truffles. Accompanying that was risotto infused with truffle oil and topped with more shaved truffles. Of course, a nice chianti went well with lunch. Then there was truffle dessert and dessert wine. Our conversations with the mayor and others centered around—what else?—truffles. I was thinking this mycology gig was pretty good.

The following day, we toured the city and took in all that the festival had to offer. A parade proceeded through old town, highlighted by a group dressed up as their favorite mushrooms. There were several porcini guys, several marching lumpy truffle tubers, and a lone Caesar's amanita. Shortly thereafter, we arrived at a large circus tent where perhaps forty truffle vendors displayed their recent harvest. The first thing I noticed was the incredibly strong odor of the fresh Italian white truffle. Having never experienced such a powerful aroma, I was taken aback. It was like a spicy, earthy bomb had just gone off when I entered the tent. Every table featured the white truffle next to medical grade scales, which were there to accurately weigh the most expensive condiment in the world at \$295 an ounce.

Chefs from all of Europe were in the tent buying truffles to feature at their restaurants.

The following day, we were greeted by two Italian university professors who had studied under Jim at Oregon State University. They had arranged for us to have dinner at the Il Cortile Trattoria in Parma, Italy. As we entered the restaurant, we were seated by the maître d' holding a basket full of fresh black truffles for the meal. The truffles had come from a truffle orchard that one of the professors had helped establish near Parma. He had arranged for them to be sent to the restaurant to celebrate Jim's visit to Italy.



Grating the black truffle over a hot entrée.

What followed was the most extraordinary three-hour meal (showcasing freshly shaved truffles at quantities we had never experienced) and a six-course dinner featuring truffles shaved on each course. Numerous bottles of Italian Barolo accompanied each course. We left totally in awe of the most incredible gastronomic experience of a lifetime. Again, I was left thinking this mycology gig is ... pretty, pretty good.

And appreciating anew what I had often heard Dr. Jim Trappe proclaim, “Why would anyone pick a profession other than mycology?”

## TRUFFLES, TREES, AND CRITTERS



A Douglas squirrel gobbles a *Rhizopogon* truffle

Truffles are the fruit of a network of underground filaments called *mycorrhizae*. These filaments act as an extension of the tree root system, attaining water and nutrients in exchange for sugars from the plant. The fruit of the underground mycelial network is the truffle, and it is packed with spores, the “seeds” of the truffle.

Truffles develop entirely underground, unlike their close aboveground relative—the mushroom. Mushrooms typically disperse their spores in the wind—in sharp contrast to truffles that need the help of animals to move their spores around. Most truffles, including the Oregon white truffles, are eaten by mammals that dig and gobble them up. When you walk in the woods, you have probably seen thousands of small animal “digs,” which are the shallow pits in the forest duff where truffles have been excavated by wildlife. The vast majority of these truffles are not species humans value for culinary value but are critically important to the diets of wildlife species in the Western United States. Human truffle hunters use these animal digs as clues to where the Oregon white truffles may be hiding. Truffles have evolved to emit powerful aromas that appeal to animals and signal that they are mature and ready to be dispersed. Truffle spores pass through the animal digestive system without impact and are ready to form a new mycorrhizal colony when deposited at some distance from the original meal. Truffles are an important food source for many wildlife species not only in the Western United States but also in forest ecosystems all over the world.

## **16. CORALS AND CONKS**

In 1928, at Saint Mary's Hospital in London, Western medicine found its most valuable botanical of the century. It was a fungus: penicillin. This discovery has saved millions of lives. Today replicating the remarkable discovery and use of penicillin is highly unlikely, but interest in fungi in clinical research is rapidly increasing. The six corals and conks in this section have potential medicinal value. Medicinal mushrooms have a long history of traditional use, and recent science has demonstrated significant therapeutic benefit for a range of illnesses and conditions. Mushrooms are an exciting area of natural health, and for forty-plus years, I have seen improved clinical research studies and peer-reviewed evaluations. However, to fulfill its potential, many questions remain to be answered. As they say, Rome was not built in a day!

I discussed corals and conks together because of their potential medicinal properties. Coral fungi are multibranched, coral-looking fungi that arise from a fleshy base. Two coral fungi species—the hen of the woods and the cauliflower mushroom—are discussed in *Fry, Thrive, or Die*. Both are both medicinal and delicious edibles.



The cauliflower mushroom.

