

Fungus Among Us

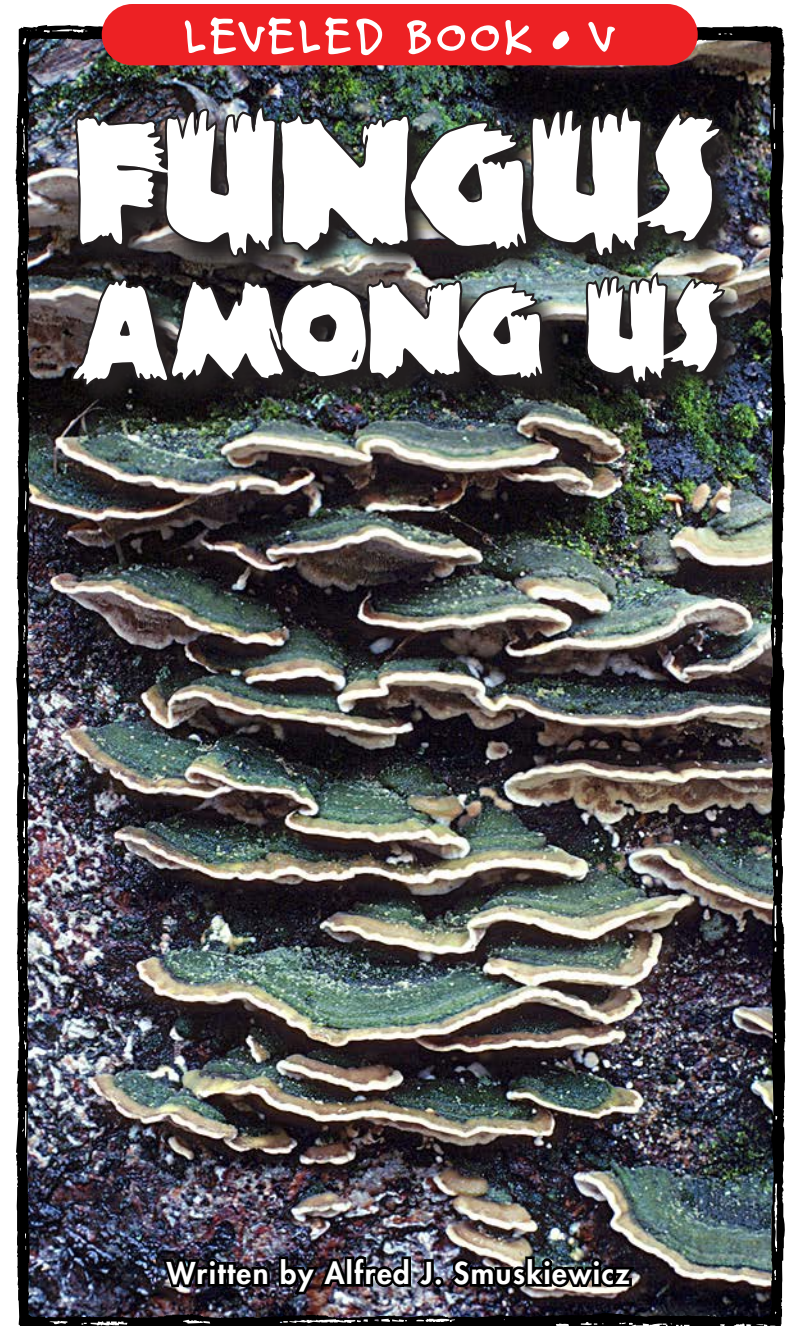
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FUNGUS AMONG US



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What Are Fungi?

What does the white, fuzzy mold on stale grapes have in common with the small brown mushrooms growing in your neighborhood park? What does the itchy, scaly skin on someone's feet have in common with the yeast used to make bread rise?

