MUSHROOMS OF TORONTO

A GUIDE TO THEIR REMARKABLE WORLD

• City of Toronto Biodiversity Series •

TORONTO

ROM

Live green Toronto

Imagine a Toronto with flourishing natural habitats and an urban environment made safe for a great diversity of wildlife. Envision a city whose residents treasure their daily encounters with the remarkable and inspiring world of nature, and the variety of plants and animals who share this world. Take pride in a Toronto that aspires to be a world leader in the development of urban initiatives that will be critical to the preservation of our flora and fauna.

Cover photo: Joanne Hamblin

Coprinus comatus (Shaggy Mane) is one of the most common and easily recognized mushrooms found in Toronto. This photograph was taken at the Toronto Botanical Garden, but city residents are just as likely to find this mushroom in their own yard or local park during the summer and fall.

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Cantharellula umbonata
illustration: David Wysotski

The Grayling Mushroom *Cantharellula umbonata* can be spotted in the fall among mosses in the wooded areas of our city.

Lactarius mushroom in a Toronto yard
photo: Patricia Burchell

"Indeed, in its need for variety and acceptance of randomness, a flourishing natural ecosystem is more like a city than like a plantation. Perhaps it will be the city that reawakens our understanding and appreciation of nature, in all its teeming, unpredictable complexity." – Jane Jacobs

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Welcome!

To encourage the celebration of all life on earth, the United Nations declared 2010 to be the Year of Biodiversity. We congratulate the City of Toronto for honouring this special year with this Biodiversity Series celebrating the flora and fauna of our city. Each booklet within the series – written by dedicated volunteers, both amateurs and professionals – offers Torontonians a comprehensive look at a major group of flora and fauna within our city.

We hope that this Biodiversity Series will achieve its main goal: to cultivate a sense of stewardship in Toronto area residents. If each of us becomes aware of the rich variety of life forms, their beauty and their critical roles within the varied ecosystems of Toronto, we will surely be inspired to protect this natural heritage. After all, our own health and ultimately our very survival is linked to the species and natural spaces that share the planet with us. Without plants, there would be no oxygen; without the life of the soil, there would be no plants; without unpolluted fresh water, we would die.

While there are many organizations actively engaged in protecting our city's flora and fauna, the support of ordinary citizens is critical to the conservation of our natural habitats. We hope you'll take a walk in one of our parks and open spaces, lower your blood pressure, look around you, and enjoy the diversity of trees, animals, fishes, birds, flowers, and fungi that flourish among us.

With best wishes,
Margaret Atwood and
Graeme Gibson
January 2011

Introduction

The Kingdom of Fungi is, in some ways, like the great City of Toronto. It is vast in size, and made up of numerous and diverse inhabitants, but whereas the citizens of Toronto are primarily consumers who are fond of recycling, fungi are primarily recyclers who are fond of consumers. In the living world around us, fungi make up approximately 25% of the total biomass. They grow under water and on land. The air around us is filled with their spores. Their existence may go unnoticed, however, as they live forgotten beneath the soil and under the bark of trees. We think of them most often when we see a mushroom spring forth, a relatively small visible part of the fungus that understates the important part these organisms play in the ecosystem. If you look closely at the ground and the trees as you venture outdoors, you may be fortunate enough to spy a mushroom. This booklet is meant as a starting point for those who encounter the mushrooms that grow in the City of Toronto, and are sufficiently intrigued that they would like to know more.

Michael Warnock,
Mycological Society of Toronto

City of Toronto Biodiversity Series

Mushrooms of Toronto is part of the Biodiversity Series developed by the City of Toronto in honour of the Year of Biodiversity 2010. A number of the non-human residents of Toronto will be profiled in the Series. It is hoped that, despite the severe biodiversity loss due to massive urbanization, pollution, invasive species, habitat loss and climate change, the Biodiversity Series will help to re-connect people with the natural world, and raise awareness of the seriousness that biodiversity loss represents and how it affects them directly. The Series will inform residents and visitors of opportunities to appreciate the variety of species inhabiting Toronto and how to help reduce biodiversity loss by making informed individual decisions.

What is a mushroom?

A mushroom is the visible reproductive structure (fruiting body) of a fungus. Like an iceberg, only a small part of the fungus is visible (the mushroom), while the bulk of its mass is hidden below the surface. Most fungi do not produce mushrooms, and exist in the world largely unseen by the naked eye.

A mushroom is not a plant. While most plants are able to use the energy of our sun to produce sugars through photosynthesis, fungi, like animals, cannot. They need to obtain sugars from their environment. Fungi have developed various strategies to obtain sugars from organisms in all of the kingdoms.

The role of fungi in the natural world is quite varied. As nature's recyclers, they may be destructive, killing a wounded old tree, taking its nutrients, and reducing it to tiny debris that becomes part of the forest floor. They may be supportive, forming complex nutrient sharing relationships with the root structure of a young sapling tree, helping to ensure that its growth is robust as it rises to become part of a new forest.

Fungi are very diverse, second only to insects in terms of the total number of species. Mycologists (those who study fungi) estimate that there are over a million fungal species on our planet. To date, mycologists have recorded approximately one hundred thousand species, of which only about 14,000 produce mushrooms. Most of the undiscovered species are microscopic and do not produce a visible structure even when they fruit, thus posing challenges for their discovery. At least 500 mushroom species have been recorded in the greater Toronto area, and this number is likely to grow in time.

Amanita species from section *Vaginatae*
illustration: Robert Gait

The Life Cycle of a Mushroom

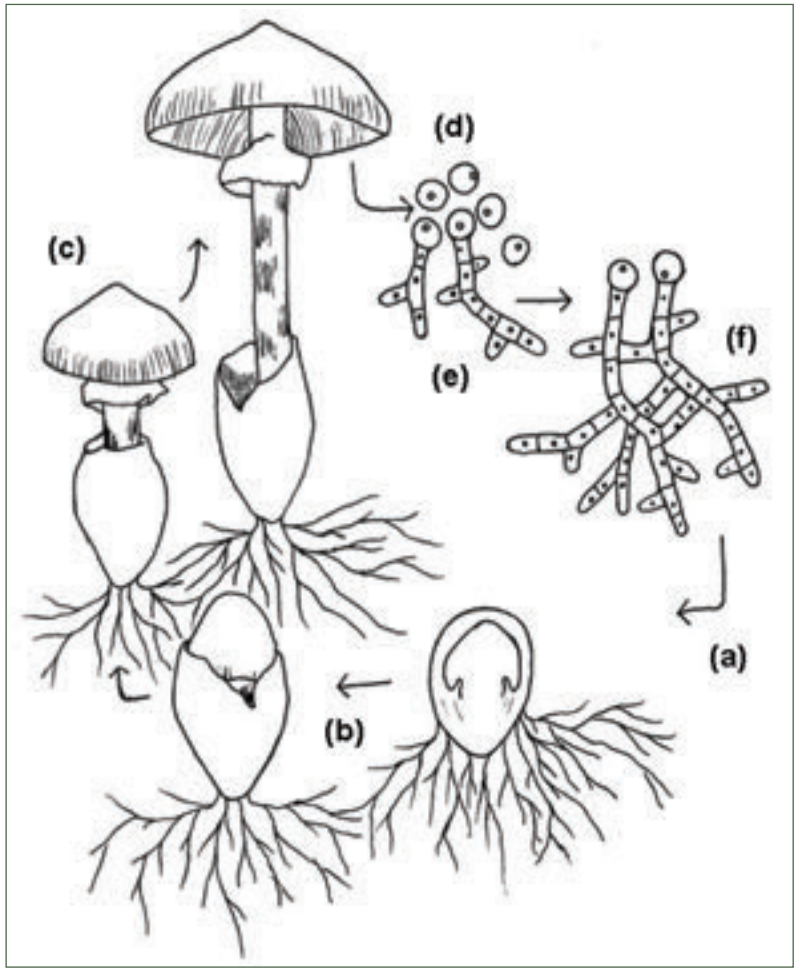


illustration: Hillary Hatzipetrakos

A fungus primarily consists of branched microscopic filaments, called hyphae, that are generally less than one hundredth of a millimetre thin but can be several metres long. Hyphae form an extensive network (a mycelium) in the substrate it feeds on. At some point, the mycelium "fruits" and in some species it produces a mushroom.

Let's look at the life cycle of a gilled mushroom as depicted in the image on the left. (a) The mycelium is foraging in its substrate; (b) at some point it starts to fruit, and (c) produces a mushroom; (d) the gills of the mature mushrooms produce spores, which are the equivalent of plant seeds but are much smaller (typically, they measure one hundredth of a millimetre); (e) when conditions are right, spores germinate into hyphae; (f) hyphae that are sexually compatible will mate, and (a) develop a mycelium to complete the life cycle of the species.

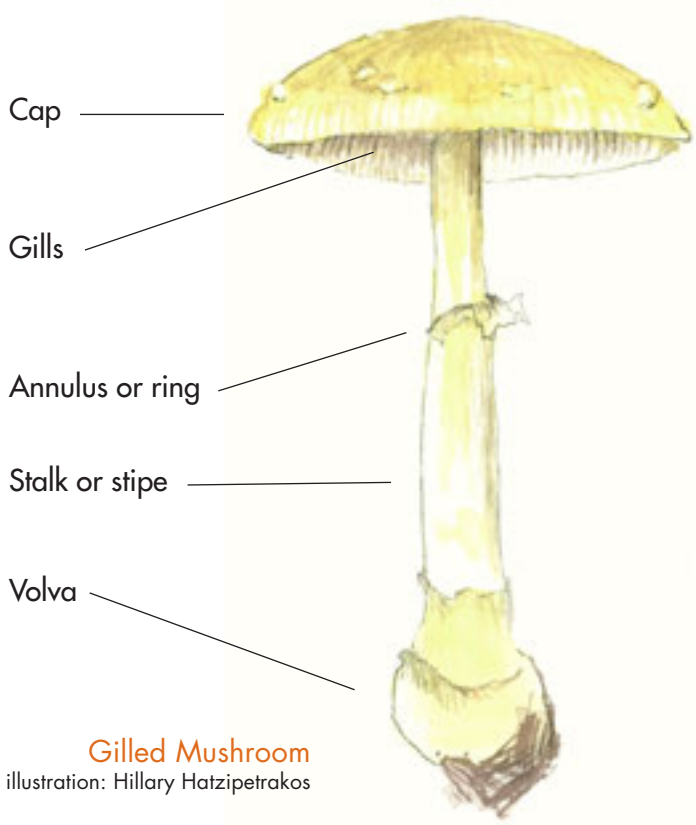
Did you know?

Many Torontonians, having returned home from a round of golf or a walk in the park, have noticed that their shoes have become rusty orange in colour. That's because the grass they walked on had become infected with a rust fungus! The dusty orange colour comes from the thousands of small fungal spores that have hitched a ride. The rust fungus spore shown here was found on the leaf of a raspberry bush near the St. George campus of the University of Toronto

Rust fungus spore
photo: Michael Warnock

Different Kinds of Mushrooms

If asked to draw a mushroom, most people would draw something shaped somewhat like an umbrella. Typically, a **gilled mushroom** has a distinct cap and stalk, and the reproductive tissue on the underside of the cap, where the spores are produced, is composed of gills. Some gilled mushrooms also have an annulus or ring on the stalk, and/or a volva around the base of the stalk.



