



Step into the world of fungi and learn all about these strange and fascinating life forms.

- The core *Welcome to the Museum* books have sold a combined quantity of over 1 million copies worldwide (as of July 2022)
- Katie Scott, the illustrator of *Animalium* and *Botanicum* returns to Big Picture Press with a spectacular exploration of the world of fungi
- The Royal Botanic Gardens, Kew completed their report into the State of the World's Fungi in September 2018, gaining much media interest. Fungi is a topic that is becoming more popular.
- Written by the mycology department at the Royal Botanic Gardens Kew.
- This is the perfect introduction into one of the most unusual life forms on the planet. Title has adult crossover appeal.

Fungarium

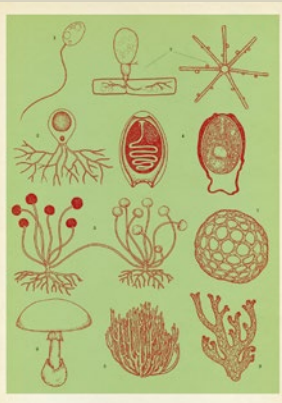
What is a Fungus?

Fungi have a long history of being both helpful and harmful to humans. As you read, you are likely to find many examples of fungi that have helped us in one way or another. You will also find many examples of fungi that have caused us trouble in one way or another.

Historically, fungi were used to make bread and cheese. The earliest evidence of bread-making is from the Neolithic period, around 10,000 years ago. The earliest evidence of cheese-making is from the Neolithic period, around 8,000 years ago. Fungi were also used to make wine and beer. The earliest evidence of wine-making is from the Neolithic period, around 8,000 years ago. The earliest evidence of beer-making is from the Neolithic period, around 8,000 years ago.

Fungi have also been used in medicine. The earliest evidence of the use of fungi in medicine is from the Neolithic period, around 8,000 years ago. Fungi were used to make antibiotics. The earliest evidence of the use of fungi to make antibiotics is from the Neolithic period, around 8,000 years ago.

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Ecosystem: Mountains

Mountains are a unique and diverse ecosystem. They are home to a wide variety of plants and animals, many of which are found nowhere else in the world. Mountains are also a source of many important resources, including water, timber, and minerals.

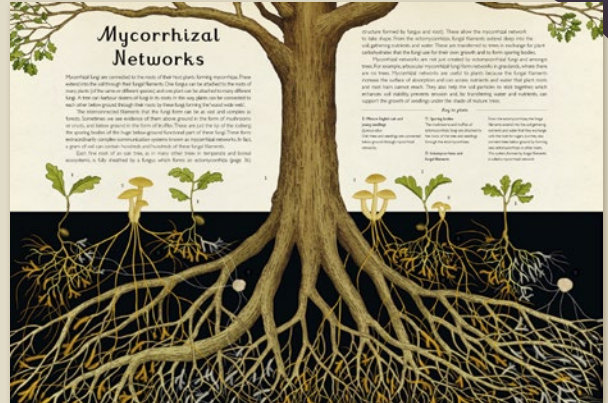
Mountains are also a source of many important services. They provide a natural barrier between different regions, which helps to protect them from the elements. They also provide a source of water, which is essential for life. Mountains are also a source of timber, which is used for a wide variety of purposes. Finally, mountains are a source of minerals, which are used in a wide variety of industries.



Mycorrhizal Networks

Mycorrhizal networks are a type of symbiotic relationship between fungi and plants. The fungi form a network of hyphae that connect the roots of different plants, allowing them to share nutrients and information. This network is essential for the survival of many plants, particularly in nutrient-poor soils.

Mycorrhizal networks are also a source of many important services. They help plants to absorb nutrients more efficiently, which is essential for their growth. They also help plants to resist disease and drought. Finally, mycorrhizal networks are a source of many important products, including antibiotics and enzymes.