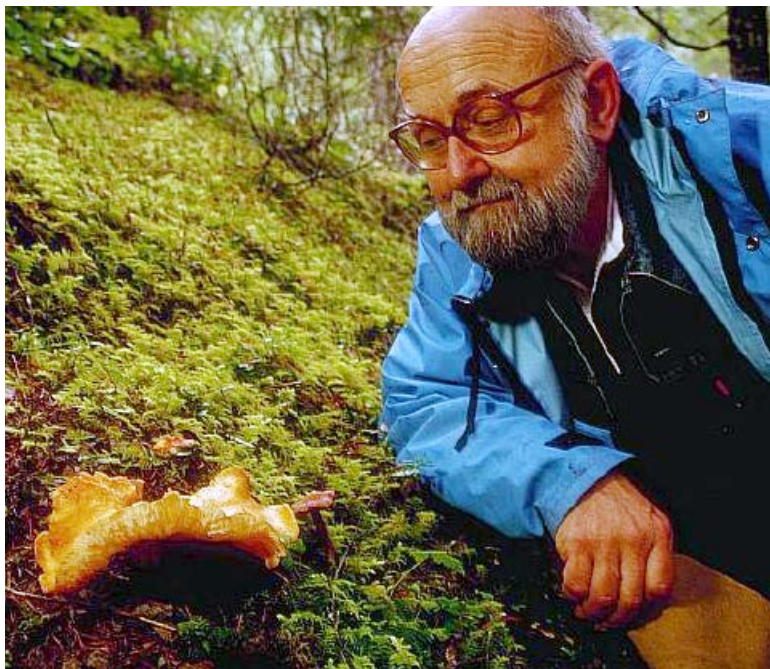
All four of these **organisms** are types of **fungi** (FUN-guy). Fungi may not be as colorful as flowers, and they don't move around a lot like animals, but fungi can grab your attention in other ways. They come in a wide variety of shapes and sizes, have their own unique ways of living, and play important roles in health care, food production, and other human activities.

Many people think that fungi are plants. However, plants carry out a process called photosynthesis, in which sunlight, water, and carbon dioxide gas are used to make the plant's food. Fungi cannot carry out photosynthesis so they have to obtain their food in another way.

Do You Know?

When scientists study the chemical makeup of fungi, fungi appear to be more like animals than plants. This is why diseases caused by fungi are hard to cure. Medicines that harm fungi can also harm humans or other animals.





Mycologists may study fungi by using computers, laboratory equipment, and indoor collections, or they may search for fungi outdoors.

Fungi obtain their food by releasing chemicals called **enzymes** into their surroundings. The enzymes cause complex molecules around the fungi to break down into simpler chemical **nutrients**. The fungi then absorb the nutrients through long, threadlike cells called **hyphae**.

Another thing that most fungi have in common that separates them from many plants is that they make tiny structures called **spores**. The spores, which can be carried by wind, water, or animals, grow into new fungi.



The Many Kinds of Fungi

Mycologists, scientists who study fungi, have identified more than 100,000 **species** of fungi. Some kinds of fungi, such as yeasts, are each made of only a single cell. However, most kinds of fungi, including molds, mildews, and mushrooms, are each made of many cells.



Mushrooms growing in a field, mold growing on fruit, bracket fungus on trees, and athlete's foot on skin, are some of the many kinds of fungi.



Yeasts

The next time you eat a sandwich, you may want to say, “Thank you, yeast!” Yeasts are single-celled fungi that are used in the bread-making process. They release carbon dioxide gas bubbles that make bread rise into the soft, fluffy loaves that you eat. Yeasts are also used to make beer and wine.

Some kinds of yeasts **reproduce** by making spores, but other kinds reproduce by budding. In budding, a small bulge—a bud—forms on a yeast cell. A hard wall forms around the bud, which then separates from the old yeast cell. The bud then becomes a new yeast cell.



A small bud grows on the side of a yeast cell. The bud will separate from the cell and grow into a new yeast cell.