Conks are those tough, woody bracket, or shelflike fungi you see growing on dead trees and stumps. They are an important part of the ecosystem, removing the dead organic debris that would pile up in forests if they were not present. They are not soft enough to eat, but many have been used medicinally as teas and powder in Asia for millennia. Recent research on the active ingredients in many conks have been driving the use of these fungi to treat a range of illnesses. Although more human trials are necessary, the unique, biologically active compounds in many conks are now being appreciated and utilized by Western medicine. The five conks covered in this section are turkey tail, varnish conk reishi, artist conk reishi, red belt conk, and chaga.



The artist conk reishi.



## HEN OF THE WOODS

*(Grifola frondosa)*



The hen of the woods is a coral fungus known for its culinary and medicinal value. They are the beautiful and distinctive multibranched, polypore that fruits at the base of large hardwoods. There are no look-alikes that are toxic.

The hen of the woods is also known as “maitake,” “ram’s head,” and “sheep’s head.”

### **Form and Size**

It grows from an underground tuber-like structure into a tight, multibranched cluster. The hen of the woods consists of multiple branched caps that are curled in the shape of a spoon with wavy margins. Underneath the multiple caps are minute pores and a thick, dense central stalk. Generally moderate to large size, it occasionally can be massive.

### **Color**

It has grayish-brown, multibranched caps and milky-white central stalk.

### **Fragrance and Edibility**

The hen of the woods has an earthy and peppery smell. It is savory and delicious and one of the best edible mushrooms. This culinary delight has been enjoyed by the Japanese for millennia. Add clean and sliced hen of the woods to meat, fish,

pasta, stir-fry, and soup dishes. It can be marinated, sautéed, barbecued, stir-fried, or baked. It is a popular dried medicinal mushroom powder and taken in capsule form.



## **Habitat**

Hen of the woods is common in Asia and the Eastern United States but is also found in Oregon, Washington, and Idaho in the late summer and fall. Hen of the woods is also being cultivated in the Western United States, where it is grown on alder sawdust and oat bran. It is sometimes found in growers' markets and gourmet groceries. It fruits in the same hardwood log or stump year after year.

## **Medicinal Value**

Hen of the woods is getting considerable attention from the pharmaceutical industry for its medicinal benefits. It has long been used as a medicinal mushroom in Japan and Korea. It has a high level of antioxidant activity (Postemsky and Curvetto 2013). Maitake also has a strong antitumor effect (Masuda et al. 2013). Trials are underway for treatment of breast, lung, and liver cancer. The causal compound is most notably beta-glucan, which can compose 10 to 50 percent of its dry weight (Masuda et al. 2015). The hen of the woods (*Grifola frondosa*) is popular as a powder mixed in capsules and medicinal products.





## THE CAULIFLOWER MUSHROOM

(*Sparassis radicata*)



The cauliflower mushroom is a coral fungus known for its culinary and medicinal value. It is a distinctive multibranched polypore that fruits at the base of conifers in the Western United States. The mass of flattened lobes gives this mushroom an appearance of tightly packed egg noodles or cauliflower. There are no look-alikes that are toxic.

The cauliflower mushroom is also known as *Sparassis crispa*.

### Form and Size

The cauliflower mushroom's multibranched, flattened lobes are relatively tough. The central stalk is thick, dense, and often extends deep into its rooting base. It ranges from large (one to five pounds) to occasionally very large (greater than forty pounds!).

### Color

The color is white to yellowish when fresh and turns tan with age.

### Fragrance and Edibility

The cauliflower mushroom has an earthy and almondy smell with a hint of morel fragrance. Delicious but chewy, it can be made more tender by slow cooking. It is a popular edible and can be sautéed, baked, or added to soup. Sometimes it is

difficult to clean. It stores well fresh and is resistant to decay. It can also be dehydrated and reconstituted.

### **Habitat**

The cauliflower mushroom is widespread in conifer stands across the Western United States and common in California and the Pacific Northwest in particular. It fruits in the same conifer log or stump year after year.

### **Medicinal Value**

The cauliflower mushroom is widely used in traditional Chinese medicine and contains a high concentration of certain beta-glucans of known medicinal value. The dry weight of the cauliflower mushroom was found to contain 43 percent beta-glucan, which is approved for cancer treatment in Japan (Sharma 2022). Experiments suggest the cauliflower mushroom contains chemicals that stimulates the immune system and has biological properties that are antitumor, anti-inflammatory, and antiviral (Ohno et al. 2000, Chandrasekaran et al. 2011).