Gilled Mushroom
illustration: Hillary Hatzipetrakos

Bolete
illustration: Hillary Hatzipetrakos

A **bolete** is similar to a gilled mushroom except that the reproductive tissue on the underside of the cap is composed of tubes instead of gills. The mouths of the tubes appear as pores when viewed from underneath, giving the underside of the cap a sponge-like appearance. Like gilled mushrooms, some boletes may have an annulus or ring on the stalk.

Different Kinds of Mushrooms

Many other kinds exist that do not resemble your typical mushroom. They differ in structure and texture and may have evolved to produce and disseminate their spores in very different ways. **Polypores**, like boletes, have tiny tubes that appear as pores when seen from underneath, but unlike boletes, they are typically tough or woody in texture, lack a distinct stalk, and grow on wood. **Tooth Fungi** can be soft and fleshy like gilled mushrooms and boletes, or corky like polypores, but are distinguished by having their reproductive tissue underneath the cap composed of teeth-like structures. They are relatively uncommon. Other less common kinds include **puffballs, stinkhorns, morels, coral fungi, club fungi, bird's nest fungi, cup fungi, earthstars, and jelly fungi**, of which some are quite small and often overlooked by a casual observer.

Puttball
illustration: Robert Gait

Polypore
illustration: Hillary Hatzipetrakos

Stinkhorn
illustration: Robert Gait

Morel
illustration: Robert Gait

Coral fungus
illustration: Hillary Hatzipetrakos

Club fungus
illustration: Robert Gait

Bird's Nest fungus
illustration: Hillary Hatzipetrakos

Cup fungus
illustration: Robert Gait

Earthstar
illustration: Hillary Hatzipetrakos

Mushroom Identification

Identifying a mushroom with any certainty can be difficult even for an expert. Field identification relies primarily on a careful examination of morphological features of the mushroom. For gilled mushrooms, for example, the shape, size, colour, texture and other characteristics of the cap, gills and stalk are important features to consider. As well, the presence or absence of an annulus and/or volva can help to determine at the least the genus to which a mushroom belongs.

Spore colour may also be important, especially in the identification of gilled mushrooms. Spores may be light coloured (e.g. white, cream or pale shades of yellow, pink, orange or green), dark salmon pink, various shades of brown (e.g. ochre-brown, cinnamon-brown, rusty-brown, chocolate brown, purple-brown, etc.) or black. One way to determine spore colour is to make a spore print.

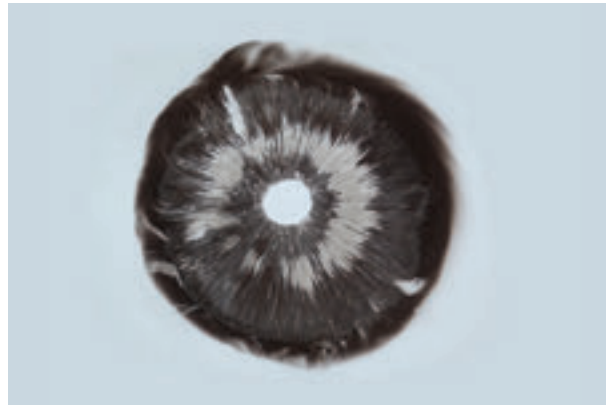
While some mushrooms can be identified in the field with reasonable confidence, many cannot. Confirming a species identification may require microscopic examination of parts of the mushroom and/or its spores. Professional mycologists are increasingly relying on DNA sequencing to more precisely define and identify species.

A word about names

In this booklet mushrooms are identified by scientific Latin names. If the mushroom has a widely accepted common name, that is also provided. Most mushrooms, however, do not have common names, or have been given different common names in different places or by different authors, or the same name has been applied to more than one species, creating confusion.

How to make a spore print

Cut off the cap of a mature specimen, put it on a piece of paper, cover it with a bowl, and wait a few hours to overnight for the spores to drop.



Spore print made from the large *Agaricus* mushroom shown below
photos: Patricia Burchell

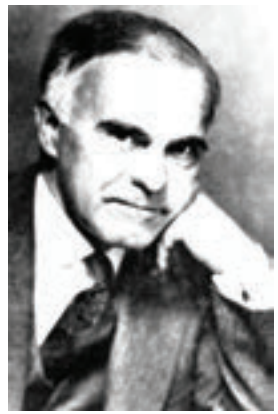
Early Toronto Mycologists

Herbert Spencer Jackson (1883-1951) was the first professional mycologist in Toronto. He was born in the U.S.A. and earned degrees from Cornell, Harvard and Wisconsin universities before being appointed Professor of Mycology in the Botany Department of the University of Toronto in 1929. During his tenure, the University of Toronto mycology collection grew from about 500 to 94,000 specimens.

Roy Franklin Cain (1906-1998), a student of Jackson, took over the responsibility for research in Mycology at the University of Toronto after his mentor passed away. Dr. Cain was an avid collector and developed a very active research program that was recognized internationally. He was particularly interested in studying microscopic fungi worldwide but he also collected and documented many mushrooms from Ontario. Under his direction, the mycology collection at the university grew to about 350,000 specimens. Dr. Cain was also a founding member of the Mycological Society of America (1932) and a major force in the creation of the Mycological Society of Toronto.

Russula species
illustration: Robert Gait

John Christian Krug (1938-2005), a student of Cain, became Curator of the mycology collection at the University of Toronto in 1982. He was a restless traveller who collected fungi worldwide. He also had a very active exchange program with other herbaria, which contributed to the growth of the University collection to its current holding of about half a million specimens. Dr. Krug worked efficiently to transfer the collection from the University of Toronto to the Royal Ontario Museum, and was also very active in promoting the knowledge of fungi to Toronto residents.



H. S. Jackson
courtesy of R.W. Lichtwardt

R. F. Cain
photo: David Malloch

J. C. Krug
courtesy of the ROM

Ecology

Fungi are found in all terrestrial habitats and play many important ecological roles. For instance, many animals, small and large, eat mushrooms, and several insects use mushrooms as shelters in which to hide and feed themselves and sometimes also to lay their eggs.

Fungi that decompose dead organic matter are called saprobes. Many species are saprobes on small plant debris, such as leaf litter and twigs, while others can decay large logs. There are two types of wood decomposers: "brown-rot" fungi, and "white-rot" fungi. The former decay wood cellulose, and the latter decay lignin. Cellulose is a major component of plant cell walls, whereas lignin is a tough and complex molecule that forms the structural core of wood. White-rot fungi are the only organisms that can decay lignin; in other words, without these fungi, wood would not fully decompose and would accumulate on the forest floor indefinitely. Fungi that cause damage to other living organisms such as plants are called pathogens, for example *Armillaria*. Other fungi grow on living trees but without causing significant damage or leading to the death of the tree; these are called parasites, for example *Hypsizygus*. Both *Armillaria* and *Hypsizygus* are presented later in this booklet.

Wood decayed by brown-rot fungi, but not white-rot fungi, retains its structural lignin and turns into a pile of brown cubes. Wood decayed by white-rot fungi loses its lignin; when some cellulose is left behind, the decomposed wood is white and soft with a paper-like appearance. White-rot fungi have been used to make paper, but the natural process is too slow to be economically viable for large industries which, therefore, still prefer the use of more efficient yet toxic chemicals such as hydrochloric acid.

White-rot
photo: Tom Volk

Brown-rot
photo: Bill Bakaitis

Mycorrhizal fungi

[from Greek mykes=fungus; and Latin rhiza =root]

Many fungi live in symbiotic association with plant roots, and are essential to the growth and health of most plants. The fungus provides the plant with micronutrients present in the soil, in exchange for sugars produced by the plant photosynthesis. The mycelium of a mycorrhizal fungus somehow extends the plant root network into the soil. It can be associated with different plants at the same time, somehow linking one plant to another with the possibility of channelling micronutrients between them.

More than 80% of plant species host fungi in their roots. While most of these fungi remain microscopic all their life, some do form those large reproductive structures we call mushrooms. Mycorrhizal mushrooms are generally associated with trees rather than annual plants, but not all trees host mycorrhizal mushrooms. In Toronto, trees that support mycorrhizal mushrooms include oaks, birches, beeches, pines and other conifers, but not maples. Some mycorrhizal mushrooms are always associated with certain trees, while others are more generalists.

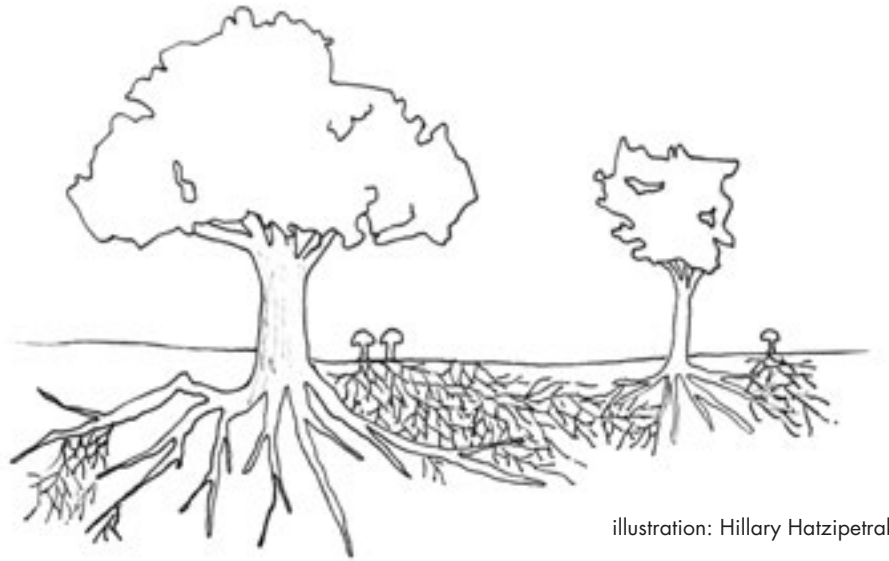


illustration: Hillary Hatzipetrakos

The mycelium of a mycorrhizal fungus forms a mutually beneficial relationship with the roots of trees.

Did you know?

The Ghost plant, *Monotropa uniflora*, and a few other plants, including some orchids, lack chlorophyll. Chlorophyll molecules are responsible for the green color and photosynthesis activity of most plants, whereby the plant produces sugars directly from the sun's energy. In order to obtain the energy it needs to grow, the Ghost plant forms an underground network with mycorrhizal fungi that pass on sugars that they have obtained from green plants. This relationship does not appear to benefit either the green plants or the fungi.

Monotropa uniflora
photo: Vello Soots

Mushrooms of Toronto

Toronto's (un)Official Mushroom: *Polyporus squamosus* (Dryad's Saddle)

Polyporus squamosus first appears in the late spring, and may be seen throughout the summer and early fall. It is frequently found on logs and stumps of deciduous trees, but may also grow on living trees. With its short thick stalk and large, yellowish-brown, scaly cap, it is one of the most easily recognized of the polypores or bracket fungi commonly found in the Toronto area. The white underside of the cap is sponge-like with angular pores.

