**Animal, Vegetable, or Mineral?**

Some things are obviously one thing or another, but then there are fungi, those molds, yeasts, mushrooms, etc. that are both familiar and mysterious.. Fungi lack chlorophyll so are incapable of photosynthesis but they have an important role in breaking down dead organic matter as well as a source of antibiotics.

On the campus of the US Agricultural Research Service in Beltsville, Md. there is the second largest fungus collection in the world with a million or so specimens. Currently underway is an attempt to sort out the names of these species that have often been given two names because they reproduce two different ways.

They reproduce both sexually, via spores, and asexually by cloning, each way resulting is specific shapes and appearances and so during the centuries have been given different names. Exactly what fungi are has been a matter under consideration for centuries. Aristotle, BCE, put objects into either the plant world or the animal world and decided fungi belonged with the plants. Two thousand years later, Carl Linnaeus, designer of the 2-word Latin classification system still in use among botanists, also found fungi plant-like. In the 1960s fungi got their own kingdom – neither pure plant nor pure animal. Since the 1990s genetic evidence has been building to place the fungal kingdom closer to animals than to plants.

Additionally, things once considered a fungus are now found to belong to other taxonomic groups. For instance, slime molds are not fungi but protists. [According to the dictionary protista is a kingdom or large grouping that comprises mostly single-celled organisms, some of which have both plant and animal characteristics.] Also curious is that some fungi like Phytophthora, including the infestans specie of the Irish potato famine is closer to some sorts of algae than to fungi.

Even before DNA analysis was available to sort such things out, there were scientists who intuited that Linnaeus categories were insufficient. In the mid-19$^{th}$ Century Charles and Louis Rene Tulasne had noticed that, under a microscope, the same fungus sprouted into different kinds of reproductive forms. There are three volumes of the Tulasne brothers in the Beltsville Systems Mycology and Microbiology Lab containing delicate line drawings of these minute records of fungal reproduction.

Because scientists, like the rest of us, are resistant to change, some fungi will continue to have two names even though DNA has found them to be the same specie. Other more familiar fungi may adapt. The boxwood blight caused by the Cylindrocladium fungi, with an asexual genus name from 1892 may be switched to the even older sexual state name of 1867, Colonectria. This discussion may fall on deaf-eared owners of boxwood, deploring the presence of boxwood blight whatever it is properly called!

For those of us who love mushrooms, more important than their proper names is the determination of which species are safe to eat and which are poisonous. Even though we know a mushroom is merely a fungal growth that has the form of a domed cap on a stem, we are reluctant to pick for dinner those suddenly appearing on our property. It is wiser to grow your own from a kit or spores.

Aside from culinary uses new virtues have been discovered. An amateur mycologist and scientist inoculated diesel oil contaminated soil with spores of the oyster mushroom. In less than four months those fungi had reduced the toxicity of the soil from 10,000 parts per million to less than 200 ppm. In Corvallis, Oregon, oyster mushroom spores mixed with coffee grounds and straw were ladled into burlap bags and placed by storm drains. The number of pathogens from

the toxic runoff was reduced, protecting creeks and rivers. Signs warned people not to eat any sprouting mushrooms!

Polystyrene (a.k.a. Styrofoam) is toxic, energy intensive, and non-biodegradable. But it is useful for packaging as well as insulation. Can you believe some smart company has created a mushroom-derived bioplastic that works as well as polystyrene but can be composted in your backyard? This process uses agricultural waste, corn husks or rice hulls and inoculates them with fungal mycelium from the root-like part of mushrooms. This substance is placed in a mold and during five days the mycelium devour the woody biomass leaving a bioplastic in the shape of the mold. This process holds promise in creating construction parts for shoes, cars, surfboards. Amazing!

It surely gives us hope that if we honor the gifts contained in the natural world, these gifts can help us clean up the mess we've made.

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