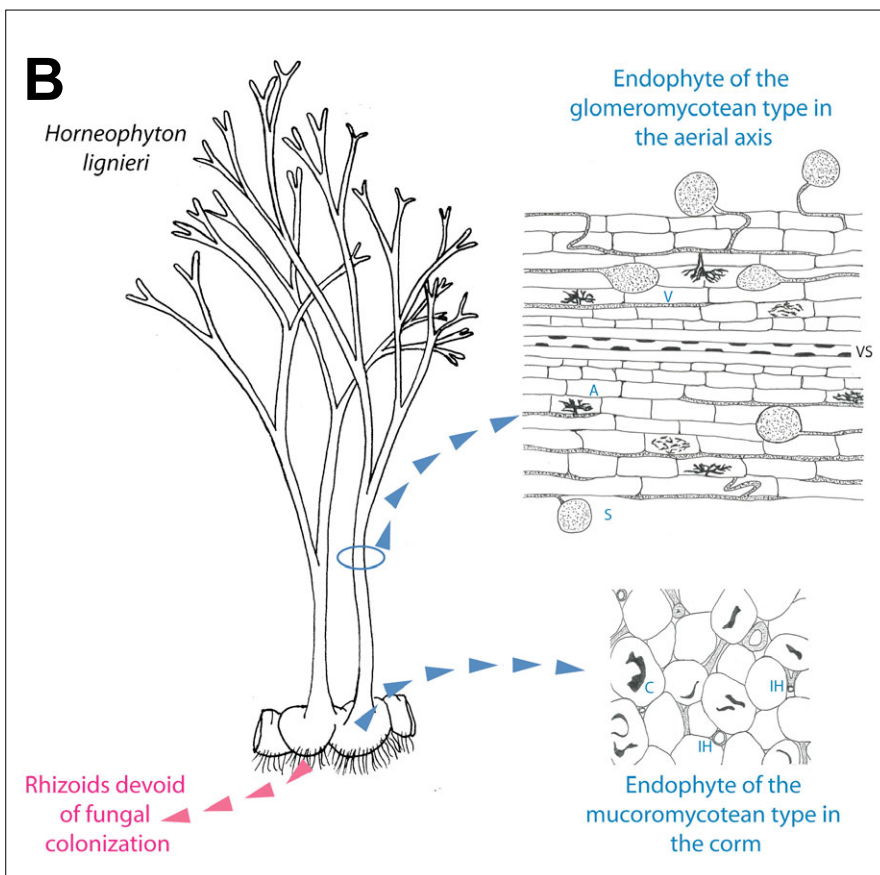
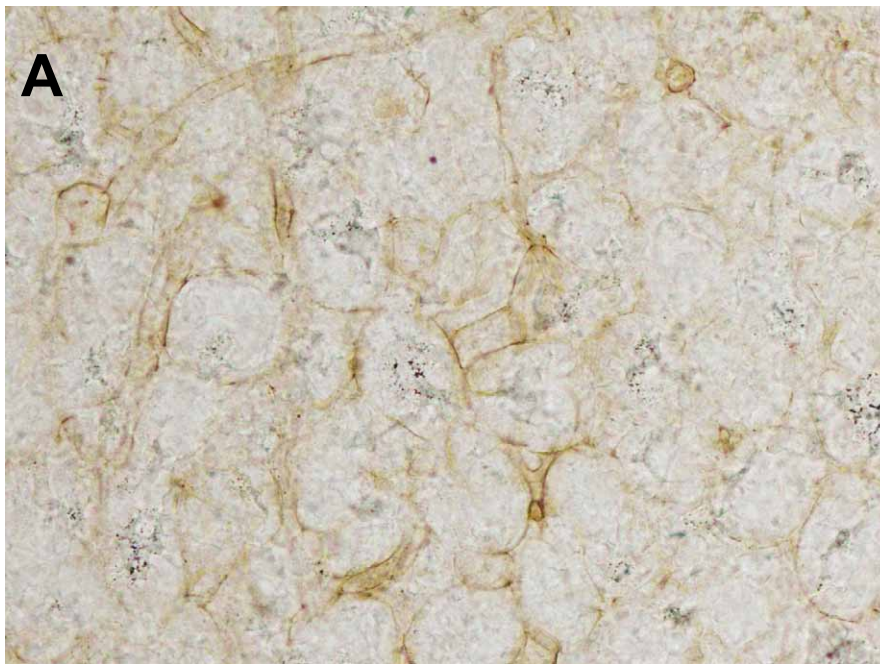


New endophytic fungi in 407 Myr-old plants



A. *Palaeoendogone gwynne-vaughniae*, showing hyphae between the plant cells. B. *Horneophyton lignieri* and its associated endophytic fungi. Figs courtesy Christine Strullu-Derrien.