The depression in the centre of the cap gives it a saddle like shape. Together with its tough leathery texture, this may account for its fanciful common name of Dryad's Saddle. The caps are typically 10-30 cm across, but can be even larger.

Polyporus squamosus
photo: Vello Soots

Young and mature specimens of *Polyporous squamosus* in Wilket Creek Park, Don Valley
photos: Patricia Burchell

The dramatic mature specimen of *Polyporus squamosus* depicted in the watercolour above measured 38 cm across. At right, is a watercolour of a young specimen of this mushroom found at Cherry Beach in Toronto.

illustrations: Robert Gait

Gilled Mushroom: *Amanita muscaria* (Fly Agaric)

Amanita muscaria is probably the best known mushroom in the world. It features in the folklore of many cultures, and illustrations and models of mushrooms frequently depict a "typical" mushroom as having a red cap covered with white dots. Most people are more familiar with the red variety, which is common in Europe and some parts of North America, than with the yellow-orange variety, which is common in Ontario.

The variety of *Amanita muscaria* seen in the Toronto area has a bright yellow to orange coloured cap adorned with small whitish patches, and cream coloured gills. The stalk is also cream coloured, with a hanging ring. Specimens are typically 15-20 cm tall with caps measuring 10-15 cm across, although much larger specimens may sometimes be found. Its spores are white.

This mushroom is found on the ground in wooded areas under deciduous and coniferous trees. It may be found throughout the summer and early fall, but is most often seen in late August and early September.

The common name Fly Agaric is derived from its use in Europe in earlier times to attract and stun flies, by cutting off the cap and putting it in a dish of milk.

Amanita muscaria
photos: Vello Soots

Gilled Mushroom: *Amanita virosa* (Destroying Angel)

"How could something so beautiful be so deadly?" asked one Toronto man from his hospital bed, having consumed several of these mushrooms he found in a local park. Unfortunately for him, *Amanita virosa* is one of the most poisonous mushrooms in nature. Although it is responsible for numerous deaths around the world, the Toronto man did survive his mistake, albeit with significant liver and kidney damage. Eating wild mushrooms can have dire consequences for those who cannot correctly identify them.

Known commonly in North America and Europe as the Destroying Angel, *Amanita virosa* starts off as a white egg-like structure emerging from the soil. It develops into a tall elegant mushroom that is completely white from top to bottom. The cap may be up to 12 cm in diameter and the stalk up to 15 cm long. The presence of a ring on the stalk and the volva (a cup-like structure) surrounding its base help to establish this mushroom's identity.

Amanita virosa is one of several gilled mushroom species which contain toxins which damage the liver and kidneys, and which are responsible for most fatal mushroom poisonings in Canada. The onset of symptoms, which may include severe abdominal pain, vomiting, diarrhea and fever, is typically delayed more than 8 hours after ingestion, and is usually followed by a period of temporary remission; however, after a few days, more severe symptoms associated with liver and kidney failure appear. Without prompt medical treatment the victim will likely die. Even with treatment, those who survive may suffer irreversible damage to their liver.

Amanita bisporigera is a very similar pure white *Amanita* mushroom, which is also deadly poisonous and commonly called Destroying Angel. The two species can only reliably be distinguished microscopically. *Amanita bisporigera* is an eastern North American species, while *Amanita virosa* was first described in Europe. Further DNA research is needed to clarify the relationship and distribution of these species.

Amanita virosa
photos: Vello Soots

Gilled Mushroom: *Coprinus comatus* (Shaggy Mane)

Coprinus comatus is a mushroom commonly seen in Toronto yards and parks. The cap is mostly white in colour and covered with large scales tipped with brown. When young, the distinctive cylindrical shape and shaggy surface texture of the cap make this mushroom easy to recognize. It is usually found scattered, or in small groups, in grassy areas, but it may also be found along the edge of woodland paths. Individual specimens of this mushroom are typically 10-20 cm in height. Its spores are black. This mushroom may be found throughout the summer and early fall, but it is most often seen in August and September.

Coprinus comatus
photo: Vello Soots

Coprinus comatus belongs to a group of mushrooms commonly referred to as “inky caps”. As the mushroom ages, the gills deliquesce or liquefy. The mushroom begins to blacken at the edge of the cap, and the blackening progresses upward until eventually the cap dissolves into an inky mess.

Coprinus comatus
photo: Vello Soots

Gilled Mushrooms: *Coprinopsis atramentaria* (Tippler's Bane) Formerly known as *Coprinus atramentarius*

Coprinopsis atramentaria has smooth gray, or grayish-brown, conical to bell-shaped caps, and usually fruits in clusters on well rotted, sometimes buried, wood. Individual specimens of this mushroom are typically 10-15 cm tall. *Coprinopsis atramentaria* can be found in Toronto yards, parks and local woodlands in the summer and fall. Like *Coprinus comatus*, it is an "inky cap" mushroom which deliquesces as it ages.

The common name of this mushroom is Tippler's Bane. It contains a toxin called coprine which interacts with alcohol to produce a very unpleasant reaction, similar to the effects of Antabuse, which is a chemical given to alcoholics to dissuade them from drinking alcohol. Symptoms may include nausea, vomiting, confusion and a flushed appearance. These symptoms may occur even when alcohol is consumed hours, or even days, before or after eating the mushroom.

Coprinopsis atramentaria
photo: Vello Soots

Coprinellus micaceus (Mica Cap) Formerly known as *Coprinus micaceus*

Like *Coprinopsis atramentaria*, *Coprinellus micaceus* grows in clusters on rotted wood, and may be found on or near stumps, or in grassy areas where there is buried wood or decaying tree roots. It is typically somewhat smaller than *Coprinopsis atramentaria* and has tan coloured conical to bell-shaped caps. A closer look at the caps when they are young and fresh reveals that they are covered with tiny particles which glisten like mica. This mushroom first appears in late spring, but can be found throughout the summer and early fall.

Coprinellus micaceus
photo: Vello Soots

Gilled Mushrooms: *Agaricus*

When very young, some mushrooms in the genus *Agaricus* may resemble the "button" mushroom sold in stores, with a smooth creamy white or buff cap and stalk. As the cap expands, the veil covering the gills breaks away leaving a ring on the stalk. As the mushroom ages, the colour of the gills changes from white or pinkish to pinkish brown, and finally to very dark brown as the spores mature.

Agaricus arvensis is typically 10-20 cm tall, with caps 10-20 cm in diameter. It grows in fields and grassy areas, and may be found throughout the summer and fall, but it is most often seen in late August and early September.

Agaricus arvensis
photo: Vello Soots

Did you know?

The button, cremini and portabello mushrooms you buy in the grocery store are all varieties of the same cultivated species, *Agaricus bisporus*. These mushrooms have been cultivated in Europe since the 18th century. They are currently grown commercially in many places around the world, including southern Ontario.

Agaricus mushrooms from the grocery store
photo: Simona Margaritescu

Agaricus bitorquis
photo: Vello Soots

Agaricus bitorquis
photo: Vello Soots

Agaricus bitorquis has a short stalk with a distinctive double ring. Caps are typically 5-10 cm across. This mushroom is often found in Toronto area lawns and gardens from late spring until early fall. It is surprisingly strong and may sometimes be seen in driveways, pushing up through the asphalt, much to the dismay of home owners.

Fairy Rings

Fairy ring of mushrooms in a lawn (species unknown)
photo: David Gough

A few mushrooms, including several species of *Agaricus*, may be found growing in a circular pattern commonly called a “fairy ring”. In folklore, the sudden and mysterious appearance of such rings was sometimes attributed to the work of fairies. In fact, a fairy ring is a naturally occurring arc or ring of mushrooms. When the source of nutrients in the soil is relatively homogeneous, the mycelium of the fungus grows outward from a central point in a circular pattern. The fruiting bodies appear at the outer edge of the circle. The ring expands every year as the fungus spreads.

Little lawn mushrooms

Some small mushrooms appear almost magically overnight, and may last only a few hours or a day at most. They are common in urban areas in lawns from spring until fall.

Parasola plicatilis is tiny and delicate with a pleated white cap and thin white stalk. Its common name Japanese Parasol is descriptive of its appearance.

Conocybe apala is also white, but with a smooth or slightly wrinkled conical cap. Its pointed cap is the reason for its common name of Dunce Cap.

Panaeolina foenisecii is commonly known as the Haymaker's or Lawn Mower's Mushroom because it often appears soon after the grass has been cut. It is one of several species of little brown mushrooms (LBM) found in lawns.

Parasola plicatilis
photo: Vello Soots

Conocybe apala
photo: Vello Soots

Panaeolina foenisecii
photo: Vello Soots

Gilled Mushroom: *Lepista nuda* (Blewit)

Lepista nuda is a woodland species which is also well suited to the urban environment. In the woods, it grows on the ground in leaf litter and needle duff which accumulates on the forest floor. It grows equally well on piles of leaves, compost and garden mulch which may be found in urban yards and parks. This mushroom can be found in the Toronto area from late summer through fall.

The common name of Blewit is probably a corruption of "Blue hat", although the caps of *Lepista nuda* are not really blue in colour. The colour of the cap and gills varies from violet to pale lilac to brownish, but usually violet tones can still be seen in the gills even if the cap colour has faded or changed with age. The cap can be up to 15 cm in diameter. The pale violet stalk is usually short, relative to the size of the cap, and is often bulbous at the base.

A cultivated variety of *Lepista nuda*, called the "Bluefoot" or "Blue foot" mushroom, can sometimes be bought in specialty food stores in Toronto. The name Bluefoot is also used by some people to refer to a different and unrelated mushroom species. People who study mushrooms generally refer to them by their scientific Latin names because the usage of common names is not always consistent.

Lepista nuda
photo: Ethel Luhtanen

Gilled Mushroom: *Tricholoma myomyces* (Mouse Mushroom)

Tricholoma myomyces is one of several grey species in the genus *Tricholoma*. The caps are grey or grey-brown to dark gray, 2-7 cm across, and covered with matted fibrils which give them a somewhat "furry" appearance, reminiscent of little grey mice. The gills and stalk are whitish in colour.

Tricholomas are forest mushrooms which form mycorrhizal associations with trees, especially conifers. *Tricholoma myomyces* can be found, sometimes in great numbers, in the fall under pines. *Tricholoma terreum* is another species of Mouse Mushroom which is virtually indistinguishable from *Tricholoma myomyces*. In fact, some mycologists now consider them to be one species.

Tricholoma myomyces
illustration: Robert Gait

Tricholoma myomyces
photo: Vello Soots

Gilled Mushroom: *Flammulina velutipes* (Velvet Stalk)

Flammulina velutipes is a cool weather mushroom. It typically appears late in the fall but can still be seen after the first snow, or show up during a warm winter thaw or early in the spring. It grows in clusters on decaying deciduous trees, stumps and logs. Its caps are red-brown and slimy when wet, 2-6 cm across, and its stalks are dark brown and velvety in texture. Its Latin epithet, *"velutipes"*, is a combination of two words, *"velutinus"*, which means "covered with hairs", and *"pes"*, which means "foot", hence its common English name, "Velvet Stalk".

