Mycology today

Tony Trinci

Organisms commonly referred to as 'fungi' actually represent two distinct evolutionary lines, the true fungi (Kingdom *Eumycota*) and the algal-like fungi (Kingdom *Straminopila*); these groups contain about 70,000 and 750 species, respectively. The aquatic chytrids are the ancestors of the true fungi, whilst the algal-like fungi are related to the biflagellate algae. The algal-like fungi arose from a line which either never possessed chloroplasts or lost them. It follows that one of the most famous of all moulds, *Phytophthora infestans*, the cause of potato blight, is not a true fungus. Nevertheless, for practical reasons the two groups continue to be regarded as 'fungi' and as such are studied by mycologists.

Surprisingly, of the 1·5 million species of fungi thought to exist, only about 5% have been identified and classified. Where are the missing fungi? Many are thought to reside in the tropics, but the discovery of obligately anaerobic fungi in the rumen of herbivores indicates the need to seek missing species in more specialized habitats.

The formation of circular colonies is perhaps the most characteristic of all 'fungal' features. These colonies are observed as ringworms (*Trichophyton* spp.) on man and animals, and as fairy-rings (e.g. *Marasmius oreades*) in fields, as well as in conventional plate cultures. Since the highly polarized nature of fungal growth enables the hyphae of *Neurospora crassa* to extend at rates of up to 100 μm min^{-1}, this fungus can colonize the surface of a 9 cm diameter culture plate in a matter of a few hours. Amazingly, fairy-rings can grow up to 200 m in diameter and some must be at least 500 years old. In Washington State, a clone of the basidiomycete *Armillaria ostoyae* was found throughout an area of over 1,500 acres and was estimated to be 400–1000 years old! Thus, fungal colonies can be long-lived and can grow to huge sizes. Remember this when you are next asked to name the largest living organism!

The importance of fungi to man is beyond doubt. The devastating effects they have on plants is well illustrated by the loss in the UK of some 30 million elm trees to the wilt fungus, *Ophiostoma novo-ulmi*, and the significant yield losses which still occur in agricultural crops. Until recently, few deaths in the UK were caused by fungal infections, but this has changed dramatically with the increase in the number of immunocompromised patients. Unfortunately, we lack effective treatments; the polyene amphotericin B, first discovered in 1955, is still the antimicrobial of choice for systemic human fungal infections, despite its very unpleasant side effects which include kidney damage. No wonder pharmaceutical companies worldwide are trying to develop new antifungal drugs.

Other examples illustrating the importance of fungi to man include:

- their role in lignocellulose turnover (surprisingly only fungi can degrade lignin, although some claims have been made for the streptomycetes)
- their symbiotic associations with higher plants (about 95% of vascular plants have mycorrhizal roots!)
- their use as sources of natural products (β-lactams, cyclosporin, etc.)
- their use as foods (mushrooms, truffles, Quorn™ myco-protein
- their use as model organisms to study important biological problems (Beadle & Tatum used *Neurospora crassa* to establish the one gene : one enzyme hypothesis which led to their Nobel Prize in 1958).

Because of the significance of fungi in our lives, there is reason to be seriously concerned by the decline of mycology in the UK. Although there are reasonable numbers of geneticists and molecular biologists using fungi as model organisms, there are now few mycologists with a broad knowledge of fungi. Prior to the 1980s, nearly every Department of Botany had a mycologist (ironic, since we now know that fungi are more closely related to animals than to plants), but with the disappearance of these departments, few Schools of Biological Sciences feel the need to appoint mycologists to their staff. A similar fate has befallen mycologists in former Departments of Microbiology. Indeed, some microbiologists even refuse to recognize filamentous fungi as micro-organisms! Shame on them. Consequently, there has been a decrease in the number of mycologists in UK universities and an increase in the average age of those that remain. The exception is in medical mycology. To my knowledge, in the early 1980s there was only one clinically qualified medical mycologist in the UK. Today, the University of Manchester alone has three such staff, two of whom are professors. This change reflects the increasing importance of fungi as human pathogens.

I do not believe that the 'disappearing mycologists' problem will be solved by special pleading, but by increasing the quality of the research conducted by mycologists. This must encompass modern approaches, including molecular biology, genomics and bioinformatics. Second-rate research is of little value to anyone, even if carried out on a very important group of micro-organisms. One way to help to increase the quality of fungal research is by forging stronger links between UK societies with an interest in mycology (SGM, British Mycological Society, British Society for Plant Pathology, British Society for Mycopathology, etc.) and by liaising with societies in Europe. Without such an effort, the decline in UK mycology will continue. Indeed, perhaps it is already too late to reverse the present trend. I hope not.

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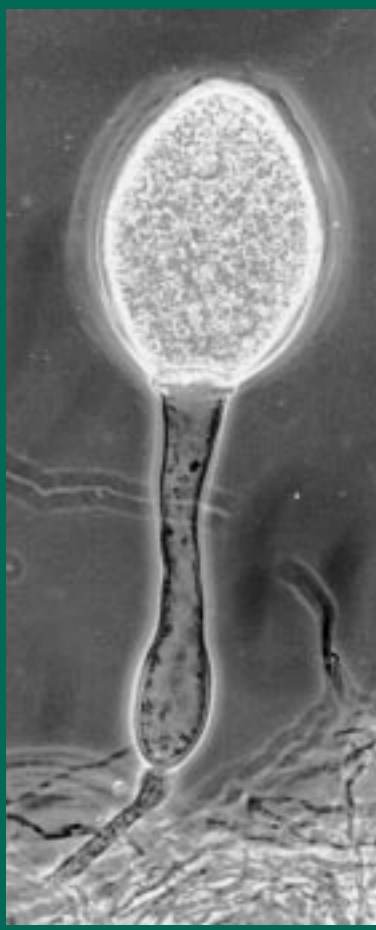

A thallus of an obligately anaerobic chytrid isolated from a water buffalo in Malaysia. This is a member of the true fungi.
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