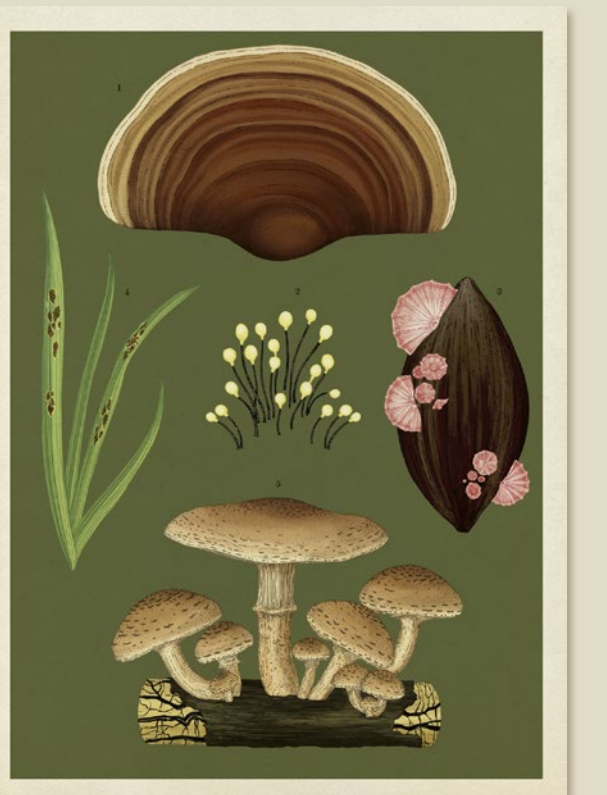


Plant Pathogens

Although most fungi perform helpful roles in recycling nutrients in ecosystems, some have adopted a different lifestyle that is harmful to the plants they interact with. Fungi that attack plants (fungal plant pathogens), are a major cause of crop damage, causing huge financial costs in agriculture and even threatening the supply of food to our tables. The price we pay for common food items in the shops is dependent on our success in our ongoing struggle with these fungi. It is estimated that 8-21 per cent of the six major food crops are lost to fungal pathogens and a further 10 per cent is lost after the crops are harvested.

New plant pathogens emerge on a regular basis, but our knowledge of their existence extends back to antiquity. A student of Aristotle, Theophrastus, provided one of the first written descriptions of fungal rust diseases. In the seventeenth century in Europe, farmers observed a connection between the presence of barberry plants growing on the margins of wheat fields and the levels of stem rust damage to wheat. This proved to be a valuable insight as barberry is now known to act as a host for the wheat stem rust, *Puccinia graminis*. Digging up and destroying the barberry plants turned out to be an effective way of controlling the rust disease.

Fungi adopt three broad strategies to infecting plants. They can infect plants and live off their nutrients while keeping the plants alive (biotrophs), they can kill plants outright and digest the dead plant matter (necrotrophs) or they can start out as biotrophs but then switch to a necrotrophic lifestyle later. Infection begins when a fungal spore lands on a plant. Most hyphae (page 16) emerge from the spore and spread across the surface of the leaf looking for a way in. Some fungi such as the rusts search out a natural opening – the stomatal pores which allow water in and out of a plant's leaves, for example. Others use a hardened hyphal tip to push through the leaf surface. Once they have gained entry, fungal pathogens interfere with the plant's ability to defend itself. For example, necrotrophic pathogens may release toxins to kill plant cells and then digest them. Biotrophic fungal pathogens keep infected tissue alive against the will of the plant which is trying to stop the infection.



Key to plate

1: Beal stem rot
Gaeumannomyces graminis
This fungus causes leaf sheath rot in all palm plantations in Southeast Asia. The fungus produces woody brackets on the side of the infected tree.

2: Dutch elm disease
Ophiostoma novo-uriae
This is a particularly aggressive cause of Dutch elm disease. It is spread by a bark beetle that lives in galleries inside the bark of the trees.

3: Winter broom disease
Monographera perniciosa
This pathogen infects cocoa trees, causing reduction in yield of up to 90 per cent. It is also resistant to fungicides.

4: Rice blast disease
Pyricularia oryzae
This infects rice plants, causing brownish lesions to appear on the leaves. It destroys enough rice a year to feed 10 million people.

5: Dark honey fungus
Armillaria mellea
Some honey fungi are major pathogens of trees and shrubs, forming black strands (mycelium) which spread through the soil and split the bark from the wood. One colony of *Armillaria gallica* forms the 'honey fungus' occupying 70 hectares of forest in Michigan State (United States). It is believed to be the largest organism on Earth.

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