Flammulina velutipes
illustration: Robert Gait

Enoki
photo: Jasmine Moncalvo

Did you know?

The cultivated variety of *Flammulina velutipes* found in grocery stores, and known by its Japanese name of Enoki, looks nothing like the wild variety. The cultivated mushrooms are grown in the dark, and have tiny caps, long thin stalks and are a pale yellowish white in colour.

Flammulina velutipes
photo: Vello Soots

Gilled Mushroom: *Armillaria* (Honey Mushroom)

Mushrooms can evoke varied responses from human beings, and *Armillaria* is a good example of this. For Canadians who like to collect wild mushrooms for eating, *Armillaria* species are widely referred to as Honey Mushrooms. The name denotes the honey brown colour of the caps. For workers in the forestry industry, however, the common name for *Armillaria* is "Shoestring Root Rot". This name refers to the dark rhizomorphs (root-like filaments produced by some fungi) that can be found under the bark of the victimized tree, and appear as black shoestring-like structures. The fungus lives as a parasite upon the trees and rots the wood, thus diminishing the timber value of the tree. Research has shown that the Honey Mushroom is not a single species, but rather a complex of several *Armillaria* species, some of which are indistinguishable from one another in the field.

Armillaria is found in the Toronto area in the fall, and grows in clusters on and around the base of trees. The caps are yellow-brown to tan and may be up to 10-15 cm in diameter. The stalks are similar to the caps in colour and may grow to a length of 15-20 cm. There is typically a cottony ring on the stalk which helps distinguish this mushroom from others that are similar in appearance.

Did you know?

Armillaria became a biological celebrity in 1992 when Dr. James B. Anderson, a University of Toronto professor, published a paper with some colleagues reporting that a single individual organism found in Wisconsin that covered nearly 10km^2 of forest, was between 1,000 and 10,000 years old, and weighed approximately 100 tons.

Armillaria
photo: Vello Soots

Armillaria
photo: Madi Piller

Gilled Mushroom: *Entoloma abortivum*

Are you ready for a mystery story? Mycologists over the years have been struggling to understand *Entoloma abortivum*, a pink-spored gilled mushroom with a grey or grey-brown cap up to 8 cm across, and a whitish-greyish stem up to 10 cm tall.

Entoloma abortivum is often found near strange fungal growths – whitish to pinkish white, lumpy, ball-like masses up to 10 cm across. These contorted forms eventually came to be considered as specimens of this mushroom whose normal development had been aborted by the presence of invasive tissues of species of *Armillaria* commonly known as Honey Mushrooms, often also found nearby. Accordingly the species became known as the "Aborted Entoloma".

But wait! In 2001 mycologists using newer techniques, determined that these malformed balls were not aborted forms of this *Entoloma*. On the contrary, the previously presumed roles now needed to be reversed; this *Entoloma* had infiltrated its tissues into the *Armillaria*, causing a gross deformation of the Honey Mushroom with little, if any, gill development. The *Entoloma* is the aggressor while the *Armillaria* is the passive victim, so a more appropriate name might be the "Abortive Entoloma". The strange "aborted" forms have tissues of both *Entoloma* and *Armillaria* and remain enigmatic to this day. More detective work is needed.

Entoloma abortivum
photo: Vello Soots

Entoloma abortivum
photo: Vello Soots

Gilled Mushrooms: *Pleurotus* (Oyster Mushroom)

Many people are familiar with Oyster mushrooms from the cultivated varieties sold in the grocery store. There are several species of Oyster mushrooms in the wild that cannot be distinguished from each other morphologically. DNA studies at the ROM have recently shown that there are at least two species of Oyster mushrooms in Ontario, *Pleurotus populinus* and *Pleurotus pulmonarius*, whereas the presence or not of *Pleurotus ostreatus* is still unclear.

Oyster mushrooms can be seen in city yards and parks growing on dead trees and rotting logs. They first appear in late spring, but are more commonly found in the fall. They have shelving, creamy white to grayish white caps with almost no stalk. As the common name suggests, the caps are typically shell shaped and can be up to 10-20 cm across.

Pleurotus species
photo: Vello Soots

Hypsizygus tessulatus

Hypsizygus tessulatus is a parasitic fungus, somewhat similar in appearance to *Pleurotus* species, but it has a distinct stalk and may grow singly or in clusters, often high in the crotch of a tree. It can be found in the late summer and fall on Manitoba maples and other deciduous trees growing in Toronto parks and ravines.

Hypsizygus tessulatus
photo: Umberto Pascali

Gilled Mushroom: *Volvariella bombycina*

Volvariella bombycina is a spectacular white mushroom which fruits from wounds in deciduous trees or from crotches high up in their branches, from summer through fall. It is quite rare, but some beautiful examples of this mushroom were found recently growing on a downtown maple. When it first appears, it looks a bit like an egg growing out of the tree. Soon the white cap of the mushroom breaks through the membrane of the "egg" from within and expands to as wide as 20 cm, leaving a sac-like volva at the base of the stalk. The striking white cap has a silky finely-hairy surface and the gills are at first whitish, but, as the salmon pink spores develop and fall, the gills take on a pinkish hue. Unless the "egg" was pointing straight up, the stalk will be curved so that the gills will point straight down and the mature spores can be discharged to be blown away by the wind.

Volvariella bombycina
photos: Anthony Wright

This mushroom was collected and deposited with the Royal Ontario Museum Fungarium, which houses one of North America's largest collections of fungi. These collections are critical to our understanding of fungal biodiversity in Canada and around the world.

bbc.botany.utoronto.ca/ROM/TRTCFungarium/home.php

Volvariella bombycina
photo: Simona Margaritescu

Gilled Mushroom: *Hygrocybe* (Waxy Cap Mushroom)

Mushrooms in the genus *Hygrocybe* are mostly small and colourful. They grow on the ground, often in wooded areas, in the late summer and early fall. They are commonly called Waxy Caps (or Waxcaps) because of their wax-like appearance and feel when bruised between our fingers. The genus consists of many species that are difficult to tell apart.

Hygrocybe species
illustration: Hillary Hatzipetrakos

Hygrocybe miniata is one of several red species which can be found in the Toronto area. It may grow singly or in small clumps. Caps are 1-3 cm across and the stalk is the same bright red colour as the cap.

Hygrocybe conica has a red conical cap, 2-5 cm across, and a orange or yellow stalk. As the mushroom ages, the cap colour fades to orange or yellow. Wherever this mushroom is touched or bruised it turns quickly black. The pointed shape of the cap and this blackening reaction may be the reason for its common name of Witch's Hat.

Hygrocybe chlorophana is one of several yellow species which may be found locally. Caps are 2-6 cm across and may vary in colour from yellow to yellow-orange. The stalk is similar in colour to the cap.

Hygrocybe miniata
photo: Vello Soots

Hygrocybe conica
photo: Vello Soots

Hygrocybe chlorophana
photo: Vello Soots

Gilled Mushroom: *Russula*

Mushrooms in the genus *Russula* are generally a colourful group. The name *Russula* means reddish and reflects the number of species with red caps. Caps can range from 4-20 cm across depending on the species. Convex at first, the cap flattens with age and often becomes depressed in the centre. In many species the gills, and often the stalk as well, are white. A key characteristic of *Russulas* is brittleness. If you run your finger along the gills, they will crumble rather than bend, and the stalk will snap like a piece of chalk.

Russulas are found in the forest or other wooded areas as they are dependent on a close relationship with the roots of trees. They prefer moist areas, and are mainly seen in the summer and early fall.

Russulas are a favourite food for slugs which can often be found nibbling on the cap or gills. Red squirrels also like *Russulas* and will pick them and hang them up in trees to store them.

Russula emetica
photo: Vello Soots

Russula emetica has a rosy to bright red cap, which is slippery when wet and keeps its shiny appearance even when dry. It is often found growing in moss.

Russula paludosa has an orange-red cap which is sometimes lighter coloured in the centre and is slimy when wet. It grows under conifers.

Russula claroflava has a yellow cap and cream coloured gills, and its flesh turns grey when cut or bruised. It grows under hardwoods.

Russula paludosa
photo: Vello Soots

Russula claroflava
photo: Vello Soots

Gilled Mushroom: *Lactarius* (Milk Mushroom)

The most notable characteristic of mushrooms in the genus *Lactarius* is that they bleed a milky fluid or latex when cut. Because of this, they are commonly known as milk mushrooms. The latex may be one of several different colours, providing an important characteristic for identifying the particular species. Caps can range from 2 to 15 cm across depending on the species. When young, the edge of the cap may be rolled under, but as the mushroom ages, the edge of the cap spreads out flattening it. In some species the cap may become depressed in the centre, while in others the cap eventually becomes inverted like an umbrella blown inside out by the wind. *Lactarius* mushrooms have a sturdy central stalk that is usually similar in colour to the cap.

These species are all mycorrhizal and so are most likely to be found in wooded areas in the late summer and fall.

Lactarius indigo
photo: Umberto Pascali

Lactarius thyinos
photo: Vello Soots

Lactarius thyinos is a yellowish orange colour and is one of several species which have orange latex. Although not common, this mushroom may be found locally under conifers, especially cedars.

Lactarius indigo, as its name suggests, is blue when young, becoming grey-blue with age. The latex is dark blue. *Lactarius indigo* is usually found in mixed woods, and though not common, is exciting to find because of its unusual colour.

Lactarius vinaceorufescens is one of several species that have latex which is white at first, changing to yellow when exposed to the air. This mushroom is buff to cinnamon-pink in colour and stains dark red, especially on the gills. In fact, *vinaceorufescens* means "becoming wine red". It grows under conifers, especially pines.

Lactarius vinaceorufescens
photo: Vello Soots

Confusing Look-alikes

Lactarius deceptivus and *Russula brevipes* look remarkably alike. Both have large white somewhat funnel-shaped caps and short white stalks. The species epithet *brevipes* means short foot. Perhaps the *Lactarius* species is called *deceptivus* because it deceives us into thinking it might be *Russula brevipes*. Since *Lactarius* mushrooms have latex, however, and *Russulas* do not, you should be able to tell these two mushroom species apart by breaking the flesh and looking to see if it exudes a milky white fluid.

Lactarius deceptivus
photo: Vello Soots

Russula brevipes
photo: Vello Soots

Hypomyces lactifluorum (Lobster Mushroom)

Hypomyces lactifluorum is a spectacular parasitic fungus which uses another mushroom as its food source. The host mushroom is a *Russula* in the group of *Russula brevipes*. The attack by the parasite deforms the host, making it appear a striking orange or orange-red colour, and causing it to form mere ridges instead of normal gills.

The tiny fruiting bodies of the parasite are just under the rather hard pimpled surface of the colourful cap, but you will need a hand lens to see where they open to the surface. Because of the bright orange-red colour, mushrooms which have been attacked by this parasitic fungus are commonly called Lobster Mushrooms.