### **Similar Mushrooms That Should Be Avoided**

A larger group of coral mushrooms species called *Ramarias* are not included in *Fry, Thrive, or Die*. They are described in the David Arora's *Mushroom Demystified*. The *Ramarias* are a large complex group that are still being sorted out taxonomically. Some *Ramarias* are edible, while some are slightly poisonous, and distinguishing between the species can be difficult. The medicinal value of the *Ramaria* group is also unknown. However, they are always a welcome sight on a foray—beautiful and mysterious entities pushing up through the forest floor.



## TURKEY TAIL

*(Trametes versicolor)*

Although too tough to eat, turkey tail is popular as a medicinal fungus when prepared in teas, tinctures, or capsules. True to its name, the fruiting body resembles a turkey's tail. It is distinctive with no toxic look-alikes.

The turkey tail is also known as *Coriolus versicolor* and *Polyporus versicolor*.

### **Form and Size**

The turkey tail ranges from small to medium in size. It varies from shelflike shapes, multiple rosette shapes, to fan shapes. Zoned conspicuously with varying colors, it often has velveting, hairy zones. A stalk is absent or minimal. The pores are minute, thin, and vary from white to very pale brown. It does not stain when handled. Turkey tail is tough like leather when young and hard and rigid when old or dry.

### **Color**

The color is highly variable from gray and charcoal to cinnamon, red, and brown in alternating zones.

### **Fragrance and Edibility**

Fresh young turkey tail has a mild fruity smell. It is bitter to taste and too tough and leathery to eat. It is a popular medicinal dried mushroom powder and taken in capsule form and available as a tincture.



## Habitat

Turkey tail is found all over the world. It is especially common on oaks and other hardwoods in the Western United States. It rarely occurs on conifers. This saprobe breaks down and lives off dead wood. In this important ecological role, it helps clean the forests of organic matter and create space for new growth. It is common and often present in clusters on hardwood stumps, down logs, and branches and is harvested year-round.



A single log or stump can have over a hundred turkey tails.

## Medicinal Value

Turkey tail is one of the best-documented medicinal mushrooms and is a source of chemical compounds with anticancer activity (Tatiana et al. 2020). It contains PSK (polysaccharide Kureha) also known as krestin, which is approved for use as an anticancer agent in Japan. PSK extract from turkey tail is a frequently used cancer treatment drug in Asia and is being tested on humans in Western countries (Nakazato et al. 1994). The FDA recently approved a clinical trial for turkey tail extracts, allowing patients with advanced prostate cancer to take it in combination with conventional chemotherapy. Numerous human studies have been published on turkey tail extract for gastric, lung, and breast cancer. To access fourteen recent scientific studies on turkey tail medicinal properties, go to [mushroomreference.com](https://mushroomreference.com). A wide variety of turkey tail products are available commercially as teas, tinctures, capsules, or as an ingredient in coffee and other drinks. Fruiting bodies are generally ground to a fine powder

or broken into one- to two-inch chunks used to make tinctures.



## VARNISHED CONK REISHI

*(Ganoderma oregonense)*



The varnished conk reishi grows as a bracket fungus on logs, stumps, and dead standing conifers. As with many *Ganoderma* species, the varnished conk reishi is valued for its medicinal properties. There are no toxic look-alikes, but the varnish conk reishi should be harvested before it decays or gets moldy.

The varnished conk reishi is also known as “western varnish conk,” “Oregon reishi,” and “Oregon ling chi.”

### **Form and Size**

The varnished conk reishi is large and shaped like a hoof or a bracket, with no stalk or stubby lateral stalk. It has a hard outer crust, and it is soft beneath the crust.

### **Color**

It has a smooth, varnished dark reddish brown to mahogany cap. The pore surface underneath the cap is white to yellowish white and stains brown when scratched.

## **Fragrance and Edibility**

The varnished conk reishi has an earthy smell and is bitter and too tough to eat. It is popular dried medicinal mushroom powder and taken in capsule form and as a tincture. It is also a medicinal tea when dried chunks are boiled in water for five minutes. Fruit juice or other beverages can be added to improve the taste.

## **Habitat**

Parasitic and saprophytic, the varnished conk reishi grows on dead standing conifer trees, logs, and stumps. It occurs in conifer stands across mountainous areas in the Western United States. It fruits in the fall to midwinter.

## **Medicinal Value**

The varnished conk reishi is a relative to *Ganoderma lucidum*, which has been used for millennium in Chinese medicine. The Chinese believe that reishi promotes good health, longevity, aids digestion, and prevents cancer. Published studies are indicating a strong antitumor effect (Tank et al. 2006, Tank 2006). Reishi is widely available from health food stores in tinctures and capsules. It is also an ingredient in many medicinal mushroom products.





