WHAT LIES BENEATH

A dark web lurks under the woodland floor - and we can't survive without it. Fiona Collins reports

IT'S THE WORLDWIDE WEB, but not as we know it. An information network so vast that it covers much of the Earth's surface. Yet we know more about black holes in space than about the subterranean fungus superhighway that transports nutrients and chemical signals from root to root in our woods.

Fungi first slinked from the murky depths of the oceans some 700 million years ago - and have colonised every facet of life on the planet. They've created wonder drugs like penicillin and statins, they are the alchemists behind cheese, beer and bread, and they're the lifeblood of our natural world. But Professor Lynne Boddy, from the University of Cardiff, concedes that fungi have an image problem.

Lynne has spent 40 years untangling their dark web, and says: "I've got a bee in my bonnet about decay fungi at the moment. People see them eating away at rotten branches, or find brackets and toadstools fruiting on trunks, and assume they are pathogens or parasites. It makes me cross because in the vast majority of cases it's not true; they're the goodies, not the baddies!"

She's right. Fabulous fungi such as chicken of the woods, candlesnuff (pictured) or turkey tail - all common sights at a wood near you - are grafters. They break down tonnes of deadwood and leaf litter each year, recycling its nutrients into the soil. Below ground, another mysterious network is furiously gobbling up the disgorged goodness and feeding it back to the trees and plants in exchange for the heady gift of sugars. >>

These underground operatives are mycorrhizal fungi, and live symbiotically with trees and plants, only popping their heads above ground to bear fruit - think of the fairytale favourite fly agaric or the chef's beloved chanterelle.

"You never find a tree without mycorrhizal fungi living on or in its roots: says Lynne. "They feed trees with water and minerals - it's not done by the root hairs as we're taught at school. Without these fungi, trees simply wouldn't survive. We also know that nutrients pass from tree to tree through these networks, along with chemicals which warn of aphid or parasite attacks, for example."

It all sounds a bit sci-fi, and Dr Gabriel Hemery, eminent forest brain at Oxford's Sylva Foundation, says fungi are the next tree-science frontier. "There are so many unanswered questions. We don't really know what impact non-native fungi might have on our native networks when imported on roots for example. We don't know if we can improve the fungi in soils to make trees more resilient and healthy. We don't even fully understand what triggers fungi to fruit and create the mushrooms and toadstools we see in our woods."

The raw data backs that up. To date 144,000 species of fungus have been identified worldwide, but an estimated two million are still 'unknown to science' And while 68,000 animals and 25,000 plants have been assessed for inclusion in the International Red List of Threatened Species, just 56 fungi have been afforded the same courtesy.

The Trust's Alastair Hotchkiss is among those hunting for answers. He's been working with Aberystwyth University to study the effects of restoring our ancient woods at nearby Allt Boeth. In this dramatic valley, where wizened oaks muscle up against larch and spruce plantations, strange things are afoot.

"We've been using DNA barcoding to analyse the air and soil:' Alastair says. "We've picked up an array of microscopic fungi - without this analysis we'd have no idea they were there. They are all playing a role in the wood's ecology - the question is, what?"

Mycorrhizal fungi are a wood's life support machine, Alastair says. "Damage them by soil compaction or pollution and you weaken the trees and make them more susceptible to stresses and disease. We know that nitrogen from agriculture and industry can be really bad for fungi health, and scientists are now exploring whether the syndrome Acute Oak Decline, for example, might be linked with higher nitrogen levels. Perhaps their mycorrhizal support systems have been weakened."

Meanwhile, Lynne Boddy's team in Cardiff have been working to dispel a woodland myth. "Historically foresters wanted to know why their biggest, oldest trees were always hollow: says Lynne. "They thought heart-rot was bad for tree health and wanted to stop it. We now know it's actually caused by decay fungi eating the dead sapwood and releasing the nutrients back into the roots, so it's a really positive thing."

The rot is good for biodiversity too: hollow trees harbour some 1,700 UK insect species, not to mention myriad birds and bats. But with ancient woodland squeezed to the brink, Lynne is now hunting for the holy grail of tree elixirs. "Conservation groups asked if there was a way we could `veteranise' younger trees to give them old characteristics. These habitats take centuries to develop, so we've been working with beech trees at Windsor Great Park, inoculating them with what we think are the key fungi species for tree hollowing. I'm hopeful we'll get there."

And what of woodland management? How can we help to nurture our fabulous fungi as well as our trees? Opinion is unanimous: deadwood is a forest's friend.

"A mycorrhizal network is like looking down on a town at night and seeing the streets aglow with moving traffic: says Gabriel Hemery. "That's what's going on below our feet. By overzealously clearing away rotting branches, not only are we removing wildlife havens, we're taking away the petrol stations that feed and sustain our fungi networks. Leave it where it lies!"

BEN PORTER

SHROOMS WITH A VIEW

Five picturesque Trust fiefdoms for fungus fans

LOCH ARKAIG, HIGHLANDS

North of Fort Wiliam, the Trust's fragment of ancient Caledonian forest is home to a treasure trove of fungi: 172 species and counting! They include golden chanterelles, known for their love of old pines. Move fast and you could join our Arkaig fungi workshop on September 15: book at woodlandtrust.org.uk/events.

OAKS WOOD, DERRY

Mysterious clouds of 'hair ice' have been spotted at this tranquil Trust oasis. The icy wisps form on rotting wood at night, and in 2015 they were discovered to be the product of an invisible fungus, Exidiopsis effuse. You'll need to get up early, though: they melt with the dawn.

HACKFALL, NORTH YORKS

With its grottos and gullies, this wooded gorge on the edge of the Dales is the stuff of fairytale. No surprise then that red and white fly agaric fungi abound, along with putrid-smelling stinkhorns and King Alfred's cakes, its spherical black buboes clustering on branches.

PLAS POWER, WREXHAM

Stroll the 2km loop trail at this botanist's paradise, where the autumn colours wow. Fungi highs include amethyst deceiver, shaggy inkcap and horn of plenty - an edible shroom despite its French name, the trumpet of the dead.

ASHENBANK WOOD, KENT

Ashenbank is ripe with intrigue, from its Bron3e Age barrows to its underground WWII bunkers. There's a smorgasbord of fungi too, from ghoulish dead moll's fingers and storybook scarlet elf cup to fiery lion shields.

Boost your fungi VD *skills* with our swatch book: sh op.*woodla*ndtrust. org.uk.

FUNGI TO BE WITH
Porcelain mushrooms love beech trees, and (inset) the scarlet elf cup, amethyst deceiver and yellow stagshorn.