

Co-operation among plants, animals and fungi in Nature

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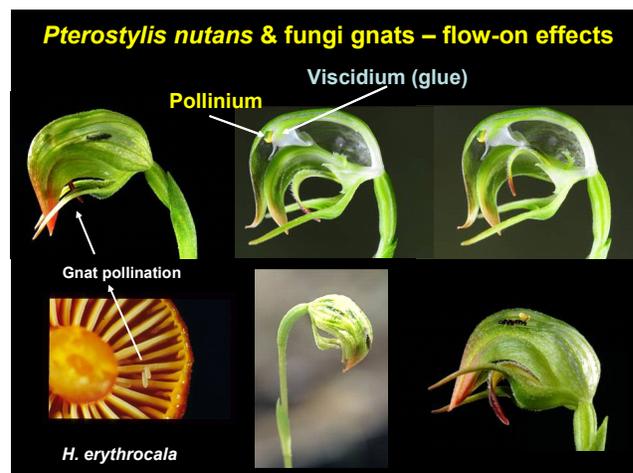
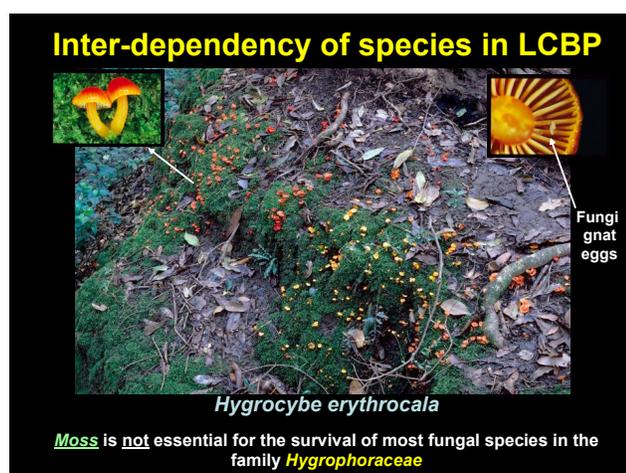
Most mycology textbooks concern themselves primarily with describing what fungi ARE, and how we classify them but contain much less about what fungi DO and how they do it. Botanists, zoologists and ecologists nearly always view the world in terms of competition among organisms. Thus, "*Nature is red in tooth and claw*" and "*survival of the fittest*". The possibility that plants/animals/fungi might co-operate and actually "help" one another does not at all fit into this widespread view of Nature.... a view now slowly changing!

Today, as decades ago, a group of university students, led into a rainforest by a professor of botany, would soon be programmed into thinking that the plants are really individuals, in the sense that Darwin thought they were individuals, competing for survival of the fittest. How wrong the professor! In fact, research today confirms that the plants are interacting with each other, trying to help each other survive. Fungi act like a symbiotic 'internet'.
https://www.ted.com/talks/suzanne_simard_how_trees_talk_to_each_other?language=en

Expert opinion	Expert opinion	Expert opinion
 <p>Expert No. 1 "The lorikeets are nesting in the hollow" Facts: Nesting season, tree hollow; male & female; nesting material</p>	 <p>Experts No. 1 & 2 "The kookaburra is harassing the lorikeets" Facts: Lorikeets; kookaburra has no food; leaves quickly; needs hollow</p>	 <p>Expert No. 3 "Lorikeet & kookaburra are harassing a possum" Occupant of hollow is a ring-tail possum</p>

Often we read in newspapers, research outcomes which are illogical co-relations e.g., more and more people drink milk, more and more people get cancer therefore, *milk causes cancer*! In our analogy above three experts in their field made decisions based on facts, but only the third expert made the right decision based on facts being coupled with a proper understanding of the cause of the effect. Facts alone were not enough without understanding!

In Nature, there are numerous examples where fungi co-operate with plants and animals to help each other. The failure to understand this by bureaucrats who endorse the use e.g., of certain fungicides can put at risk not only certain fungi but also plants and animals dependent upon them.



For example, certain ground orchids (which require fungal hypha to enshroud the seeds for germination) can also release a fungi pheromone to attract fungi gnats for pollination. The gnats can lay eggs in the mushroom on which the larvae feed. Certain fungi appear to depend upon the larvae of gnats to process fungi spores to germinate. The use of pesticides and herbicides can in some circumstances put at risk the survival of the orchid. See Figure below.

Waxcaps are believed to be biotrophic... a form of parasitism without affecting the host plant. "As soon as waxcap rich grasslands are treated with fertilizers, herbicides, or other "icides," and as soon as the sheep or cattle that keep the sward short are removed, waxcap species will cease to fruit."

<https://www.mssf.org/mycenanews/pdf/1405mn.pdf>

Science needs more people who know and know that they know not those who know not and know not that they know not!

Another example of the interdependency of species is illustrated in the composite diagram showing a new species of beetle which feeds off the chitin-containing hard, outer shell of a 'false' truffle. The chitin is acted on by chitinases of bacteria (e.g., *Bacillus circulans*) in the gut making available glucose and other sugars for the beetle. After bushfires the underground truffle, in mycorrhizal association with native shrubs/trees, emits a scent (pheromone) to attract bandicoots who crack the outer shell to access the edible kernel inside. In doing so the spores of the truffle are shed. Each species therefore helps the other.

Some orchids (*Dipodium sp.*) have a parasitic relationship with certain fungi (e.g., *Russula sp.*) because they cannot obtain sufficient energy by photosynthesis for lack of chlorophyll. They are obligately myco-heterotrophic for part of their life cycle. The fungal species is mycorrhizal with adjacent plant species (e.g., *Angophora sp.*). Such interdependency is vital to the health and well-being of such a biological community.

The essential business of pollination can be very complex but exquisitely beautiful and awe-inspiring of the many adaptations by orchids to pollinate when their flowers are not designed for self-pollination.

Species of the ground orchid in the genus *Chiloglottis* have been classified according to the kind and number of wasp pollinator species. At Mt Wilson the ground orchid *Chiloglottis reflexa* was in flower and its pheromone was attracting male thynnine wasps. Recorded for the first time the male wasp was delivering a nuptial gift of nectar to the seductive orchid thinking he was feeding the female before grasping 'her' to fly off. Not realizing 'she' is tethered, the male in frustration bumps his thorax on the viscidium glue which causes the pollinia to adhere - just what the orchid intended. The above photo records the delivery of a nuptial gift of nectar to the 'head' of the orchid's female mimic.

