

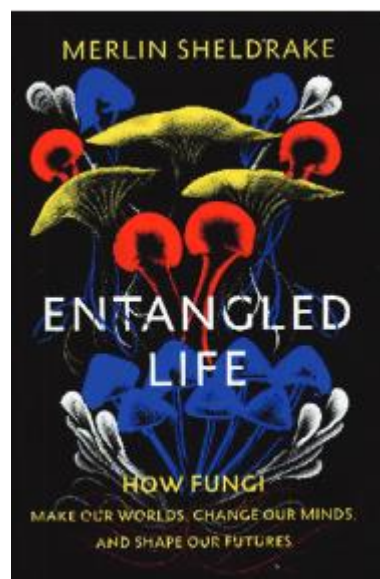
Entangled life: how fungi make our worlds, change our minds, and shape our futures

Merlin Sheldrake, 2020

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Merlin Sheldrake is a mycologist who has specialised in the study of a rainforest gentian called *Voyria*. *Voyria* is a mycoheterotroph receiving all its energy and nutrition from fungi in the wood-wide-web, and it pops up frequently in this fascinating exploration of the fungal world. Fungi are one of life's kingdoms, as broad and busy as plants and animals, but rather neglected in comparison. This neglect is puzzling as they have been around for at least 600 million years, allowed bacteria to emerge from the sea onto land to initiate the plant colonisation of Earth; and have survived all five of the planet's major extinction events which knocked out up to 95 percent of plant species.

The fungi that we see growing are fruiting bodies consisting entirely of felted hyphae, which absorb water and swell. The way that fungi make mushrooms and synchronise their emergence remains one of the central riddles of developmental biology. But our knowledge is growing rapidly, as this book informs us in riveting detail. The 'intelligence' of hyphal mycelium in detecting food sources, communicating across the network and exchanging (trading) nutrients for carbon in mycorrhizal associations with plants, are examples of how fungi actively sense and interpret their world. Fungal lives are a flood of sensory information: light, gravity and texture all make their mark on the behaviour of the mycelium, which is able to integrate the data and act accordingly – a brain-like concept.

Sheldrake delves into the concept of mycorrhizal fungi as a form of socialism – re-distributing the wealth of the forest. Supplying nitrogen and phosphorus to the neediest plant roots and receiving carbon from the photosynthesis of the strongest. In reality, there appears to be a mutualism-to-parasitism continuum in the fungal universe. Lichens are an example of symbiotic partnership (between fungi and algae, but also involving yeasts and algae as well). The fungal mycobiont enabled the algal photobiont to emerge from the water and live on the harsh environment of land – a place where neither could have survived alone.

The mind-altering effects of fungal chemicals is discussed in some detail. The hallucinogenic properties of psilocybin (from *Psilocybe* spp.) and LSD (from ergot, *Claviceps* spp.) are perhaps the best known, but other examples make for grim reading. There is the zombie fungus

(*Ophiocordyceps unilateralis*) that invades carpenter ants, persuades them to climb high above the ant nest, and bite into a leaf nerve. This is the death grip, thereafter hyphae emerge and lock the ant's feet to the vegetation, then the fruiting body emerges from the ant's head and showers spores onto the nest below infecting the next generation of ants. The *Entomophthora* fungus infects flies and chemically obliges them to climb high when a gum exudes from the tongue to glue it to the vegetation before the body is consumed and the spore-producing fruiting body erupts from the dead insect.

There is so much more that the book will tell you, from myco-remediation of radioactive material at Chernobyl to mycelial furniture and modern medicines. Almost every page of this door-opening book has a similar revelation, but we are left in no doubt that there is so much more to learn and that we are standing at the entrance to one of the oldest of life's labyrinths.

Brian Sims

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