Hypomyces lactifluorum
photo: Vello Soots

Hypomyces lactifluorum
illustration: Robert Gait

Asterophora lycoperdoides

Asterophora lycoperdoides is a parasitic fungus which attacks and grows on old *Russula* or *Lactarius* caps. This mushroom's roundish caps can be up to 2.5 cm wide, and they grow on the surface of its decaying host. When mature they will be covered with a brown powdery coating making them look a little like small puffballs.

Favoured hosts for *Asterophora lycoperdoides* are a group of *Russula* species which blacken naturally as they age and are difficult to distinguish from one another, including *Russula nigricans*, *Russula dissimulans*, *Russula densifolia* and *Russula albonigra*.

Blackening *Russula*, probably *Russula albonigra*
photo: Vello Soots

Asterophora lycoperdoides
photo: John Sparling

Gilled Mushroom: *Mycena*

Many of the small mushrooms you will see growing in the Toronto area during the summer and fall are currently in the genus *Mycena*, but some will undoubtedly be reassigned to other genera as a result of future DNA research. Their caps can be as large as 5 cm across, or only a few millimetres across, and their stalks are thin. *Mycenas* are decomposers and can be found growing on all sorts of woody debris, reducing it to essential elements to enrich the soil. Some grow in clusters, some are quite colourful, but all will have a bell-like or conical cap and a white spore print. Putting a species name to a specimen with the naked eye is often impossible. If the specimen has the odor of radish, iodine or bleach this may be helpful towards identifying the species. Some species are very fussy and will only grow on certain kinds of debris.

The bright orange colour of *Mycena leaiana* is sure to catch the eye. This mushroom grows in clusters on rotting logs and stumps.

The cut flesh of a few *Mycenas* oozes a thick liquid or latex. *Mycena haematopus* oozes a blood-red coloured liquid, especially from the base of the stem, when cut or crushed. The cap is reddish -brown and scalloped at the edge. This species is a favourite host of the mould parasite *Spinellus fusiger* which radiates very thin stalks from the cap with minute spore packages at the tip of each.

Mycena haematopus
photo: Audrey Harris

Mycena leaiana
photo: Umberto Pascali

Spinellus fusiger on Mycena
photo: Umberto Pascali

Gilled Mushroom: *Cortinarius*

The genus *Cortinarius* comprises over 2,000 species, of which most have been described from temperate regions of the northern hemisphere. Members of this genus are easily identified from the presence of a cortina, a cobwebby veil which can be seen attached to the edge of the cap on young specimens. In mature specimens, remnants of the veil stick to the stalk (and sometimes also to the edge of the cap) and display a rusty-brown colour from the spores collected as they fell from the maturing gills. The smallest species have caps only 1 cm across, while larger species have caps 8-12 cm across. Most species have smooth dry caps, but others have caps that are hairy or slimy. Most of these mushrooms display brown, red-brown or violet tones in their coloration. Identification of *Cortinarius* species is extremely difficult even for professional mycologists.

Cortinarius species are mycorrhizal with conifers, but also sometimes with hardwoods. They are often overlooked in the urban environment because they will usually only be found by venturing into wooded areas. A few of these mushrooms may appear in the late summer, but they are most common in the fall. In Toronto, two recognizable species are *Cortinarius alboviolaceus* and *Cortinarius armillatus*.

Cortinarius alboviolaceus is pale lilac when young, with the violet tones often most evident in the gills. The is pale lilac when young, with the violet tones often most evident in the gills. The caps may be 3-10 cm across and often fade to almost white with age. The gills turn brownish as the spores mature. The sturdy stalk is often enlarged at the base.

Cortinarius armillatus is reddish-brown, with caps 5-12 cm across. The stalk is paler and enlarged at the base. This mushroom is sometimes called the Banded Cort because of the bright red-brown bands of colour which encircle the lower part of the stalk. These bands should not be mistaken for the cortina, which will be found higher up on the stalk.

The cortina is a cobwebby veil
photo: Vello Soots

Cortinarius alboviolaceus
photo: Vello Soots

Cortinarius armillatus
photo: Vello Soots

Gilled Mushrooms: *Galerina marginata*

Galerina marginata is often called the Deadly Galerina because it is poisonous and contains the same potentially fatal toxins found in *Amanita virosa*. This little brown mushroom grows in clusters on rotting wood. It is very common in the fall, but can also be found in the late spring and summer. The caps are tan to dark brown and usually less than 5 cm in diameter. The stalks are slender with a tiny fragile ring. In many field guides this mushroom is called *Galerina autumnalis*, but DNA research has shown that what was once thought to be two separate species is really one, and the earlier name, *Galerina marginata*, has prevailed.

Galerina marginata
photo: Vello Soots

Hygrophoropsis aurantiaca (False Chanterelle)

Hygrophoropsis aurantiaca is one of several mushroom species which are sometimes mistaken for chanterelles. While the general size, shape and colour of this mushroom may be similar to a chanterelle, it is not usually as uniform in colour. The centre of the cap of *Hygrophoropsis aurantiaca* may be a deeper colour, or the stalk and gills more orange in colour than the cap. More importantly, the underside of the cap has true gills rather than the folds or ridges of the chanterelle. The False Chanterelle may grow on rotten wood, while true chanterelles grow on the ground.

Hygrophoropsis aurantiaca
photo: Vello Soots

Chanterelle: Common Yellow Chanterelles in *Cantharellus*

The common chanterelle is a uniform golden yellow colour with caps 2-10 cm across. The underside of the cap has folds or ridges which run part way down the stalk instead of true gills. Some people claim it has a distinctive odour like apricots. It grows on the ground in wooded areas and may be found throughout the summer, but is most likely to be seen in August.

Although identified in North American guidebooks as *Cantharellus cibarius*, a species described from Europe, ongoing DNA research indicates that this species may be absent from North America. The presence of at least two species of yellow chanterelles has been confirmed in Ontario, *Cantharellus roseocanus* and *Cantharellus formosus*, but they are difficult to distinguish from each other based on morphology alone.

Chanterelles are sought after, but are not common in our urban environment. When in season, chanterelles brought in from elsewhere may be found in Toronto grocery stores and markets.

Cantharellus species
illustration: Robert Gait

Cantharellus species
photo: Vello Soots

Cantharellus species
photo: Vello Soots

Gilled Mushrooms related to Boletes

DNA research has revealed that some mushrooms with gills are actually more closely related to boletes than to other gilled mushrooms. Two of these are *Paxillus involutus* and *Tapinella atrotomentosa* (formerly called *Paxillus atrotomentosus*). Both may be found in the Toronto area during the summer and fall.

Paxillus involutus is rather nondescript, with a light brown cap, depressed in the centre, and gills which run down the stalk. It grows under a variety of tree species and can be found in both forest and urban settings.

The most distinctive feature of *Tapinella atrotomentosa* is its thick, velvety, dark brown stalk. The brownish cap is typically irregular in shape and the stalk off-centre. This mushroom grows on rotting conifer stumps or buried wood.

Paxillus involutus
photo: Vello Soots

Tapinella atrotomentosa
photo: Vello Soots

Boletes: *Tylopilus felleus* (Bitter Bolete)

Tylopilus felleus has a smooth tan coloured cap 5-25 cm across. The pore surface on the underside of the cap is whitish at first, but turns pinkish brown as the spores mature. The sturdy buff coloured stalk may be up to 15 cm long and may be enlarged at the base. A distinctive brown net-like pattern or reticulation may be seen on the stalk especially near the top. Like most boletes, *Tyopilus felleus* is mycorrhizal, mostly with the roots of coniferous trees. It is usually found in late summer.

Tylopilus felleus is commonly known as the Bitter Bolete because of its very bitter taste. This mushroom is sometimes mistaken for *Boletus edulis*, the King Bolete, also known as cep or porcino, which looks somewhat similar, but has a white reticulation on the stalk.

Boletus edulis
illustration: Robert Gait

Tylopilus felleus
photo: Vello Soots

Boletus edulis
photo: Vello Soots

Boletes:
Suillus granulatus

Suillus granulatus has a mottled tan to rusty brown cap, 5-15 cm across, and a yellowish pore surface. The surface of the cap is slimy. The stalk is covered with tan coloured granules or dots, especially near the top.

Suillus granulatus is mycorrhizal with coniferous trees, especially pine and spruce. It is common and widespread, and may be found locally throughout the summer and early fall.

Suillus granulatus
photo: Vello Soots

Suillus luteus (Slippery Jack)

Suillus luteus, as its common name of Slippery Jack implies, has a very slimy cap surface. The yellow-brown to red-brown cap is typically 4-12 cm across. The underside of the cap has pale yellow pores that become darker with age. There is a ring around the stalk, the remnants of a membrane that covers the pore surface when the mushroom is young.

Suillus luteus is mycorrhizal and grows mainly under pines. It may be found locally in the late summer and fall.

Suillus luteus
photo: Vello Soots

Bolete: *Boletinellus merulioides* (Ash Bolete)

Formerly known as *Gyrodon merulioides*

Boletinellus merulioides has a yellow-brown cap, 7-20 cm across, which tends to turn upward with age, and a short off-centre stalk. The shape of the cap is irregular, often kidney-shaped, and the surface has a somewhat leathery appearance. The dark yellow angular pores are arranged in rows that radiate outwards from the stalk, somewhat like the gills on gilled mushrooms. DNA research has confirmed that this bolete is closely related to gilled mushrooms in the genus *Paxillus*.

Boletinellus merulioides is commonly called the Ash Bolete because it is only found under ash trees. Unlike most other boletes, it is not mycorrhizal. It is in a symbiotic relationship, not with the ash tree, but with the ash aphids which live around the tree. The mycelium of the fungus forms underground structures called sclerotia, to help it survive harsh winter conditions. The aphids burrow inside the sclerotia, where they are protected. In exchange, the aphids secrete honeydew which nourishes the fungus.

Boletinellus merulioides
photo: Vello Soots

Boletinellus merulioides
photo: Vello Soots

Polypore: *Piptoporus betulinus* (Birch Polypore)

Piptoporus betulinus grows only on dead or dying birch trees or birch logs. It has a distinctive kidney-shaped cap 10-25 cm across which, when fresh, is fairly smooth, buff to pale brown on top and whitish on the underside. It is an annual polypore which grows from spring until fall and may last through the winter.

Ötzi, the Iceman

In 1991, the well preserved natural mummy of a Neolithic man was found in a glacier in the Tyrol near the border between Italy and Austria. Among his possessions Ötzi carried two kinds of mushroom, the polypores *Piptoporus betulinus* and *Fomes fomentarius*. This suggests that already more than 5,000 years ago people made use of mushrooms for more than just food.

There has been much speculation about why these particular mushrooms were so important to Ötzi that he carried them with him, but most likely they were used for medicinal purposes and as fire starters. *Fomes fomentarius* was probably the better of the two for starting fires, and when pounded into a felt may even have been used to transport fire from place to place. It may also have had medicinal uses, especially as a styptic to stop bleeding. *Piptoporus betulinus* reportedly has antibacterial properties and may have been used as a remedy for intestinal parasites or other ailments.

