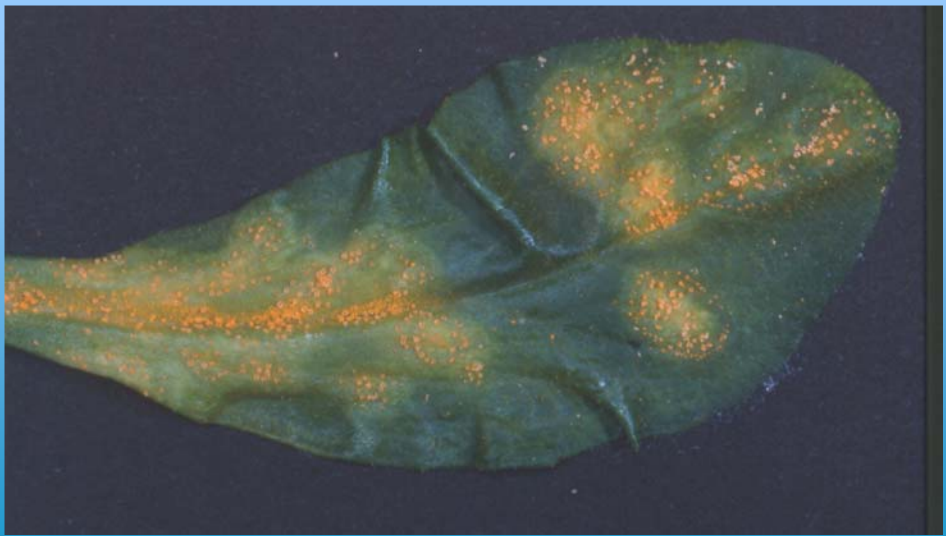
Roland Weber's Fungus Facts

Puccinia distincta, cause of the current worldwide rust epidemic on daisies

The spread of a truly devastating plant disease is an exciting event for those studying fungi, although growers of the affected plant may not fully share these sentiments. A case in point is the epidemic of wild and cultivated daisies caused by *Puccinia distincta*. The fungus may be of Australian origin, and the European epidemic probably started in the mid-1990s in Britain, France or Germany. In the past 5 years, the disease has spread to Southern and Eastern Europe and has recently been found in North America. In many places, ornamental daisies can no longer be grown unless they are protected by fungicide sprays.



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Phaffia rhodozyma, the yeast that makes salmon pink!

The pink or orange colour of the flesh of wild salmon is caused by carotenoid pigments which are produced by marine algae and pass down the food chain to prawns and other crustaceans which in turn are eaten by salmon fish. Farmed salmon, in contrast, is pale unless its diet contains the pigments (especially astaxanthin). One organism which produces astaxanthin is the yeast *Phaffia rhodozyma*. This fungus is now widely in use as a feed supplement for farmed salmon.

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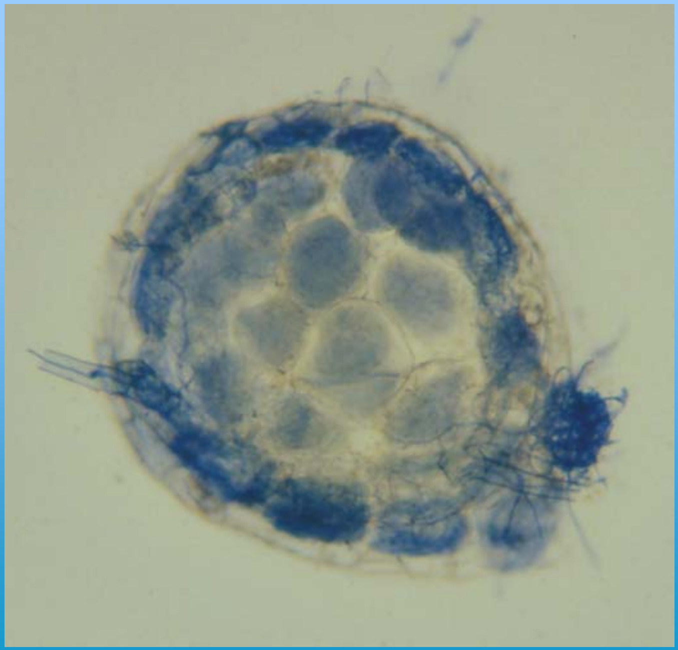
How orchids turn the table on root-infecting fungi

Soil fungi of the genus *Rhizoctonia* cause many severe plant diseases, such as damping-off, root rots, potato black scurf, or sharp eyespot of cereals. Infections usually proceed through the roots of plants. *Rhizoctonia* also infects germinated orchid seeds (protocorms)(photo, bottom left); the hyphae penetrate epidermal hairs and cortical cells but are digested by the orchid as they attempt to penetrate deeper tissues (photo, bottom right). In fact, in nature orchids rely on otherwise dangerous plant pathogens such as *Rhizoctonia* or *Armillaria* which are forced to supply minerals and sugars.



