

# PUTTING THE FUN IN FUNGUS

by Jim Cornish

**I**t's fall! The leaves are changing colour as the days shorten and cool. Nature is falling asleep for the long winter ahead. But wait! What's that growing out of my lawn? A mushroom ring? Well, for fungi at least, fall is not a time to sleep. Rather, it's a time to put on a spectacular, albeit brief, nature show.

The growths we see shooting mushroom-like above the ground, protruding shelf-like on trees or oozing jelly-like from decaying logs are the fruiting structures of something much larger and well hidden; a network of fibres growing like cobwebs in soil, wood or decaying matter. We call these fibres fungi and their fruiting bodies mushrooms.

#### Uses of Mushrooms

Vikings believed mushrooms strengthened their "Berserker Warriors" in battle. Egyptians considered them delicacies and on festive occa-

sions, Romans served them as "the food of the gods". In modern times, mushrooms play an important role in the production of foods such as wine and cheese. The mold *Penicillium* is used to produce antibiotics. Button and oyster mushrooms are two of several species cultivated for consumption. Polypores are often used as curios. The undersides of some varieties of conks are used by etching artists. And, last but not least, pigments in certain mushrooms are used to make dyes. As you can see, the lowly mushroom plays an important role.



**SHELF FUNGUS**

Photos: Jim Cornish

## Diverse Mushrooms

Although they look like and share their habitats with plants and have feeding behaviours similar to animals, fungi are neither plants nor animals. They have their own kingdom called Eumycota. Because fungi cannot make their own food, they depend on energy-rich carbon compounds such as chitin (insect exoskeletons), keratin (skin, hair, horn, and feathers), cellulose (most plant debris) and lignin (wood) for nourishment.

Fungi thrive by either being:

- saprophytic — breaking down dead and decaying organisms with digestive enzymes (an animal behaviour),
- parasitic — removing nutrients from living organisms (a relationship that damages the host) or
- symbiotic — living in a mutually beneficial association usually with plants.

## A Typical Mushroom

The fungi familiar to most of us are the gilled mushrooms - the portobellos and button ones we buy in the supermarket, and the toadstools we see growing on the ground. Typically,

these are umbrella-shaped, stemmed and topped by a flat, pointed or cup-shaped cap usually gilled on the underside. But, mushrooms exist in a wide variety of sizes, shapes and colours. Some called polypores are woody and look like shelves or hooves growing out of the bark of trees. Instead of gills, their white, brown or creamy coloured undersides are covered in pores. Visible year round, they grow like trees, adding a ring of growth each year. Other mushrooms, like the convoluted jellies oozing from logs, look rather grotesque. While not gilled or pored, they are still mushrooms.

## Life Cycle

The function of a mushroom is to produce spores, which are the “seeds” of the fungus. Depending on the species, these spores are produced on gills, in pores, in leathery pouches, in the bottoms of cups or over the surface of the mushroom itself. Just like seeds, when the spores fall off, they are dispersed by wind, water and animals. After germinating, they form hundreds of threads that grow into the fungi’s feeding bodies.

Called mycelia, these fibers lie hidden under the ground or inside decaying organic material. When climatic conditions are right — usually a drop in temperature and an increase in precipitation — the mycelia are triggered to begin the final stage in the fungi’s life cycle; the formation of mushrooms. Within a week or two, the mature mushrooms release billions of spores and the cycle repeats.

## When and Where to

### Look for Mushrooms

In Canada, mushrooms pop up in fields and forests on the damper and cooler days of spring and fall. Since most varieties appear and then disappear quickly, finding them is often a matter of timing and luck. To narrow your search, wait until spring or fall. Look in shaded, damp areas and on or near dead and dying trees, decomposing leaves, dung, mulch and compost. Once you find one mushroom, it is easy finding more.



