Fungi

Mushrooms, Toadstools, Molds, Yeasts, and Other Fungi

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A chicken of the woods (Laetiporus sulphureus) fungus growing on a tree trunk. This is an edible wild mushroom.

A species of jelly fungus (Ascocoryne sarcoides)
Fungi are neither plants nor animals. Yet, like both groups, fungi are eukaryotic, which means that their cells have a membrane around the nucleus. In contrast, the cells of bacteria do not have such a membrane. These cells are prokaryotic. Some fungi have only one cell and so are unicellular. Most fungi have more than one cell and are thus multicellular.

Keeping Tabs on Fungi
There are about 98,000 known species of fungi, and 100 more species are discovered by scientists every month. No one knows for sure how many fungi species there are, but it could be as many as 1.5 million. The scientists who study fungi are called mycologists.

Kingdom or Domain?
The way life-forms are grouped, or classified, is constantly changing. Traditionally, organisms were classified as either animal or plant. Over the years, many organisms have been grouped alongside animals and plants, rather than within those two groups. For years, the classification of living things has been based on six kingdoms of life—animals, plants, fungi, protists, bacteria, and archaea.

As scientists improve their understanding of the genetic makeup of living things, they can better compare organisms. This understanding has helped scientists figure out even more detailed groupings of living things. In the past, organisms were grouped according to their appearance. Appearances can be misleading, however. Two organisms may look similar, but their genetic makeup can be very different. For example, some yeasts might be taken for bacteria based on the fact that, like bacteria, they consist of a single round cell. Today, yeasts are known to be fungi, not bacteria.

Some scientists now believe that organisms should be classified using an even bigger grouping than kingdom. This level is called the domain. These scientists propose that life should be divided into three domains—Eukarya, Bacteria, and Archaea. Within the domain Eukarya are the four kingdoms of animals, plants, fungi, and protists. These kingdoms are more closely related to each other than to the domains of bacteria and archaea.

This is where things stand—for now. As scientists continue to make new discoveries, this system will undoubtedly turn out to be another chapter in the story of life!
They have plenty of work to keep them busy! Mycologists study fungi in the outdoors or wherever fungi grow, but they also study them in the laboratory. To do this, mycologists grow fungi in a nutrient-rich gel, in sterile dishes. These dishes, called petri dishes, have loose covers on them so the growing fungi’s spores do not accidentally get mixed up or start to grow where they are unwanted.

Above: A scientist is growing different types of fungi during a study into parasitic fungi that can be used to kill the weeds and insect predators that attack crops. This is a natural alternative to using chemical pesticides.

Fungus growing on logs in Sumatra, Indonesia
Mushrooms and toadstools are the best-known fungi, but there are many other kinds. Bracket fungi, which look like shelves on tree trunks, are fungi, as are puffballs, the mold that grows on old bread and rotting fruit, and the brown spots on apples. Many fungi, such as the yeast that is used to make bread and pizza dough, are used to make food or to produce chemicals for industry and medicine. Some fungi cause disease, and some damage crops. Fungi are also important to us because they decompose dead plants and animals and provide plants with nutrients. Life on Earth relies heavily on fungi for its health.

**The Classification of a Fungus**

Classification within the fungi is changing as scientists continue to study DNA and improve their understanding of the genetic relationships of organisms. All fungi are members of the domain Eukarya and the kingdom Fungi. They are next organized into seven broad groups, called phyla. Mushrooms and toadstools are all in the phylum containing club fungi. Most other known fungi fall into two other phyla: those containing the pin molds and the sac fungi.

The common mushroom, also known as the button mushroom and the white mushroom, is a member of the phylum containing club fungi. Its scientific name, *Agaricus bisporus*, is made up of the names of its two most narrow groupings, genus and species.

### CLASSIFICATION OF THE BUTTON MUSHROOM

<table>
<thead>
<tr>
<th>Domain</th>
<th>Eukarya</th>
<th>Organisms made up of complex cells</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kingdom</td>
<td>Fungi</td>
<td>Fungi</td>
</tr>
<tr>
<td>Phylum</td>
<td>Basidiomycota</td>
<td>The club fungi, includes bracket fungi, jelly fungi, smuts, and rusts</td>
</tr>
<tr>
<td>Class</td>
<td>Agaricomycetes</td>
<td>Mushrooms</td>
</tr>
<tr>
<td>Order</td>
<td>Agaricales</td>
<td>Fungi with spore-producing “gills”</td>
</tr>
<tr>
<td>Family</td>
<td>Agaricaceae</td>
<td>Stalk usually bears a ring</td>
</tr>
<tr>
<td>Genus</td>
<td>Agaricus</td>
<td>Caps that are not brightly colored</td>
</tr>
<tr>
<td>Species</td>
<td><em>Agaricus bisporus</em></td>
<td>The button, or common, mushroom sold in grocery stores</td>
</tr>
</tbody>
</table>
The mushrooms on this farm are grown in large, sterile plastic sacks of compost.

**The Grocery Store Mushroom**

Ninety percent of all mushrooms grown in Europe and North America for food are one species, *Agaricus bisporus*. The white button mushrooms on the shelves of grocery stores, the brown creminis, and the large portobello mushrooms are all of this same species. They grow naturally in meadows, where they feed on dead plant matter. On mushroom farms, they are grown on composted straw (straw that has been left to rot over a period of time with manure and fertilizers so it has begun to break down into soil).