## ARTIST'S CONK REISHI

*(Ganoderma applanatum)*

The artist's conk reishi has been used as a natural artist's canvas for years. Under the cap is a white-pored surface that turns permanently brown when scratched. Artists have made etchings on these surfaces, often of nature scenes, and sold them in novelty shops and art studios. Unlike the varnish conk reishi, this conk does not have a shiny or varnishy cap.



The artist's conk reishi is also known as "artist's bracket," "shelf fungus," and "tree tongue."

### **Form and Size**

The artist's conk reishi ranges from large to very large. It is shelflike, has no stalk, and is hard and solid. The surface is furrowed and ridged.

### **Color**

The cap is brown to gray, not shiny. The pore surface underneath the cap is white and stains brown when scratched. This can be used by artists as a "canvas" for their drawings. The tiny white pores under the conk turn brown on mature or overmature specimens.

## **Fragrance and Edibility**

The artist's conk reishi has an earthy smell. Obviously, it is too woody to eat. It is a popular dried medicinal mushroom powder and taken in capsule form or as a tincture. It is also a medicinal tea when dried chunks are boiled in water for five minutes.

## **Habitat**

Parasitic and saprophytic, the artist's conk reishi grows on stumps, downed wood, and dead standing hardwoods. Occasionally, it is found on mature and old-growth Douglas fir. Widespread and common across the Western United States, its perennial fruiting body expands in the fall and early winter. Artist's conk can live for decades.

## **Medicinal Value**

Reishi is widely available in health food stores as a supplement in powder, capsules, and tinctures. It is a popular ingredient in other products like coffee, teas, and chocolate. Field specimens of the artist's conk reishi can be turned into one- to two-inch chunks with a hatchet or saw and used in the preparation of teas or tinctures. The tea is slightly bitter, and fruit juice can be added to improve the taste. Active ingredients include antioxidants, antivirals, antitumors, triterpenoids, ganoderic acids, and beta glucans (Mohammadifar et al. 2020).

## **Reishi: A Rich Medicinal History and Use**

Asian reishi (*Ganoderma lucidum*) is a close relative and has been used medicinally for two thousand years by the Chinese (Jones 1990). Writings from the Eastern Han Dynasty in China (AD 25–220) describe the beneficial effects. Images of reishi in Chinese art, furniture, and carvings began in AD 1400. Records from the Ming Dynasty AD 1590 indicate reishi was used to enhance vital energy and strengthen cardiac function and memory. Reishi in China was also believed to have antiaging effects, which gave it the name “mushroom of immortality.” Its benefits, combined with its scarcity, made the

use of reishi expensive. Only the rich and privileged of Chinese society could afford the fungus. Today reishi is a popular medicine throughout Asia, and its use is growing in North America. Recent scientific studies (fifty available at [mushroomreferences.com](http://mushroomreferences.com)) document the beneficial effects of reishi for cardiac health, liver health, and its antioxidant, antitumor, and antimicrobial activities.





## CHAGA

*(Inonotus obliquus)*

Chaga is too tough to eat and ugly in appearance but popular as a medicinal fungus. You might walk right by it because it resembles a clump of burnt charcoal on select hardwoods.

Chaga is also known as “clinker,” “birch canker polypore,” and “cinder conk.”

### **Form and Size**

Chaga ranges from medium to large in size. The sterile conk grows on birch trees and a few other hardwoods like poplar and alder. It resembles a clump of burnt charcoal, but inside the tough outer surface is a soft orange core.

### **Color**

The color is charcoal brown to black on the exterior and brown and reddish brown interior.

### **Fragrance and Edibility**

Chaga has a mild sweet, earthy, aromatic smell. The smell has hints of vanilla. It is too woody to eat.

It is a popular dried medicinal mushroom powder and taken in capsule form and as a tincture. It is also a medicinal tea when dried chunks are boiled in water for five minutes. It has a mild and pleasant flavor.

### **Habitat**

Chaga occurs naturally in higher northern latitudes primarily on birch trees. It is also found on birch ornamental plantings in urban and suburban areas.

## **Medicinal Value**

Chaga is among the greatest sources of natural antioxidants and powerful immune support (Balandaykin and Zmitrovich 2015). The [mushroomreferences.com](http://mushroomreferences.com) website has twenty-one recently published studies on the medicinal properties of chaga. Its high level of anti-inflammatory properties makes it a potential alternative remedy for maladies such as arthritis, high blood pressure, and high blood sugar levels. Chaga has very high concentrations of melanin, which is present in our hair, eyes, and skin. Melanin from fungal sources can improve the health of skin epidermis and maintain skin and hair pigmentation. It is also what turns chaga tea water brown when brewed. Beneficial compounds in chaga may also help slow the growth of cancer cells (Kim et al. 2006, Sun et al. 2014). Several studies are underway investigating the ability of chaga extracts to treat breast, lung, and colorectal cancer. While some studies have produced promising results, more human trials are needed. A wide variety of chaga products are available commercially as teas, tinctures, capsules, and as an ingredient in coffee and other drinks. Fruiting bodies are generally ground to a fine powder or broken into one- or two-inch chunks (chaga chunks) used to make teas and tinctures.