Piptoporus betulinus
photo: Vello Soots

Piptoporus betulinus
photo: Patricia Burchell

Polypore: *Fomes fomentarius* (Tinder polypore)

Fomes fomentarius is a woody hoof-shaped polypore commonly found growing on hardwoods, especially birch. The top of the cap is hard and uneven with zones of grey and brown, and the pore surface underneath is brownish. Caps may be up to 20 cm wide, with the height often exceeding the width.

Fomes fomentarius is a perennial polypore which overwinters and continues to grow from year to year, so it can be found year round. Like other polypores, the orientation of the fruiting bodies may be different depending on whether they are growing on a standing tree or a fallen log, since they grow with the pore surface facing the ground to facilitate the spread of their spores.

The common name Tinder polypore derives from the use made of *Fomes fomentarius* for starting fires. Part of this fungus can also be pounded into a felt-like substance called amadou, which, as well as being highly flammable, is very absorbent. Its water absorbing ability has made it popular with fly fishermen for drying out artificial flies.

Fomes fomentarius
photo: Vello Soots

Fomes fomentarius
photo: Patricia Burchell

Polypore: *Ganoderma*

Ganoderma is a mushroom that delights hikers and pedestrians alike with its large and often lacquered appearing bracket-like growth from the trunks of old and dying trees. Just as the City of Toronto got its name from a Huron word meaning "to be plenty" or "meeting place", *Ganoderma* is a name derived from two Greek words. Gano derives from the Greek word Ganos, and denotes a shiny quality, while derma refers to skin. In Toronto, there are two species of *Ganoderma* commonly found.

Ganoderma tsugae is a red or reddish brown bracket fungus with a distinct "shiny skin" appearance. It commonly grows from conifer trees like hemlock. It is annual in its growth and only the rotting remains may still be found at the end of the winter season. The cap is up to 30 cm in diameter, fan-shaped or hemi-spherical, and it may have a short stalk as well. It has a cork like feel, a white poroid underside, and may be present singly or in a cluster.

Another striking species often encountered is *Ganoderma applanatum*, commonly known as the Artist's Conk. Similar to *Ganoderma tsugae* in size and shape, *Ganoderma applanatum* is distinct because it is tan to grey in colour, less lacquered in appearance, and is perennial in its growth. It is typically found on hardwood trees like maple, but also less commonly on some conifer trees. The poroid underside of this mushroom also has a wonderful characteristic that captures the imagination of young and old alike – it serves as a natural sketch pad for artwork and writing.

Ganoderma tsugae
photo: Vello Soots

Ganoderma applanatum
photo: Vello Soots

Ganoderma applanatum
photo: Patricia Burchell

Polypore: *Laetiporus sulphureus* (Chicken of the Woods)

Polypores are sometimes called “Bracket fungi” because they grow from the sides of trees or stumps in overlapping shelves. *Laetiporus sulphureus* is one of the largest and most colourful, with its bright yellow-orange caps. The pore surface on the underside of the caps is a distinctive sulphur yellow colour.

Laetiporus sulphureus grows on hardwoods, especially oaks, during the summer and early fall. It is an annual polypore, but may reappear on the same stump or log for several years. When found on a living tree, it is a sign that the tree is in poor health, as this fungus causes “heart rot”, decaying the wood in the centre of the trunk and branches.

Laetiporus sulphureus
photo: Umberto Pascali

Laetiporus sulphureus
photo: Umberto Pascali

Polypore: *Trametes versicolor* (Turkey Tail)

Trametes versicolor can be found year round almost anywhere there are hardwood logs or stumps to decompose. Its overlapping caps are thin and tough and may vary in colour, but are always "zonate" with contrasting concentric bands of colour. This banding may be what suggested its common name of Turkey Tail. The top of the cap may be somewhat velvety in texture and the underside is whitish, with pores almost too tiny to see with the naked eye.

Trametes versicolor
photo: John Werner

Trametes versicolor
photo: Patricia Burchell

Did you know?

Mushrooms can be used to create dyes to use for dyeing natural fabrics like wool and silk. The colour produced depends on the mushroom and the dyeing process used.

Many polypores, including *Trametes versicolor* and *Phaeolus schweinitzii*, are a good source of dyes, but other kinds of mushroom can also be used.

Polypore: *Phaeolus schweinitzii* (Dye Maker's Polypore)

Phaeolus schweinitzii is more or less circular and flat, with overlapping lobes arising from a short central stalk. When very young, the edge of the cap is bright yellow, but the colour fades as the mushroom matures. The top of the cap is somewhat velvety in texture, with concentric bands in various shades of brown which darken as the mushroom ages.

Phaeolus schweinitzii grows on the ground from the buried roots of coniferous trees, or occasionally on conifer stumps or logs. It is often seen with bits of grass or debris sticking up through it. As it develops, the fruiting body grows around whatever material it encounters. This mushroom is commonly known as the Dye Maker's Polypore because it can be used to make fabric dyes.

Phaeolus schweinitzii
photo: Umberto Pascali

Phaeolus schweinitzii
photo: Vello Soots

Phaeolus schweinitzii
photo: Vello Soots

Phaeolus schweinitzii
photo: Vello Soots

Polypore: *Grifola frondosa* (Hen of the Woods)

Grifola frondosa is composed of numerous brown wavy overlapping caps attached to a thick branching central stalk. A single clump can be as much as 60 cm or more across and weigh from 2-10 kg. This mushroom grows at the base of hardwoods, especially large oak trees, in the late summer and fall. It may reappear around the same tree year after year. Perhaps its common name came about because some people thought is looked like a large hen with ruffled feathers sitting by the tree.

Grifola frondosa is a white-rot fungus which feeds off the roots of the tree and causes decay at the base of the trunk and in the roots. It doesn't kill the tree, but it does weaken it, so although the tree may survive for many years it is more susceptible to storm damage.

Grifola frondosa
photo: Umberto Pascali

Grifola frondosa
photo: Vello Soots

Puffball: *Calvatia gigantea* (Giant Puffball)

Puffballs and some other fungi produce their spores on the inside of their ball-like fruiting bodies, rather than on the outside. The inside of a true puffball is at first white and solid, but at maturity it has become a powdery mass of dark coloured spores.

The Giant Puffball, *Calvatia gigantea*, is more or less round and can grow to be 50 cm across or more. It has a smooth thin outside wall, initially white but becoming cream or tan with age. It fruits on the ground, joined to its underground mycelium with a root-like mycelial cord. The spore case will eventually break open to release its spores. Falling rain or animal feet hitting the mature ball will cause the spores to puff out into the air to be borne away.

Calvatia gigantea
photo: Vello Soots

Calvatia gigantea is the largest of several species of puffball which can be found in the Toronto area in late summer or early fall. It is often found in fields, but in some years may also be quite common in grassy or lightly wooded areas like urban parks and yards.

Calvatia gigantea
photo: Nick Trainos

Puffballs:

Lycoperdon perlatum (Gem-studded Puffball)

Lycoperdon perlatum, usually fruits in groups on the ground and can be 6 cm or more tall. It has a stalk-like sterile base and a rounded upper part where the spores are produced. It is white, aging brownish, and features on its surface little conical points which may rub off. Its thin skin breaks open as a hole at the top to release the spores. It fruits in summer and fall.

Lycoperdon perlatum
photo: Vello Soots

Lycoperdon pyriforme (Pear-shaped Puffball)

The Pear-shaped Puffball, *Lycoperdon pyriforme*, grows in groups, usually on well-rotted wood, and can be 5 cm or more tall. It is normally shaped roughly like a pear. White when young, it turns brownish and its spores are released through a hole which opens up at its top. The small rough scales or warts initially on its surface may all wear off. It fruits in summer and fall.

Lycoperdon pyriforme
photo: Vello Soots

Earthball: *Scleroderma citrinum*

This round or somewhat flattened earthball, *Scleroderma citrinum*, has a thick skin, like a rind, and can be up to 10 cm across. It is light brown, with a rough scaly or warty surface. Also known as the Pigskin Poison Puffball, it is not really a puffball at all. While true puffballs are white inside when young and fresh, earthballs are not. The solid mass inside *Scleroderma citrinum* is dark grey to purplish black even in young specimens. It will become powdery as the spores mature.

Scleroderma citrinum fruits in the late summer and fall, on or around rotting stumps. Although it is often mistaken for a puffball, it is not even a close relative. DNA research has shown that it is related to the boletes, whereas true puffballs, such as those in the genera *Calvatia* and *Lycoperdon* are more closely related to gilled mushrooms.

Scleroderma citrinum is dark inside
photo: Vello Soots

True puffball *Calvatia cyathiformis* is white inside when young
photo: Patricia Burchell

Earthstar: *Geastrum*

Mushrooms in the genus *Geastrum* are commonly known as earthstars. They grow on the ground in the summer and fall. They are not as common as puffballs, but they both have rounded ball-like spore cases. When mature, the outer covering of an earthstar fruiting body opens up into rays or arms which curve down to the ground and appear to support the spore case. Despite their superficial resemblance puffballs and earthstars are not closely related.

Geastrum triplex is tan or brownish, 5-10 cm across, and its spores are dispersed through a pore-like mouth, bordered by a circular striate zone, opening at the top of the spore case. The species name *triplex* reflects its three-part mature appearance: the rounded spore case, the saucer shaped collar underneath, and the rays or arms below pointing down to the ground.

Geastrum saccatum is buff to tan and looks somewhat similar to *Geastrum triplex*, but it is much smaller and lacks the distinctive collar.

Geastrum species
illustration: Robert Gait

Geastrum triplex
photo: Vello Soots

Geastrum saccatum
photo: Robert Gait

Cup Fungi:
Bisporella citrina (Lemon Drops)

Bisporella citrina is very small (only up to 3 mm wide), but its bright lemon-yellow colour makes it quite visible in summer and fall when it grows in clusters, sometimes by the hundreds, on rotting wood. Each individual fruiting body is shaped like a tiny short-footed shallow cup or saucer. It is on the inside surface of such cups that Cup Fungi in general form their spores for eventual dispersal.

Bisporella citrina
photo: Patricia Burchell

Scutellinia scutellata (Eyelash Cup)

Scutellinia scutellata is a little bright red to orange cup, up to 1.2 cm across, with a noteworthy feature at the margin of the cup that gives it its common name. The cup is fringed all around with short stiff black hairs that look like eyelashes. It may be found on damp rotten wood or the ground nearby, summer and fall, scattered or in groups.

Scutellinia scutellata
photo: Raymond Cicin

Sarcoscypha austriaca (Scarlet Cup)

Sarcoscypha austriaca appears in spring and early summer, as a deep cup up to 5 cm wide, scarlet red on the inside and whitish outside. It has no stalk, or only a rudimentary one, and it grows in deciduous woods on sticks or buried wood.

Sarcoscypha austriaca
photo: Umberto Pascali

Morels: *Morchella*

When mushroom lovers in Toronto think of spring they think first of morels, with their distinctive honeycombed caps. In northeastern North America morels are found only in the spring and in the Toronto area they are most likely to be seen in May, on the ground in wooded areas, or even in parks or yards.