A Special Relationship

Have you ever seen a crustiness—maybe it was gray, yellow, orange, or brown—growing on a rock? That growth may have been a lichen, which can be created when fungi and algae grow together. The algae make food that the fungi use, and the fungi absorb water that the algae can use. Lichens grow on rocks and tree bark. Many lichens grow in cold places where there is very little to eat for other life forms. Lichens are an important food for reindeer, caribou, and other animals.





Use a microscope and look closely at the mold that grows on stale bread. You may see the mold's tiny sporangia, which make spores.

Molds

Do you remember being hungry for a piece of fruit like an orange, only to find that it was covered with blue-green white fuzzy stuff? “Yuck!” That fuzzy growth was mold. Mold is a type of fungus that can grow on fruits, such as grapes, peaches, and grapefruits, as well as on bread, cheese, and other foods.

Many kinds of molds have hyphae (remember these help fungi absorb nutrients) that stick straight up like pins. The “pinheads” have tips called **sporangia**, which produce spores. These pinheads are also what give mold its fuzzy look.



Fungi cover the surface of an apple hanging in an orchard.

Mildews

Mildews are fungi that are parasitic—that is, they live in or on organisms that they feed on. Many mildews form powdery blotches on the leaves of such plants as apple and cherry trees, rose bushes, and pea plants. People often call the scum that forms on bathroom walls “mildew,” but the stuff that plagues most bathrooms is actually bacteria, not fungi.

Mushrooms

Among the more than 5,000 species of mushrooms are white ones, yellow ones, orange ones, red ones, and brown ones. Most species grow in the woods or in grassy areas, where they live on dead, decaying matter, such as dead grass. The hyphae of a mushroom form a tangled mass called a **mycelium** underground—just below the surface. The mycelium can grow and spread underground for many years. The umbrella-like parts that you see above the surface live only for a few days—just long enough to produce spores.



These fly agaric mushrooms (below) are poisonous, while other mushrooms such as the enoki, or straw mushrooms (right), are edible.



The Largest Living Thing

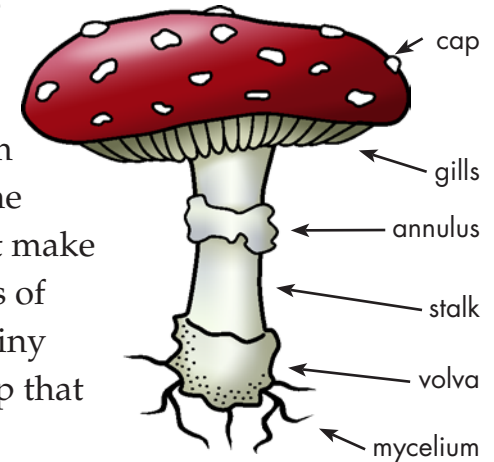
You may think the largest living thing is a blue whale or a giant redwood tree, but both of these creatures are dwarfed by an underground fungus that grows in Malheur National Forest in Oregon. The mycelium of this fungus spreads out for 3.5 square miles (5.6 sq km)—an area larger than 1,600 football fields! Few people have seen this giant, however, because the only parts that are above ground are clusters of small golden-brown fruiting bodies that pop up every now and then.



Parts of a Mushroom

A mushroom grows out of the ground on a **stalk**, which—depending on the mushroom—can be between 3/4 inch (1.9 cm) and 15 inches (38 cm) high. At the stalk's top is a round **cap**, which can be as wide as 18 inches (46 cm) in the largest mushrooms. The stalk and cap together are called the **fruiting body** of the mushroom.

On the underside of the cap of many mushrooms are rows of thin, bladelike structures called **gills**. Unlike the gills of fish, these gills do not help the mushroom breathe. Instead, the gills have cells that make spores. Some kinds of mushrooms have tiny tubes under the cap that make spores.