## **How to Make Tinctures**

It is easy to make tinctures from dried turkey tail, chaga, and reishi mushrooms. Tinctures are an extraction of both alcohol- and water-soluble compounds. Break your conks into one- to two-inch chunks, or grind them to a fine powder. Pack a glass jar (don't use plastic) with your mushrooms, and cover with high-percentage alcohol, like Everclear or vodka. Seal the container, and shake or stir once a day for two to four weeks. When you are ready, decant the infused alcohol through a filter cloth, and squeeze the liquid out of the remaining mushrooms through the filter cloth to extract all the alcohol. For the water extract, place your one-part mushrooms in a saucepan with twenty-parts water and boil for five minutes. Allow the water extract to cool, and add it to the alcohol infusion at a 5:1 ratio.

Tinctures are stable and can be kept for at least a year at room temperature. You can add two full droppers of tincture to water, juice, coffee, or any other beverage morning and night.





## RED-BELTED CONK

*(Fomitopsis pinicola)*

The red-belted conk is shelflike or hoof-shaped; it is very hard. Medium to large in size, it's colored red, reddish brown, or cinnamon bands and brown or black where it connects to the tree. It has a pale-yellow band at the margin of the conk. It does not have a varnished cap and has a white pore surface underneath the cap that does not stain when scratched. There is no stalk.

The red-belted conk is also known as “red-belted fungus,” “red belt bracket fungus,” “red-banded polypore,” and *Fomes pinicola*.

### **Form and Size**

The red-belted conk ranges from medium to large. It is shelf- or hooflike, with no stalk, and is very hard and solid. The surface of the conk is furrowed and ridged, with each “ring” representing a year's growth.

### **Color**

The color is reddish to cinnamon and brown to black where it connects to the tree. The cap is dull, not shiny, and the outer edge of the conk is often a pale-yellow color. The pore surface underneath the cap is white and does not stain brown when scratched.

### **Fragrance and Edibility**

The red-belted conk is obviously too woody to eat. Less research has been done on the medicinal value of the red-belted conk, but it does contain many of the same active

ingredients as reishi. Field specimens of the red-belted conk are very hard, and with elbow grease, it can be turned into one- to two-inch chunks with a hatchet or saw and used in the preparation of teas or tinctures. The tea is slightly bitter; fruit juice can be added to improve the taste. Active medicinal ingredients are antidiabetic and anti-inflammatory with antioxidant-supporting compounds (Zahid et al. 2020, Onar et al. 2016).

### **Habitat**

Growing on stumps, downed wood, dead standing conifers, and occasionally hardwoods, the red-belted conk is widespread. It is very common across the Western United States from the Rocky Mountain Range, Cascades Mountain Range, Sierra Nevada Mountain Range, and coastal ranges of California, Oregon, and Washington. Its perennial fruiting body expands in the fall and early winter. The red-belted fungus can live for decades.

## SPECIAL DEDICATION TO DR. JAMES M. TRAPPE, MYCONAUT

### **Dr. James Trappe**

Sixty years ago, astronauts commanded missions to unlock the secrets of space. Scientists worked together to travel to the moon and discover the wonders of the universe. Recently, we celebrated the fiftieth anniversary of humans' first walk on the moon.

Sixty years ago, the fungal research world also set off on a journey. A journey to unlock the mysteries of a living universe right beneath our feet. A journey of discovery all of us share in *Fry, Thrive, and Die*.

Dr. Jim Trappe was one of our first fungal astronauts—a “myconaut”—under whom I had the honor of studying at Oregon State University and the United States Forest Service. Jim introduced me to the mysterious universe below the surface of the soil and how it influences the ecosystems we live in. I had the opportunity to travel around the world with Jim in search of mycorrhizae, truffles, and mushrooms ... celebrating the cultures and gastronomic pleasures that followed fungi. Jim had friends on every continent.



Dr. Jim Trappe (left) collecting fungi with Dr. Gaston Guzman (center), a pioneer of *Psilocybe* research, in 1976 in Veracruz area of Mexico.