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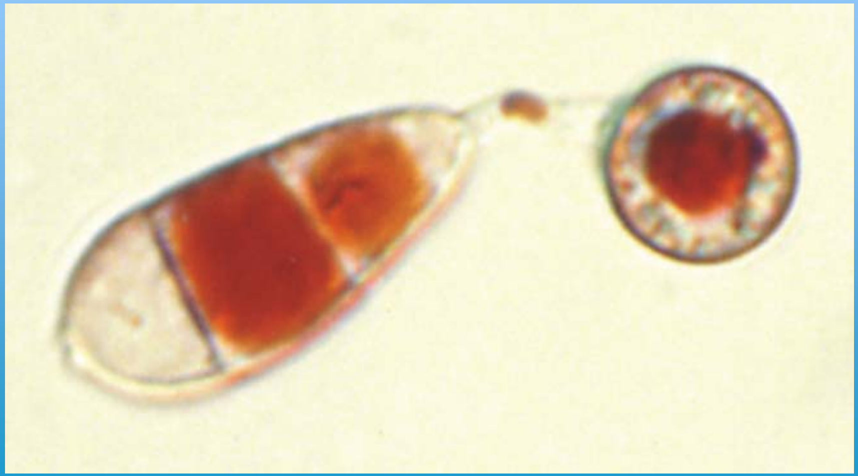
The rice-blast fungus: generator of the highest pressure known in nature

Magnaporthe grisea, cause of the economically important rice-blast disease, has developed a particularly efficient infection method. Spores (conidia) are packed with storage reserves such as glycogen and lipids. When they land on a rice leaf they germinate to produce an infection structure, the appressorium, in which the storage reserves are converted into sugars and glycerol. The appressorium has a very thick wall except for a small pore where it touches the rice leaf. The sugars draw water into the appressorium by osmosis. As a result, a massive hydrostatic pressure, up to 80 atmospheres, builds up. This is by far the highest pressure recorded in living organisms to date, and it forces the contents of the appressorium through the basal pore and the thick plant wall into the plant cells where the infection begins.

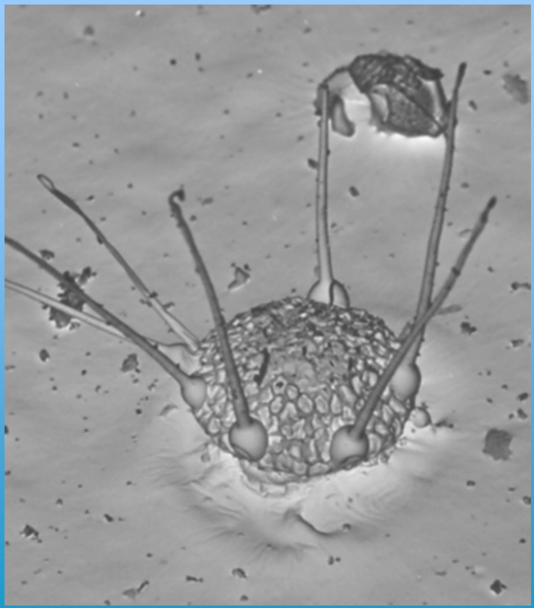


This photo shows a conidium (on left) with its appressorium (the circular structure on the right). The vacuole in the appressorium (which is stained red) will eventually take up and degrade the surrounding lipid droplets, producing sugars and glycerol in the process.

Roland Weber's Fungus Facts

Fungi as flight engineers: the hazel powdery mildew, ***Phyllactinia guttata***

P. guttata causes powdery mildew of hazel and other broad-leaved trees, being visible from September onwards on the underside of leaves as a whitish felt with minute yellow or black dots. The dots are the sexual fruit-bodies (cleistothecia) which bear two kinds of ornamentations: (a) bulbous appendages which radiate outwards, and (b) secretory appendages which produce a slime droplet and face downwards (photo on left).



In autumn, the bulbous appendages bend upwards and detach the cleistothecium from the leaf; they then serve as shuttlecocks as the cleistothecium falls, making sure that it lands on the sticky drop which cements it to a twig or fallen leaf (photo on right), so it can infect new growth the following year.

Roland Weber's Fungus Facts

From fungus to fungicide: the story of the Strobilurins

About 25 years ago, Timm Anke and Wolfgang Steglich observed a strong antifungal activity in cultures of an inconspicuous fungus growing on pine-cones, *Strobilurus tenacellus* (photo on left). The substance responsible for killing other fungi was isolated and identified as a then new natural product called Strobilurin A. Related substances were subsequently discovered in other mushrooms such as *Oudemansiella* and *Mycena*. Synthetic derivatives with an enhanced UV stability were developed, and today Strobilurins are among the best-selling plant protectants worldwide and are used against most major fungal plant pathogens. Being derived from a natural product, Strobilurins are environmentally safe because they are rapidly degraded in the environment.