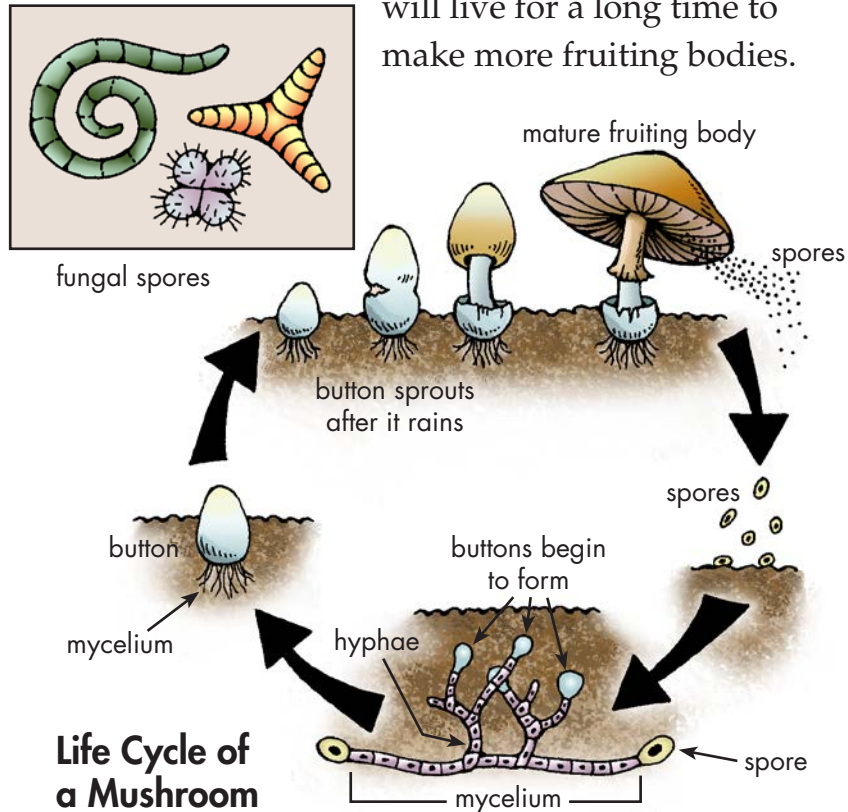
Life Cycle of a Mushroom

A life cycle refers to the different stages of development that a species goes through, from when an organism first starts to grow to when it dies, to when a new organism starts to grow. Each species of fungi has a certain kind of life cycle.



The life cycle of a typical mushroom begins when a spore lands in a place with enough food and water to **germinate**. The hyphae of the growing fungus branch out underground to form a mycelium. Sometimes, the hyphae of two different mushrooms join together in a mycelium. Tiny knots, called **buttons**, grow on the mycelium. These buttons sprout into fruiting bodies, which may quickly shoot above the surface after a heavy rain. After the new mushroom releases its spores, the fruiting body withers away, but the mycelium

will live for a long time to make more fruiting bodies.



Life Cycle of a Mushroom



Fungi That Are Harmful

Many kinds of fungi are harmful to plants, animals (including people), or items made by people. Mildews and certain other fungi often grow in books, clothing, and wood in damp places. The fungi cause these items to decay.

Other parasitic fungi cause diseases in crops, especially cereal crops like wheat, rice, oats, and corn. Sometimes spores of these fungi get inside the seeds of these grains. When the grain drops to the ground, they spread into the new plants growing from the seeds.

Dutch elm disease is caused by a fungus that is carried from tree to tree by insects called bark beetles. The fungus can kill a large elm tree in four to eight weeks. A similar fungus, called chestnut blight, killed nearly all the chestnut trees in the United States in the early 1900s.



The Great Irish Famine

In the 1840s, a fungal disease called blight killed most of the potato plants in Ireland. At that time, people in Ireland depended on potatoes for most of their food. Because the blight was so extensive, about one million people in the small country died from starvation. Millions of others left Ireland for the United States, Canada, and England.



Fungal Diseases in People

Hot, sweaty feet are not very attractive, unless you're a fungus! Some microscopic fungi grow best on warm, moist skin between toes and on the soles of feet. These fungi cause an **infectious** disease called athlete's foot, in which the skin becomes red, scaly, and itchy. To avoid getting this disease, you should keep your feet clean and dry, and wear socks that allow fresh air in.