## FUNGI FUN FACTS

- ♣ The oldest fossil fungi are at least 545 million years old and found in northern Russia.
- ♣ Fungi species worldwide are estimated at 100,000. Because few studies exist on tropical fungi, the number may be as high as 1.5 million species.
- ♣ Each year, wood-decaying fungi release some 85 billion tonnes of carbon dioxide (and other carbon gases) into the atmosphere.
- ♣ The Destroying Angel and Death Cap mushrooms are responsible for 90% of human deaths from fungal poisoning.
- ♣ The football-sized Giant Puffball produces about seven trillion spores of which only 0.001% will germinate.
- ♣ Plastics are immune to fungal attacks. This means that we, not the fungi, must take responsibility for recycling them.
- ♣ A fungus helps digest the grasses eaten by cows. Indirectly, fungi help to produce the milk we drink.
- ♣ Honey Mushrooms produce light called bioluminescence. People once used pieces of fungus-infested wood to light their way.
- ♣ Molds and bacteria growing together in sawdust can generate enough heat to catch the sawdust on fire.
- ♣ Mushrooms are a good source of protein and are 85-95 percent water.
- ♣ Placed end to end, the fungal threads living symbiotically with the roots of a single tree can encircle the world several times.

## Identifying Mushrooms

It is very difficult, and even unwise, to try to identify mushrooms to the species. For most enthusiasts, including Scouts, it is best to name mushrooms based on their general appearance. Pictured right is a non-scientific identification chart based on the common shapes of mushrooms. Not all varieties/shapes are covered. If you want a more in-depth coverage, locate a mushroom expert living in your area.

General Appearance	Common Characteristics
gilled	fleshy, umbrella-like, gilled under cap, stalked, solitary or cluster, many colour varieties, found in woodlands and grasslands
tube/club	stalked, no cap, fleshy, hollow inside, many colour varieties
shelf/bracket	no stalk, shelf-like, attached to tree or fallen logs, single or clustered, many colour varieties, colours arranged in rings
cup	cup shaped cap, many colour varieties, with/without egg-like structures in cup
coral	worm-like, branched, like underwater coral, or club-like; often yellowish to orange
jelly	jelly or butter-like appearance, yellow, orange and black, found on rotting wood

# CAUTION

**Mushrooms should never be collected for consumption unless they are first identified and then properly prepared by an expert guide.** Certain species of mushrooms are poisonous but there are no telltale ways of distinguishing them from the non-poisonous varieties. While handling fungi poses no health risks, when completing the following activities, always handle the mushrooms gently and when finished, wash hands immediately.

# THE FUN SIDE OF FUNGI

## TIPS ON COLLECTING MUSHROOMS FOR LATER STUDY

1. Choose early adult stage mushrooms free of decay, worm holes or animal bites.
2. Use a knife or trowel to pry the entire mushroom from the substrate.
3. Keep species separate. Store in paper bags. Do not use plastic bags as it causes the mushrooms to sweat and hastens decay.
4. Place collected mushrooms in a flat bottomed basket or pail. Don't stuff them in.
5. Place fragile mushrooms inside a small box.
6. Keep mushrooms in the shade and as cool and well ventilated as possible.

**Do not collect polypores (shelf or bracket mushrooms). These exist year round, so leave them for the next passer-by to admire.**

## MUSHROOM HUNT

*Materials:* index cards, pencils, map, paper bags, bucket or basket, garden trowel, knife.

### *Directions:*

The best place to study mushrooms is in their natural habitat in wooded areas or open fields. Studying nature can be a slow process. Don't rush to finish and be observant!

1. Plan a walk or hike. Note where mushrooms exist and mark their general location on a map. Use index cards to record something about the habitat (field or forest) and the substrates (live tree, leaf litter, forest floor, decaying log/stump.) Sketch the mushroom. Collect and store mushrooms in a paper bag. Label using name on index card.
2. Find a variety of gilled mushroom. Identify their parts using the diagram (See opposite page). Compare characteristics (cap size, shape and colour, gills (attached or unattached to the stem), base (bulbous or not), stem (straight or decreasing in circumference from base), and rings (present just below the cap, at the base or absent altogether). Some mushrooms change colour when they dry out, so re-cording field details is important for later study.
3. Compare field mushrooms with others growing in a forest. Note varieties, sizes, substrates, and growth patterns (rings, clusters or solitary).
4. Observe how the polypores growing on live trees or logs (bracket/shelf fungi) resemble protruding shelves. Compare these bracket fungi across the same and different tree species. Do they have stems? What are some similarities and differences between species? Are they plain or do they have concentric rings of contrasting colours? What colours are present?
5. Gently remove leaf litter. Do you see small cup-shaped mushrooms growing underneath? Look in the cups. They may contain spore casings that look like eggs in a nest.
6. Look for jelly fungi (pieces of yellow or whitish jelly-like or butter-like material) oozing from dead tree stumps, logs or even wooden fences.
7. Find coral-like and club-like fungi on the ground or hidden beneath a raised log. Notice their shape (single, branched) and observe their colours — white, orange, red and yellow. Are they growing solitary or in clumps?
8. Remove a thin layer of the substrate around the base of mushrooms. Try to locate the whitish threads (mycelium) — the underground part of the fungi that absorb nutrients from the organic matter surrounding it.
9. Hunt mushrooms in both spring and fall and compare the varieties found.