The fungi associated with the roots of some of the earliest land plants which emerged in the Devonian period have traditionally been viewed as members of *Glomeromycota*. When Strullu-Derrien *et al.* (2014) examined the Rhynie Chert (407 Myr old) plant *Horneophyton lignieri*, a species not previously examined mycologically, however, they had some unexpected results. Two distinct fungal associations were found in sections prepared from the aerial stems and the basal corms; these plants lacked roots but did have delicate rhizoids which were, in contrast, fungus-free.

Following a four-page compilation of the key characters of glomeromycete-like fungi previously reported associated with early land plants and extant bryophytes, lycopods, and basal ferns, a valuable document in its own right, the authors concluded that both the fungi they had found were new to science. One fungus occurred in the outer cortex of the aerial parts of the plant, formed arbuscules, had *Glomus*-like spores, and was named *Palaeoglomus boullardii*; it did not form a continuous layer. The other fungus was located in the basal parts of the plant occurring intra- and intercellularly but was absent from the rhizoids, and was recognized as a new monotypic genus *Palaeoendogone gwynne-vaughniae* referred to *Mucoromycotina*. The hyphae of the *Palaeoendogone* proliferated between the host cells, were non-septate, and formed coils when within the cells, and the colonization recalled that seen in *Treubia*, some hornworts and also lycopods.

This study is of particular interest in showing that not all the early endophytes of land plants belonged to *Glomeromycota*, and that all were not confined to the basal parts and rhizoids.

Strullu-Derrien C, Kenrick P, Pressl S, Duckett JG, Riolt J-P, Strullu D-G (2014) Fungal associations in *Horneophyton lignieri* from the Rhynie Chert (*c.* 407 million year old) closely resemble those in extant lower land plants: novel insights into ancestral plant-fungus symbioses. *New Phytologist*: in press; doi: 10.1111/nhp.12805.

Mycorrhizas and soil carbon storage

Carbon storage in soil is a major element in the global carbon budget and cycle, and fungi living in soil would be expected to have a key role in that from both their biomass and their roles in biomineralization and particularly the decomposition of plant and animal remains. The importance of mycorrhizal fungi has been studied by Averill *et al.* (2014), who examined the carbon contents of soils dominated by ectomycorrhizal and ericoid plants (EEM) and those with arbuscular mycorrhizal plants (AM) in a range of soils in ecosystems from tropical to temperate and boreal forests and also grasslands. They found that carbon storage was 70 % per unit nitrogen more in soils dominated by EEM than AM plants. This effect was found to be independent of net primary production, rainfall,

temperature, and soil clay content. At lower values of nitrogen in the soils, however, EEM dominated forests had less than AM-dominated ones. The situation is clearly complex, but that there is a correlation with mycorrhizas and soil carbon storage is inescapable. As Bradford (2014) points out, models of the dynamics of soil carbon storage have been built on what are being found to be deficient assumptions as it is not the climate, soil texture, and plant productivity that drive the system, but the relative dominance of plants (especially trees) with different mycorrhizal systems.

Averill C, Turner BL, Finzi AC (2014) Mycorrhiza-mediated competition between plants and decomposers drives soil carbon storage. *Nature* 505: 543–545.



Tuber indicum forming an ectomycorrhiza with *Pinus armandii*. Photograph courtesy Xiang-hua Wang and Fu-qiang Yu.

Bradford MA (2014) Good dirty with good friends. *Nature* 505: 286-487.

Statins as antifungal agents



The cholesterol-lowering statins, originally discovered as a product of *Aspergillus terreus*, have become one of the world's major pharmaceutical products. It is estimated that they are taken by around 30 million people every day, generating in excess of US\$ 25 billion annually. There have been calls for them to be prescribed prophylactically to those not at risk from heart disease. Now it seems they may have a further benefit.

Nyilasi *et al.* (2014) tested the antifungal activity of several statins, lovastatin, simvastatin, fluvastatin, atorvastatin, rosuvastatin, and pravastatin, against four dermatophyte fungi in pure culture. They found they were particularly active against four clinically important ones: *Microsporum canis*, *M. gypseum*, *Trichophyton mentagrophytes*, and *T. rubrum*. Two of the statins, fluvastatin and

simvastatin, were active against all even at very low concentrations. The effect of combining statins with other some other widely used antifungals was also tested; these included fluconazole, nystatin, and griseoflvin. In some instances synergistic effects were also found to occur. The authors conclude that in view of these marked effects, statins have promise in antifungal therapy.

Nyilasi I, Kocsubé S, Krizán K, Galgóczy L, Papp T, Pesti M, Nagy K, Vágvolgyi C (2014) Susceptibility of clinically important dermatophytes against statins and different statin-antifungal combinations. *Medical Mycology* 52: 140–148.

"Tinea corporis", caused by dermatophytes. Photo courtesy Ping Zhan.

STOP PRESS

IMA Fungus has just received news that a major work providing marker reference sequences for all accepted orders of *Fungi* has been accepted for publication in the journal *Database*. This has been prepared by Conrad L. Schoch and some 60 colleagues, and is expected to be available online in the next few weeks. A more detailed account of this work, which will be of enormous value to all trying to place sequences within the fungal system, will appear in the next issue of *IMA Fungus*.