Ringworm is the name of various kinds of skin diseases caused by fungi. These diseases take the form of red, scaly rings on the neck, back, chest, or other areas of the skin. Ringworm can spread from person to person easily through contact with infected skin or through almost anything else that has touched the affected area and then made contact with skin.



People with ringworm have red, itchy rings on their skin. This ringworm covers most of this person's ankle.

Other kinds of fungal diseases affect the lungs, kidneys, throat, or other inside parts of the body. Harmful fungi can be killed with chemical solutions called **fungicides**.

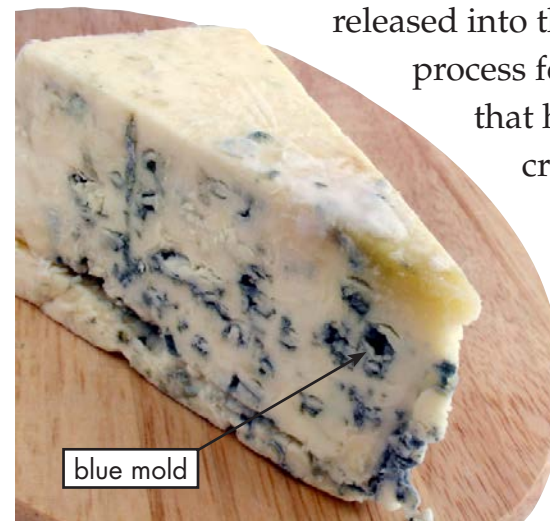


Fungi That Are Useful

Not all fungi are harmful. In fact, some fungi help cure people of diseases. Certain types of molds make chemical substances that doctors use as antibiotics, or medicines that weaken or kill bacteria that cause diseases. One of the more common fungal antibiotics is called penicillin. It is used to treat people with pneumonia and many other diseases caused by bacteria.

Other kinds of molds are used to make cheese. When these molds are added to the cheese, they cause chemical reactions that change the cheese's flavor and make the cheese ripen.

Other fungi help food in different ways. Farmers rely on fungi to help **decompose** material in dead plants. The chemicals released into the soil in this process form nutrients that help new crops grow.

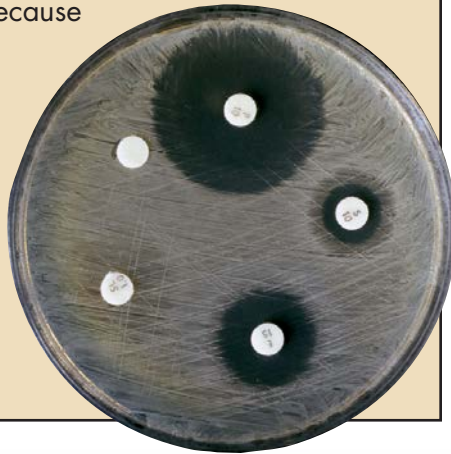


Some kinds of cheese, such as blue cheese, are made with blue mold, which causes the cheese to ripen.



A Great Accidental Discovery

Penicillin, the first antibiotic used to treat people with serious diseases, was discovered accidentally in 1928 by Sir Alexander Fleming in England. Fleming noticed a green mold growing in a laboratory dish with some bacteria. He saw that all the bacteria around the mold were dead. That was because the mold was releasing a chemical substance that was harmful to the bacteria. Other researchers later found out how to use this substance—penicillin—to kill bacteria in people.



Be a Mushroom Hunter!

What do you think would be a fun way to learn more about fungi? How about if you go out and try to find them? You might spot some mold or mildew here or there, but you'll probably have the most fun if you try "hunting" for mushrooms. **But remember not to put any mushrooms in your mouth and to wash your hands after handling fungi!** Although it is safe to eat some kinds of mushrooms, other kinds contain poisons that can make you very sick! It is difficult to tell the poisonous kinds from the nonpoisonous kinds—unless you are a very experienced mushroom hunter. In fact, you should always go with an experienced mushroom hunter.