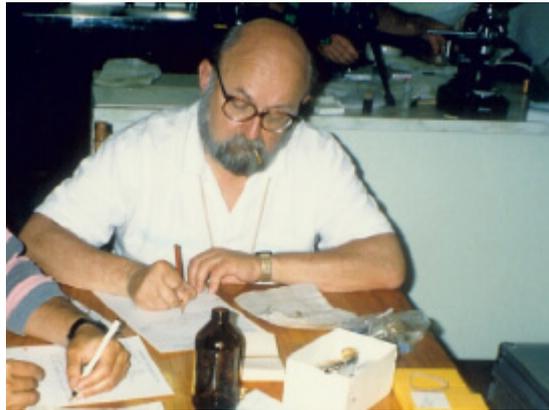
Jim has published scientific papers across seven decades. Now over ninety years of age, Jim is still writing scientific manuscripts. His résumé is unreal. After receiving his PhD in forestry in 1962 from the University of Washington, Jim began a long and distinguished career with the United States Forest Service Research Station as project leader for the Mycorrhizal Research Team in Corvallis, Oregon. With over five hundred mycorrhizal scientific publications dating back to the 1950s, his work in fungal taxonomy and mycophagy has been groundbreaking. Over the course of his career, Jim has been author or joint author of 1 new order, 3 new families, 42 new genera/subgenera, 215 new species, and 168 new species combinations. Jim has 18 fungi named in his honor.



Dr. Jim Trappe with his trusty "truffle fork."

Few, if any, scientists living today have earned Jim's taxonomic prowess. Besides classifying fungi, Jim has been interested in the role fungi play in forest ecosystems. With other scientists, he discovered that fallen trees (those pesky obstacles that get in our way while mushroom hunting) are critical for the long-term sustainability of a forest. At another point in his career, he and a wildlife biologist studied the relationship between truffles and the flying squirrel and a number of other forest animals that depend upon fungi for food and survival. They showed that animals and fungi can be intricately interconnected, a finding that enlightened many of us to the importance of maintaining old-growth forests.

Decades ago, Jim—along with a few other scientists, including me—made several trips to Mexico, China, Europe, Australia, and Thailand to locate and describe new fungal species. One particular foray took us to Tasmania, Australia, to collect and classify belowground-fruited fungi. On this trip, we visited a rural forest area called Cradle Mountain where we hit a fungal “mother lode.” In this remote landscape, we discovered dozens of new truffle species and even several new genera and families of fungi.



Dr. Jim Trappe taking notes on truffle specimens in Tasmania.

While this was pretty amazing in itself, what was really cool was our observation that so many Australian marsupials were also foraging for these same truffles. Australian possums, kangaroos, wallabies, bettongs, potoroos, bandicoots, and wombats were in search for and depended upon these belowground-fruited fungi as a food source.



An Australian brushtail possum finds a fungal treat.



A common wombat wanders across Tasmania.

After evening meals at the local restaurant, we would watch the cooks throw food scraps off the back deck to feed the wildlife. We would add the excess truffles from our daily collections to the bounty. Mountain brushtail possums, wallabies, potoroos, wombat, and bandicoots would jockey for position to eat the goodies, to Jim's great delight.

One night there was a conspicuous clatter of strange noises after the feeding. A Tasmanian devil had slowly wandered into the middle of the smorgasbord. All the other animals had backed up into the shadows while the devil sat perched on top of the food, slowly spinning to protect his food stash, like the Taz character in a Warner Brother's cartoon. You should have seen the twinkle in Jim's eye.

For seven decades, Jim has generated unique passion, insight, and humor to the fungal community. He is respected and loved by the hundreds of students, visiting scientists, and friends he has influenced and nurtured over his remarkable career. Jim is a myconaut for the ages.



Jim shares the fragrance of the Italian white truffle in Italy.

# THE AMAZING FUNGAL AND ANIMAL CONNECTION

**Dr. Jim Trappe**

I've been amazed over my career how clever and intertwined animals and fungi are. Fungi use animals to disperse their spores in a host of different ways. One of my favorites is the flying squirrel. It descends from the forest canopy at night, attracted by pheromones produced by the underground-fruiting truffles. It consumes the truffle, climbs back into the forest canopy, and sails from tree to tree across the forest landscape.



A flying squirrel descends from the forest canopy in search of truffles.



A flying squirrel eats a truffle.

