



More like creatures than plants, mushrooms prevent the world from being one large rubbish dump.
By Morgan Trimble

Mushroom MYSTERIES

DALE MORRIS

GOLDEN JELLY
The gelatinous flesh of *Dacryopinax spathularia* is edible and is used in Chinese cuisine.



A spore print is created by cutting the cap off and placing it gill-side down on a piece of paper. The cap is covered with a cup to let the print develop overnight.

A clutch of eggs lies nestled among the Tsitsikamma Forest's damp leaf-litter. In slow motion, a red arm rips through one shell. Another arm pokes out, then another. Hours pass as tentacle-like appendages creep through the torn shell. Eventually, they open into a starfish shape coated in brown sludge, reeking of a cross between a cadaver and faeces. Flies swarm to the stench.

This malodorous red starfish, known as the stinkhorn, is neither animal nor alien. It's a mushroom. The foul-smelling slime is a cunning plot to enlist flies for spore-spreading duty. Though the stinkhorn seems more creature than plant, it's actually neither. Fungi have their own biological kingdom with an estimated 1,5 million species. That's more than the vertebrates and plants combined.

Along with bacteria, fungi are the Earth's major decomposers. They prevent dead material from piling up by recycling it into components they and other organisms can use. "Without fungi any ecosystem would collapse," explains Marieka Gryzenhout, lecturer and mycologist at the University of the Free State. "Fungi form beneficial relationships with plants to aid growth or break down organic material, for example wood, one of the toughest materials on Earth. Animals and insects eat fungi, too."

Unlike photosynthetic plants, fungi are heterotrophs, unable to produce their own energy to grow so they always live in relationship with other organisms. Most get their energy by releasing digestive enzymes into the substrate around them and absorbing food.

Of South Africa's estimated 172 000

species, Marieka approximates that two-thirds are miniscule. Yeasts, moulds, mildews and rusts that find niches in soil, plants, water, animals and neglected take-away containers in the back of fridges. Though microfungi are ecologically and economically important, the macrofungi we know as 'mushrooms' are downright captivating. Pick an adjective: deadly, tasty, glow-in-the-dark, medicinal, ink-filled, gelatinous, umbrella-sized.

Though mushrooms emerge, seemingly, out of nowhere, they're fruiting bodies of a larger fungal organism, the bulk of which is practically invisible to the untrained eye. It's called mycelium, a web of strands networking among nutrients beneath the surface. While mushrooms are ephemeral, often lasting just a day or two, mycelium can be hundreds of years old and stretch to multiple square kilometres. When conditions allow, the mycelium develops mushrooms that pop up through the soil or grow as brackets on wood. Their job is to bear and release millions of spores, some of which will land in a favourable spot, create new mycelium and eventually produce mushrooms. A recent study suggests airborne spores may even help bring rain!

Under-appreciated and undescribed

The relationships between fungi and animals can be astonishing. In *The Soul of the White Ant*, Eugene Marais describes how termites maintain precise conditions of moisture and fertiliser in special chambers of their mounds to cultivate fungi, even during droughts. The gardens form the "stomach and liver of the composite animal", providing food and helping regulate temperature.

DALE MORRIS

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ALERT

DON'T FORAGE FOR MUSHROOMS IN PROTECTED AREAS, NATIONAL PARKS OR RESERVES.

UPSIDE-DOWN UMBRELLAS Under a mushroom's cap are the gills where their spores are formed.

Fungi are the Earth's major decomposers, preventing dead material from piling up by recycling it.



DARK STAR
The evocatively named star stinkhorn has a putrid scent that attracts flies to disperse spores.



How to ID a mushroom

You needn't be a professional mycologist to contribute to the MushroomMAP, a citizen science project contained within the Virtual Museum of the Animal Demography Unit at the University of Cape Town. Researcher Megan Loftie-Eaton explains: "Members of the public upload their photos to the Virtual Museum, along with the date and location details. In this way we are building up accurate distribution maps for a whole host of species, which is the first step towards proper biodiversity conservation."

When you find a mushroom, note the location and take photos that show all the angles. Then navigate to MushroomMAP at <http://vmus.adu.org.za/> to upload your sighting. The Mushrooms of Southern Africa Facebook group is a handy source for help with identifying specimens.

If you can't identify a mushroom, don't despair. You can still upload your sighting and let MushroomMAP's panel of experts take a crack at identifying it. If your sighting stumps the experts, congratulations, perhaps you've discovered a new mushroom altogether. Citizen scientists have confirmed two fascinating species in South Africa for the first time, a gigantic mushroom from St Lucia and a vivid but tiny 'all-blue agaric' in the Drakensberg.

READ MORE

Pocket Guide to Mushrooms of South Africa by Marieka Gryzenhout (R140, Struik Nature) describes over 115 mushroom species found locally.

First Field Guide to Mushrooms of Southern Africa (R65, Struik Nature) introduces 44 species of mushroom and is suitable for children.



BEST FRIENDS When fungi team up with a photosynthetic partner such as green algae or bacteria, a composite organism, lichen, is created. The algae provides various nutrients to the fungus, in exchange it receives water which prevents it from drying out. This symbiotic relationship enables lichens to survive in harsh places such as deserts and the pole regions, where they play a pioneer role in stabilising and preparing the substrate for other organisms.

Occasionally, the termites' fungal gardens produce large mushrooms that spring through the top of the mound, spreading spores and providing an annual reminder of the termitary's incredible subterranean symbiosis. Look for this special phenomenon after summer rains in the bushveld where *termitomyces* species, such as the dinner-plate-sized beefsteak mushroom or 'T'kowe', seem to appear overnight.

Despite their essential role in the environment, mushrooms are incredibly poorly known. Marieka explains: "Most of the mushrooms people encounter during walks, in plantations or in their gardens are introduced species. They have special relationships with non-native plants with which they are associated. They also tend to be the mushrooms with names because they are known elsewhere, whereas our native fungi are often unnamed."

Some common fungi naturally have a global distribution, while others were moved by humans. Often, we can't tell the difference. How invasive are introduced fungi? Do they displace native species? "Only by studying the distributions of our fungi can we figure this out. We need to know what we have in the first place, and we don't. There are so many species, where do you start?"

With most species still undescribed, we have a poor grasp of their conservation status. Fungi are almost never included in biodiversity data or conservation plans. "The biggest threat to fungi is ignorance and, after that, a lack of data and human capital working on fungal biodiversity and conservation," says Marieka. "Habitat destruction, removal of substrates such as wood, and over harvesting of edible mushrooms are other threats." Protected areas are important. "With each piece of natural veld that disappears, an unknown number of our native fungi could also disappear, and we may never really know what was there." 🐾



In this detail shot, a bracket fungus almost looks like the rings of a tree.

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It's clear why *Cyathus olla* is also known as the grey-egg bird's nest fungus.

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The distinctive 'fingers' of *Xylaria* sp.



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