Fall and spring, after heavy rains, are the best times to look for mushrooms. Before you start your hunt, you may want to go to the library or search the Internet to find out more about the mushrooms that grow in your area. The mushrooms listed at the end of the book are meant to give you an idea of some of the many kinds of fungi in North America.

Do You Know?



People used to kill pesky flies by sprinkling sugar on top of fly agaric mushrooms. The flies were attracted to the sugar. But when they landed on the mushrooms and began eating, the poison in the mushrooms killed them.



Fungi Can Be Fun!

After reading this book, have you drawn any conclusions about fungi? Have you been surprised by anything you learned? Perhaps one thing you might have discovered is that fungi can be fun! Keep an eye out for fungi, and see what else you might discover about these special organisms.



Experiment: Grow Your Own Fungus

You can grow your own mold! **(Please check with a parent or guardian before doing this.)**

- 1 Place a slice of bread or a piece of fruit in a plastic sandwich bag. The bread or fruit will provide nutrients for the mold spores.
- 2 Put a moist paper towel inside the plastic bag with the food and close the bag. The closed bag will lock in the moisture, which the mold needs to grow.
- 3 Try this with several different types of food.
- 4 Leave the food until fuzzy mold starts to grow (in about 3 to 5 days).

Are there differences in the kinds of mold that grow on different kinds of food? Write down or draw pictures of what you see.



POISONOUS



Destroying angel
(*Amanita virosa*)
Woods, under trees;
eastern North America



Fly agaric
(*Amanita muscaria*)
Woods, under trees;
throughout North America



Jack-o'lantern
(*Omphalotus olearius*)
Clusters on tree stumps,
glows in the dark;
eastern United States



False chanterelle
(*Hygrophoropsis aurantiaca*)
On or near logs and stumps;
northern North America



NONPOISONOUS

Oyster mushroom
(*Pleurotus ostreatus*)
Clusters on logs and stumps;
throughout North America



Shaggy mane
(*Coprinus comatus*)
Lawns, fields, roadsides;
throughout North America



Old man of the woods
(*Strobilomyces floccopus*)
Under trees; eastern
North America



King bolette
(*Boletus edulis*)
Under cone-bearing trees;
North America, except
in central region



Glossary

- buttons** (*n.*) knots on a mycelium that develop into a mushroom's fruiting bodies (p. 13)
- cap** (*n.*) the round top of a mushroom (p. 12)
- decompose** (*v.*) to break down into simpler chemical substances (p. 16)
- enzymes** (*n.*) chemical substances that cause or change chemical reactions without being changed themselves (p. 5)
- fruiting body** (*n.*) the mature part of a fungus that produces spores (p. 12)
- fungi** (*n.*) living things that obtain their nutrients through absorption (p. 4)
- fungicides** (*n.*) chemical solutions that can kill or slow the growth of fungi (p. 15)
- germinate** (*v.*) to begin to grow (p. 13)
- gills** (*n.*) parts on a mushroom that have cells that make spores (p. 12)
- hyphae** (*n.*) long, threadlike structures that fungi use to absorb nutrients (p. 5)



infectious (<i>adj.</i>)	refers to diseases that can spread from one organism to another (p. 15)
mycelium (<i>n.</i>)	a tangled mass of hyphae on a fungus (p. 10)
nutrients (<i>n.</i>)	chemical substances that organisms need to live (p. 5)
organisms (<i>n.</i>)	living things (p. 4)
reproduce (<i>v.</i>)	to make a new generation of organisms (p. 7)
species (<i>n.</i>)	specific types of living things (p. 6)
sporangia (<i>n.</i>)	structures on fungal hyphae that produce spores (p. 9)
spores (<i>n.</i>)	tiny structures made by fungi that can grow into new fungi (p. 5)
stalk (<i>n.</i>)	the part of a mushroom that grows out of the ground, beneath the cap (p. 12)



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