Inside the little belly of the flying squirrel, digestive juices break down the beneficial proteins, vitamins, and minerals of the truffle. But the truffle spores remain viable. The

ornamentation of the spores and their hydrophobic nature protect the spore wall from digestion. As the squirrel flies from tree to tree, it poops the spores down to forest floor, where they can germinate and form new mycorrhiza and eventually new truffles.

This poop rain has been going on for millions of years. Any book written by Dr. Mike Amaranthus needs a healthy dose of discussion of poop and gastric juices. Now you have it.

## REFERENCES AND WEBSITES

These are handy references and websites for more information about frying, thriving, and *NOT* dying while using mushrooms.



### **Field Guides to Mushrooms**

- *Mushrooms Demystified* by David Arora
- *Mushrooms of Cascadia* by Michael Beug
- *National Audubon Society Field Guide to North American Mushrooms* by Gary Lincoff

### **Cookbooks**

- *Fantastic Fungi Community Cookbook* by Eugenia Bone
- *Edible Mushrooms: Safe to Pick, Good to Eat* by Barbro Forsberg
- *Cooking with Wild Mushrooms* by Ingrid and Pelle Holmberg
- *The Mushroom Cookbook* by Michael Hyrams and Liz O'Keefe

### **Psychedelic Mushrooms**

- *Psilocybin Mushrooms of the World* by Paul Stamets
- *How to Change Your Mind* by Michael Pollan

## **Medicinal Mushrooms**

- *Medicinal Mushrooms of Western North America* by Robert Rogers and J. Sept
- *Medicinal Mushrooms: A Clinical Guide* by Martin Powell
- *Healing Mushrooms* by Tero Isokauppila

## **Poisonous Mushrooms**

- *Common Poisonous Plants and Mushrooms of North America* by Nancy Turner and Patrick von Aderkas

## **Growing Mushrooms**

- *Growing Gourmet and Medicinal Mushrooms* by Paul Stamets
- *The Mushroom Cultivator: A Practical Guide to Growing Mushrooms at Home* by Paul Stamets and J. S. Chilton
- *DIY Mushroom Cultivation* by Willoughby Arevalo

## **Children's Books**

- *Mike O'Rhiza* by Dr. Mike Amaranthus and illustrated by Linda Woodrow-Gray
- *The Mushroom Fanclub* by Elise Gravel
- *Fantastic Fungi Coloring Book* illustrated by Roman Daniel Eason

## **Websites**

- [Mykoweb.com](http://Mykoweb.com)
- [Mushroomexpert.com](http://Mushroomexpert.com)
- [Namyco.org](http://Namyco.org)
- [Fantasticfungi.com](http://Fantasticfungi.com)
- [Fungi.com](http://Fungi.com)
- [Mycorrhizae.com](http://Mycorrhizae.com)

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## **ABOUT THE AUTHOR**

**Dr. Mike Amaranthus** believes *fungi* should emphasize *fun*. As a two-time cancer survivor, getting to know this amazing group of mushrooms has enriched and perhaps saved his life. He believes that a book can not only be accurate and have substance but also delight the reader with stories, history, possibilities, recipes, and much, much more.

Dr. Mike is a retired research soil scientist for the US Department of Agriculture and associate adjunct professor at Oregon State University. Dr. Mike received the USDA's highest Honor Award for scientific achievement after his twenty years of contributions as a USDA research scientist, authoring and coauthoring over one hundred scientific papers. Dr. Mike has several mushroom and truffle species named after him in his honor. Yes, having fungi named after you is an honor, not a curse!

Two decades ago, Dr. Mike and his wife, Eileen, founded Mycorrhizal Applications Inc., a biotechnology company focusing on growing and using mycorrhizal fungi to increase food production using fewer chemical fertilizers and pesticides. The globally groundbreaking products are now used in over thirty countries. Dr. Mike Amaranthus holds an undergraduate degree from the University of California–Berkeley and a PhD from Oregon State University.

Dr. Mike is active as a mentor and volunteer for youth and cancer support network organizations all over Oregon. Dr. Mike and Eileen are thankful for a full and warm home, raising five children and having eight grandchildren.



FRY, THRIVE, OR DIE

# KEY TO MUSHROOMS WITHOUT GILLS

The cap underside has a layer pores that are closely packed tubes.

If the mushroom has gills, go to the key on PP.328-PP.329.

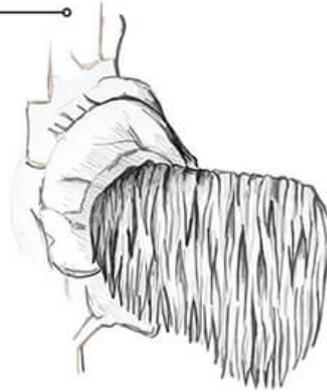
The underside of cap lacks a layer of tubes or pores.