## MUSHROOM PROFILE

*Materials:* knife, common white button mushrooms, index cards, pencils.

### *Directions:*

If you can't find mushrooms in the field, buy some of the white button variety at the supermarket. Slice them length-wise. Look for gills beneath the cap. Study the area where the cap and stem meet — the ring typical of many varieties could have been forming when the mushroom was picked. Note the shape of the cap.

## MAKING A SPORE PRINT

**Materials:** knife, dark and light paper, tape, clear glass jar or dish, toothpick, variety of mushrooms.

### Directions:

Since individual spores are microscopic, experts often make a spore print and use its colour to help identify the species. The best mushrooms for making spore prints are the gilled ones with caps fully extended.

1. Collect mushrooms with an open cap and exposed gills.
2. Cut the stem from the cap as close to the gills as possible.
3. Place the cap, gill side down, across a piece of dark and light paper taped together. Don't move the cap once you have placed it.
4. Cover with a glass jar with its lip resting on a toothpick.
5. After four to eight hours, remove the cap from the paper. (A pattern of white or colored spores should be seen on the paper under the cap.) Allow the print to dry 10 to 20 minutes. If no spores can be seen, the mushroom cap may be from an immature or sterile specimen or one that has already lost its spores.
6. To fix and preserve the print for display, spray the print with air or

art spray. (To avoid changing the arrangement of spores, apply spray from about 30 cm away, letting it fall gently on the print.)

(Spore prints make excellent photographs. Using the close-up feature on your camera, take a picture and print on 8x10 photo paper.)

## GROW YOUR OWN FUNGI

**Materials:** plastic bag, cheese, bread, water (do not use meat products).

### Directions:

1. Place food item inside a plastic bag. Add a few millilitres of water to moisten the air inside. Seal and store out of direct sunlight.
2. Use a camera to take pictures each day to record the appearance and spread of a fungus on the food.
3. Find the conditions best for growing mold by varying the storage temperature and the amount of light. Use a variety of breads to see which ones go moldy first. Check ingredients for preservatives which inhibit mold growth.
4. Take the moldy food apart. Use a magnifying glass to find the thread-like mycelium. Determine how far it has spread through the food.

## Tips for Photographing Mushrooms

1. Photograph mushrooms in their natural habitat using the close-up feature found on most digital cameras.
2. Photograph from various angles — at eye level, above and from below to capture all of the features of the mushroom. Use a small tripod or bean bag to position your camera and its self-timer feature to get great blur-free shots.
3. Use the flash to produce bright colours and lots of detail. If the flash is too bright, hold a piece of tracing paper in front of the flash. Be careful not to cover the lens.
4. To photograph a collection of mushrooms, use black construction paper for a background. X

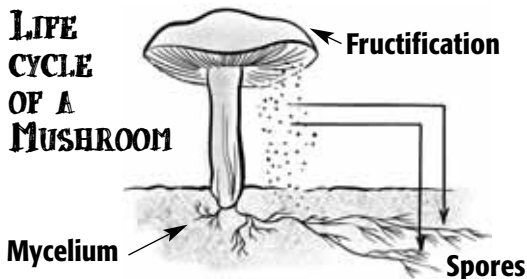
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### Program Links

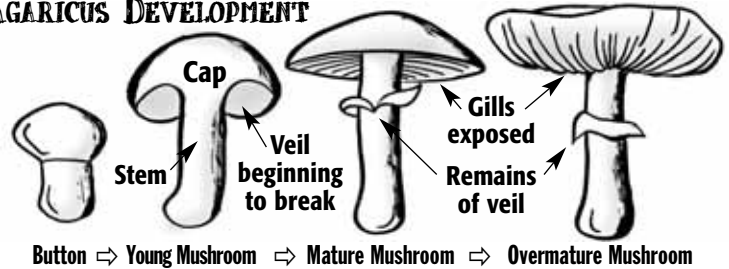
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## LIFE CYCLE OF A MUSHROOM



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