Most of the morels found locally belong to species commonly referred to as Yellow Morels and Black Morels. Yellow Morels typically have a yellow-brown conical cap, which is honeycombed with irregularly shaped pits separated by paler ridges, and a buff coloured stalk. They are hollow inside and quite brittle in texture. Individual specimens are usually 10-15 cm tall, but can be larger. Black Morels are similar in appearance to Yellow Morels, but typically darker in colour and the ridges on the cap are dark. They are usually found earlier in the season than Yellow Morels.

DNA research has shown there are more distinct species of morels than was previously thought and that some cannot be reliably distinguished in the field. On the other hand, some colour variations, for example, do not necessarily indicate a separate species.

In many guidebooks Yellow Morels are identified as *Morchella esculenta,* and Black Morels as *Morchella elata*, but new names are now being given to the North American species defined by DNA analysis. Until further research can be conducted on morel specimens found locally, it is difficult to be sure which of the newly described species occur in Ontario.

Yellow Morel
photo: Vello Soots

Black Morel
photo: Vello Soots

Yellow Morel
photo: Vello Soots

True morels are hollow inside

Yellow Morel
photo: Vello Soots

Gyromitra esculenta (False Morel)

Gyromitra esculenta is found in the spring and it is sometimes mistaken for a morel. The resemblance is superficial, however. The cap is convoluted and brain-like rather than pitted, and *Gyromitra esculenta* is not hollow inside like the true morel. Even though its Latin epithet *esculenta* means edible, this mushroom contains a dangerous toxin.

Gyromitra esculenta
photo: Vello Soots

Stinkhorns

If you have seen a freshly arisen stinkhorn, and experienced its foul smell, you will know why it is called a stinkhorn. It first appears just under or at the surface of the soil in the form of membranous "egg", connected to its underground mycelium by a thick mycelial cord. The casual observer is given no clue as to what is soon to happen. If the "egg" is cut open, however, the immature stinkhorn can be seen inside.

When conditions are right, and in the space of only a few hours, the slime-covered head and the rest of the stalk of the stinkhorn burst out of the "egg" to stand erect and invite the attention of the flies. The powerful smell of the sticky greenish-brownish slime is what attracts the flies, in hordes, to alight on and consume this sweet delicacy set out for them. When the slime has all been gobbled up, the flies depart, but they have now become messengers or delivery agents for the stinkhorn; they have walked on the slime, ingested it, and now they are carrying away the stinkhorn spores contained in the slime; they will deposit these spores in other places, perhaps to result in another generation of stinkhorns, for the benefit of another generation of flies.

Phallus impudicus may be up to 25 cm tall. This stinkhorn has a pitted head bearing the slime. The white stalk can be up to 3 cm thick, and the volva is whitish.

Phallus impudicus
photo: Vello Soots

Phallus ravenelii may be up to 20 cm tall, with a whitish stalk and a more-or-less smooth head beneath the slime.

Mutinus ravenelii is much smaller, only 5-10 cm tall, and sports a bright red slightly-swollen head beneath the slime. The stalk is often curved and only 1 cm or less wide. The volva may lie beneath the soil surface. In case you are wondering, Mutinus was a Roman phallic deity.

Stinkhorns are decomposers. They may be found among the leaf litter and woody debris on the forest floor, but they also grow well in the rich soil, mulch and wood chips found in gardens. They are most commonly seen in late summer and early fall.

Phallus ravenelii
photo: Madi Piller

Mutinus ravenelii
photo: Vello Soots

Bird's Nest Fungi

You will need good eyesight to spot these very small members of the fungal kingdom as they form little "nests" or "goblets", no larger than 1 cm wide by 1.5 cm tall, on woody or organic debris. These little nests initially have a thin cover on top which soon weathers away revealing what seem to be "eggs" resting in them. The "nests" are also called "splash cups" because rain falling into these cups will splash the "eggs" well clear of the nest. The "eggs" are in fact minute sacks filled with spores, and to help ensure that the spores find a new home nearby, suitable for germination, each sack is equipped with a special appendage - a minuscule long thin elastic cord, which enables the splashed-out "egg" to latch on to any woody debris that it may land upon.

We have several species of Bird's Nest Fungi in the Toronto area, fruiting in the summer and fall. A good place to look for them is on wood chips and mulch on gardens. The appropriate name for each kind depends on the form of the "nest" and the colour of the "eggs".

Cyathus striatus is distinguished by the striations which give it a striped appearance on the interior wall of the vase-shaped "nests" and its gray "eggs".

The fruiting bodies of *Cyathus stercoreus* are covered with a thin woolly light brown covering which opens to reveal a smooth gray interior and dark coloured "eggs".

Crucibulum laeve has creamy white coloured "eggs" in a light brown "nest". In the photograph, this mushroom is shown growing inside an old acorn cap.

Cyathus striatus
photo: Robert Gait

Cyathus stercoreus
photo: Robert Gait

Crucibulum laeve
photo: Madi Piller

Tooth Fungi

Some mushrooms have “teeth” or “spines” as their spore producing surfaces and have therefore been grouped under an informal label as Tooth Fungi. This does not imply that they are closely related to each other. Tooth Fungi are examples of what is known as convergent evolution, in which unrelated species have separately evolved similar features, in this case teeth, on which their spores are produced. The first depicted here, *Hydnum repandum*, is more closely related to the chanterelles, and the second, *Hericium americanum*, is related to the gilled genera *Russula* and *Lactarius*. If you find a toothed mushroom which is also gelatinous, you may wish to check under Jelly Fungi.

Hydnum repandum has spore-producing teeth under the cap and can be found on the ground under coniferous and deciduous trees from mid-summer to fall. The pale orange brown cap can be up to 15 cm wide, on a stalk up to 10 cm tall. It has firm flesh and a pleasant odour, but it is the teeth that inspired its common names of Hedgehog and Sweet Tooth.

Hericium americanum, commonly called Bear’s Head, has a spectacular white fruiting body, but no cap as such. Instead it sports several short branches from which long “teeth” dangle, point-down like icicles. It can be 25 cm high and 20 cm wide, or more, and may be found growing on deciduous trees and stumps in summer and fall. It turns yellowish, then brownish with age.

Hydnum repandum
photo: Vello Soots

Hericium americanum
photo: courtesy of the Mycological Society of Toronto

Coral Fungi

Corals on the sea floor often have tubes, sometimes with branches, arising from a common base. If a fungus looks vaguely similar it may be thought of loosely as a Coral Mushroom. Spores are generally produced from the entire surface area of these fungi.

Artomyces pyxidatus (Crown Coral) has many branches growing up to 12 cm tall from a common base, with the tips of the branches ending in a little crown-like cup. It starts out whitish to pale yellow, and may have pinkish or buff tones with age. It may be found on dead wood from June to September.

Ramaria stricta (Straight-branched Coral) fulfills the promise of its name (*stricta* means straight) with its pointed-tipped branches being very straight and densely packed. The white mycelium from which it grows is often very visible at its base. Up to 10 cm tall and just as wide, it appears in summer and fall on very rotten wood.

Clavulinopsis fusiformis (Spindle-shaped Coral) usually takes the form of a dense cluster of thin yellow cylinders, up to 10 cm tall, more or less pointed at their tips and narrower at their fused base. They grow on the ground or among grasses in woods.

Artomyces pyxidata
photo: Umberto Pascali

Ramaria stricta
photo: Vello Soots

Clavulinopsis fusiformis
photo: Vello Soots

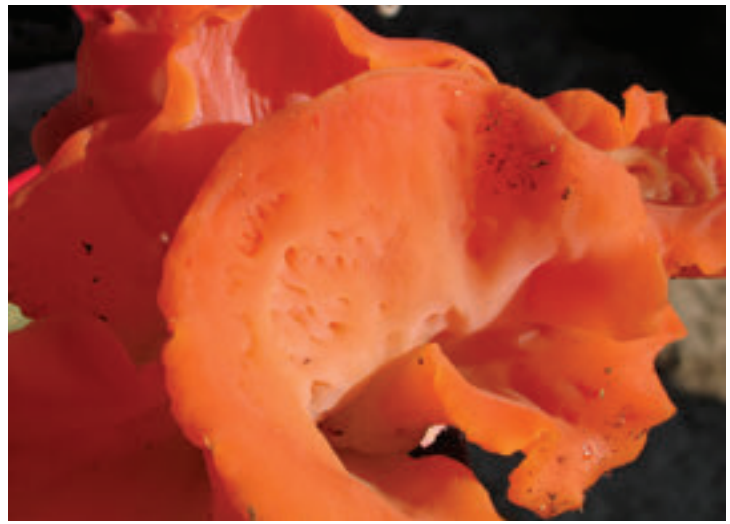
Jelly Fungi

The jelly-like feel of several fungi is an informal reason to put them under one roof as Jelly Fungi, but just because they all feel gelatinous does not mean that they are related in an evolutionary sense. They take many varied forms.

Dacrymyces chrysospermus (Orange Jelly Fungus) forms little gelatinous lobes less than 2 cm tall on conifer logs and stumps. Its orange to orange-yellow colour makes it quite conspicuous.

Guepinia helvelloides (Apricot Jelly Fungus) is a beautiful pink to reddish-orange funnel-like wonder up to 10 cm tall with a semi-gelatinous feel to it. You may find it in summer and fall in conifer woods growing on the ground or on well-rotted wood.

Pseudohydnum gelatinosum (Toothed Jelly Fungus) has caps up to 5 cm wide, whitish, greyish or brownish, and the stalk, if any, is lateral. The white underside of the cap is covered with short and translucent spines or teeth. It is found in late summer and fall on conifer wood.



Guepinia helvelloides
photo: John Werner

Dacrymyces chrysospermus
photo: Patricia Burchell

Pseudohydnum gelatinosum
photo: Umberto Pascali

Other fungi:
Xylaria polymorpha
(Dead Man's Fingers)

This species can be up to 8 cm tall, by 2 cm wide, and grows in groups at the base of trees or rotting stumps. When these hard "fingers" first appear in the spring they are covered with a white/greyish powder (actually asexual spores) but later in the year they are black. The inside flesh is white and the spores are dispersed from small sacs through very small holes in the exterior rough surface.

Xylaria polymorpha
photo: Carl de Boer

Leotia lubrica
(Common Jelly Baby)

Leotia lubrica is small and gelatinous. It is yellow to yellow brown, only up to 5 cm tall, with an irregular lobed head up to 2 cm across on a whitish or yellowish stalk, and is found on the ground in groups or clusters in summer and fall, especially during wet periods. If you find something similar with a green head, it is probably *Leotia viscosa*.

Leotia lubrica
photo: Madi Piller

How to Learn More About Mushrooms

Suillus americanus
illustration: Robert Gait

Mushrooms can be both beautiful and fascinating. At least 500 species of mushrooms may be found in the Greater Toronto Area, including more than 300 species of gilled mushrooms. Some are quite common and can be found almost every year, but others may appear only occasionally (when the conditions are exactly right), or only at certain times, or in very specific habitats. You may never even guess the fungus is there in the ground, wood or other substrate until a mushroom appears.

There are many books and electronic resources available to help you learn more mushrooms, some of which are listed on page 68 of this booklet. The best way to learn more about mushrooms, however, is to go out in the field with people who know when and where to go, and who can help you learn what features of the mushrooms you find are important for identification. The Mycological Society of Toronto (MST) provides opportunities for members to share their knowledge and experience, and to learn from guest experts and local mycologists.