If the mushroom has teeth or downward pointing spines with or without a well defined cap.

## TEETH FUNGI (PP.190-PP.207)

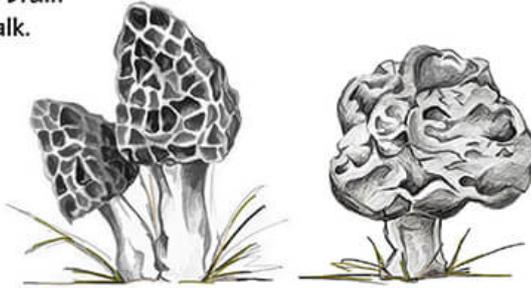
If the mushroom lacks downward pointing spines.



If the mushroom is honeycombed with pits and ridges, saddle or brain shaped and has a stalk.

## MORELS AND FALSE MORELS (PP.234-PP.266)

If the mushroom is a different shape or lacks a stalk.



If the mushroom is rounded potato shape and fruits underground with a veined, marbled interior.

## TRUFFLES (PP.267-PP.284)



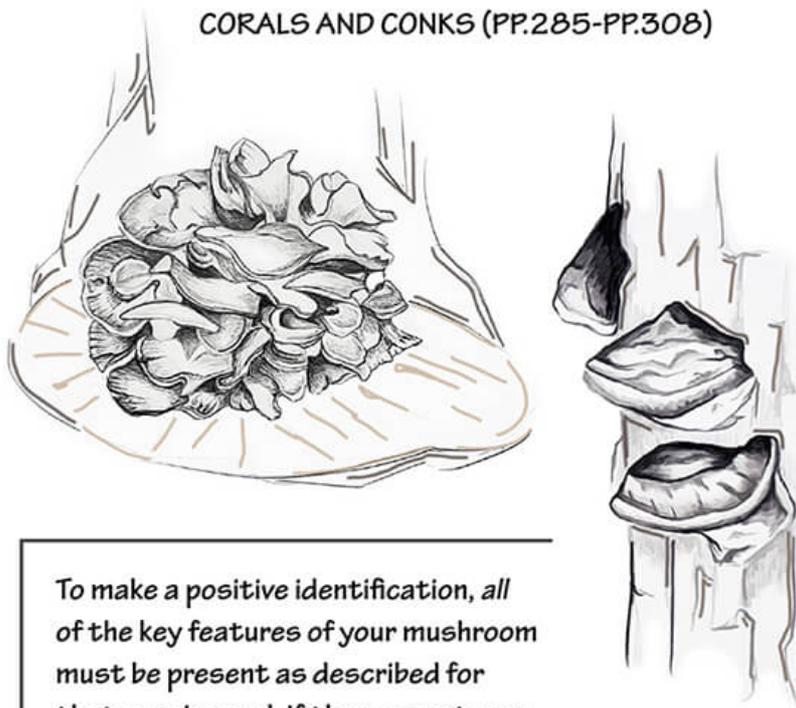
The mushroom has a fleshy cap and a central stalk that are soft and sponge-like.



**BOLETES (PP. 208-PP.233)**

The mushroom is woody, tough, bracket like, or coral-liked (branched) without a well defined cap.

**CORALS AND CONKS (PP.285-PP.308)**



To make a positive identification, *all* of the key features of your mushroom must be present as described for that species and, if they are not, you must assume it is not the correct mushroom. Its best to gather several specimens so you can look at the range of characteristics as the mushroom ages.





FRY, THRIVE, OR DIE

# KEY TO MUSHROOMS WITH GILLS

If mushroom has gills or radiating blades (sometimes folds) beneath the cap.

If the mushroom does NOT have gills, go to the key on PP.326-PP.327.



AMANITA'S (PP.92-PP.114)

If the mature gills are free from the stalk, are white or yellow and the mushroom has a volva (sack, collar or scaly rings) and patches, warts or flakes.



If not as above.



If the young gills are covered by a veil that forms a ring on the stalk.

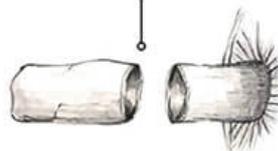
If no veil covers the young gills and no ring forms on the stalk.



MILK CAPS (PP.72-PP.83)

If mushroom stalk snaps cleanly like a piece of chalk and gills when broken bleed a juice or latex.

If the stalk shows fibers, does not snap cleanly and the gills when broken do not bleed juice or latex.



If the spores are white, yellow or pinkish.