MST was founded in 1973 by students of University of Toronto mycologist Dr. Roy Cain. Its aim is to stimulate interest in and appreciation of mushrooms and other fungi and their role in nature. During the spring and fall mushroom seasons field excursions led by member volunteers are offered in the Greater Toronto Area. From October to April guest speakers provide informative presentations on a variety of topics related to mushrooms and other fungi. From time to time, MST also offers workshops and a beginner course in mushroom identification.

To learn more about MST visit the website at www.myctor.org.

A Chronology of the Toronto Mushroom Year

Winter

It is rare to find any fresh mushrooms in Toronto in the winter. Old polypores from the previous season, especially the woody ones, can be found on trees and stumps, but only a few perennial polypores actually over-winter. The remains of small puffballs or club fungi like *Xylaria polymorpha* (Dead Man's Fingers) may also be seen on rotting logs, and old earthstars may sometimes be found if the ground is bare, during a winter thaw or after the snow is gone. Most mushrooms, however, last only a few days or weeks, and shrivel up or rot away before winter begins.

Ganoderma species
illustration: Robert Gait

Spring

The rains of April and May herald the start of the spring mushroom season. Morels are the signature mushroom of spring. In Ontario, they fruit only in the spring and are most plentiful in May. Look on the ground for the characteristic honeycombed pattern of its cap poking up through the leaf litter as you walk through the woods. When you find one, if you sweep aside the litter you may be lucky enough to expose more. Spring also brings the cup fungi. One of the earliest to appear is *Sarcoscypha austriaca* (Scarlet Cup), which fruits on rotting sticks and, like morels, is found only in the spring. Other cup fungi in a variety of colours—orange, yellow, brown and black—begin fruiting in the late spring on logs and on the ground. Some can be several centimetres across, while others are tiny and need to be viewed through a hand lens to appreciate all their details. Although cup fungi first appear in the spring, some species may be found throughout the summer as well, and even into the fall. The diversity of gilled mushrooms is less in the spring than in the summer and fall. *Coprinellus micaceus* (Mica Cap) and *Agaricus bitorquis* are two early species which may be found in Toronto yards and parks beginning in the late spring, along with the first fruitings of *Pleurotus* (Oyster Mushroom). Many of the polypores, or bracket fungi, found in the spring are actually left over from the previous year. You may, however, see the characteristic saddle shape of *Polyporus squamosus* (Dryad's Saddle) sprouting from hardwood trees, stumps or logs in the late spring. One of the most distinctive and common polypores in the Toronto area, it can also be found in the summer and early fall, and has been designated in this booklet as Toronto's Un-official Mushroom.

Morel
illustration: Hillary Hatzipetrakos

Summer

Summer is an unpredictable time for mushroom hunting. If it is hot and dry, few mushrooms will be found; however, rainy weather will encourage the fungi to fruit. It can be expected, however, that the diversity of mushrooms will increase from month to month, with the greatest variety of types and species being found in late August and early September. Summer is the time when the distinctive *Coprinus comatus* (Shaggy Mane) usually makes its first appearance in Toronto yards. As the summer progresses, other gilled mushrooms in genera such as *Amanita* and *Agaricus* appear, and the warm weather Oyster Mushroom *Pleurotus pulmonarius*. Later come the colourful *Russulas, Lactarius* (Milk Mushrooms), *Hygrocybes* (Waxy Cap Mushrooms) and *Mycenas*, which will continue fruiting into the fall, as will *Armillaria* (Honey Mushroom), which can sometimes be found in great numbers growing in clusters at the base of dying hardwood trees. August is the peak time for boletes and chanterelles. Summer is the best time to look for puffballs, especially *Calvatia gigantea* (Giant Puffball), bird's nest fungi and stinkhorns. The fruiting bodies of many of the annual polypores, or bracket fungi, develop over the summer and can be spotted on logs, stumps and trees; for example, the colourful *Laetiporus sulphureus* (Chicken of the Woods).

Fall

The autumn rains bring a cornucopia of mushrooms. Many summer mushrooms continue to be seen, including, for example, Milk Mushrooms, Waxy Cap Mushrooms, Oyster Mushrooms, Honey Mushrooms and the smaller puffballs. By the time the leaves turn colour, however, there are few boletes or chanterelles still to be found. Coral fungi, Club fungi, Jelly fungi, Tooth fungi and gilled mushrooms in genera like *Lepista, Tricholoma*, and *Cortinarius* add to the diversity of species found in fall, and many polypores are at their best. In the late fall, after the first hard frost, the diversity of species begins to diminish, but cold loving species like *Flammulina velutipes* may still be found even after the first snow.

Pholiota squarrosa
illustration: Robert Gait

Local Policy Initiatives

City of Toronto

Protecting and enhancing the natural environment and biodiversity is a high priority for the City of Toronto. The Official Plan is the City's guiding land use planning document. It protects important natural areas and functions, supports biodiversity and requires that the natural environment be taken into account as part of our city building activities.

Toronto's natural heritage features and functions have been mapped and are identified as a natural heritage system on Map 9 of the Official Plan. Most of these areas are located within the extensive network of valleys and ravines that cross our City, along the shoreline of Lake Ontario and in Rouge Park, and are protected by zoning and land use designations. These areas provide habitat for a wide variety of native plants and animals and help sustain local biodiversity. When new development is proposed in or near the natural heritage system, the proposed development's impact must be evaluated and measures must be identified to protect the system, mitigate negative impacts and improve the system.

Good stewardship supports and enhances biodiversity. The Ravine and Natural Feature Protection Bylaw protects forests and valley slopes by regulating removal of trees and changes to grade. The City also undertakes a wide range of stewardship activities in parks and natural areas, often in partnerships with other agencies, institutions and community groups. Examples include control of invasive species in ravines and woodlands; naturalization programs; tree planting events; ecological enhancement of existing habitats; creation of new habitats such as wetlands and meadows; and restoration of rivers and streams.

The impact of the built environment on biodiversity and the natural environment is also being reduced. Toronto's *Bird-Friendly Development Guidelines* and the "Lights Out Toronto!" campaign identify building design and lighting strategies that reduce migratory bird deaths. The Green Roof Bylaw is creating green spaces on rooftops that support insects and some birds and have the potential for further biodiversity enhancements. The Toronto Green Standard, which all new development applications are required to meet, includes performance measures that help preserve the urban forest, encourage tree survival and growth, and ensure native species are planted. Collectively, all of these actions reduce the impact of our city building activities on the natural environment and help protect and increase biodiversity.

photo: Joanne Hamblin

Conclusion

If you find a wild trillium growing in the forest and you cut free its stem and flower, then you have done great harm to that plant. The flower dies in a vase in your home, and the roots perish beneath the ground in the forest.

Mushrooms, however, are not like plants in this respect. A mushroom is typically a relatively small and visible reproductive part of a much larger organism that dwells beneath the ground or tree bark unseen. Picking a mushroom is much more like picking an apple from a tree. Collecting a few fruits does not typically harm the tree as a whole. However, the abundance of mushrooms is strongly tied to plant life in the ecosystem. It has been estimated that an average plant in an ecosystem has eight fungi associated with it. Further, some mushrooms are linked in their lifecycles to a single plant genus or species. If, for example, the emerald ash boring beetle (*Agrilus planipennis*) was to destroy a significant portion of the population of ash trees in our ecosystem, then we would expect this to have a major impact on the population of Ash Bolete (*Boletinellus merulioides)* mushrooms.

As stewards of the natural world, the most critical action humans can take to maintain fungal diversity and abundance is to protect the diversity and abundance of other organisms, especially trees and other plants, in the environment.

Lepiota species
illustration: Hillary Hatzipetrakos

Pholiota species
illustration: Hillary Hatzipetrakos

If you find a golden yellow cluster of scaly capped mushrooms on a rotting log or around a dead tree or stump, there is a good chance it is a *Pholiota* species. The tiny pointed scales in this illustration suggest it may be *Pholiota squarrosa*.

Select Mushroom Resources

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Arora, D. 1986. Mushrooms Demystified. Ten Speed Press, Berkeley, CA. [ISBN: 0-89815-169-4]

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Stamets, P. 2005. Mycelium Running: How Mushrooms Can Help Save the World. Berkeley, CA. [ISBN: 978-1580085793]

Periodicals

Fungi. [ISSN: 1941-4943] www.fungimag.com

Mushroom: The Journal of Wild Mushrooming. [ISSN: 0740-8161] www.mushroomthejournal.com

WEB RESOURCES

Organizations

Mycological Society of Toronto: www.myctor.org

MycoQuébec: www.mycoquebec.org and their app "La Fonge du Québec"

North American Mycological Association: www.namyco.org

Northeast Mycological Federation: www.nemf.org

Royal Ontario Museum Fungarium:

bbc.botany.utoronto.ca/ROM/TRTCFungarium/home.php

Websites

MushroomExpert.com. Michael Kuo. www.mushroomexpert.com

Rogers Mushrooms. Roger Phillips. www.rogersmushrooms.com

Tom Volk's Fungi. Tom Volk. http://botit.botany.wisc.edu/toms_fungi

Acknowledgements

Contributors

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left to right - Michael Warnock, Anthony Wright, Jean-Marc Moncalvo, Patricia Burchell and Kelly Snow.

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Partners

Royal Ontario Museum: **www.rom.on.ca**
Mycological Society of Toronto: **www.myctor.org**

Contributing Artists

Robert (Bob) Gait - Bob is a Curator Emeritus at the ROM's Department of Earth Sciences. In 1996 he was given some morels from a local ravine. Their beauty created an irresistible urge to illustrate them and so, with help from the Mycological Society of Toronto and the late Vello Soots, a fascinating hobby was born. His paintings are done from specimens found in the Toronto area. Bob is a member of the Botanical Artists of Canada and lives in Toronto.

Robert (Bob) Gait
photo: Byrraju P. Raju

Hillary Hatzipetrakos - Hillary is a fine artist with a degree in Drawing and Painting from the Ontario College of Art & Design (OCAD). She spent many summers as a naturalist at Awenda Provincial Park where she developed a deep love for fungi. Her knowledge of mushroom species identification and passion for reviving field painting has provided her with countless opportunities within the ROM Mycology section. Hillary currently resides in Toronto. She is constantly pushing herself as an artist, juxtaposing the limits of nature and culture.
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Hillary Hatzipetrakos
photo: Joshua See

David Wysotski - David has a Bachelor of Fine Arts degree from Queen's University and an honours degree in Illustration from the Ontario College of Art & Design (OECD). For the past 20 years, he has combined his two loves of art and nature into a successful career as a natural sciences illustrator of books, magazines, posters and ads.
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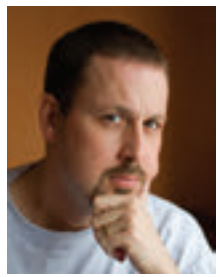

David Wysotski
photo: Graham Mastersmith

Back cover: oil painting 16"x12" by Robert Fisher, courtesy of Eva Voth


R.W. FISHER