Fungi 4 Schools – the website

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Specially produced and ready-to-use lessons and classroom activities, teacher's guides and pupils' class sheets, are among many resources available for free download from a new website

For many years the under-representation of Kingdom Fungi in the UK national curricula for schools has been a source of concern to mycologists. After all, fungi form what is arguably the largest kingdom of higher organisms on the planet and we are surrounded by them, and dependent on them, every hour of every day of our lives.

The Qualifications and Curriculum Authority (QCA) doesn't seem to know they exist. If the statutory authority is not aware of the importance of fungi, the task falls to dedicated mycologists, such as those in the British Mycological Society (BMS), to attempt to compensate for this educational deficiency by producing appropriate teaching resources. After all, who else can give you an entire kingdom (and part of two others ...!)?

With a little thought, fungi can be used for teaching many areas of the current curriculum specifications and in cross-curricular activities. The fact that fungi are not plants, not animals, and not bacteria, is not even mentioned in current GCSE specifications. Instead, the national curricula (throughout the UK) persist with comparisons between animals and plants, and by so doing fail to show students that fungi have their own unique cell biology, developmental biology, and life style, and a crucial place in every food web and ecosystem on this planet:

- Fungi digest the grass eaten by cows (and all other herbivores).
- More than 95% of all terrestrial plants depend on mycorrhizal fungi within their roots to provide them with mineral and other nutrients in exchange for photosynthates.
- We use fungal enzymes to start cheese-making, clarify fruit juices, distress denim for 'stone-washed' jeans, and as fabric conditioners in the weekly wash.
- 21st century 'wonder drugs' from fungi include cyclosporin (used to suppress the immune response in transplant patients), and statins (widely used to control cholesterol levels).
- Even today's most widely used agricultural fungicides, the strobilurins, are fungal products.

All of these 'stories' (and more) have been developed into worksheets and classroom materials, ranging in suitability from primary level to post-16, that can be downloaded (free) from a new educational website published by the BMS at http://www.fungi4schools.org.

The first edition of www.fungi4schools.org was uploaded to the server on 30 December 2005 to make it available for the Association for Science Education Annual Conference held in Reading (5–7 January 2006). As usual, the BMS Roadshow attended the ASE meeting and we handed out more than 800 copies of a CD version of the website, together with supporting leaflets (this works out at one every 100 seconds the ASE exhibition was open!). Improvements and additions to fungi4schools were made throughout 2006, and presently the website comprises over 500 Mb of data.

ABSTRACT

The one place it is almost impossible to find fungi is in the UK national curriculum for schools. This means that children are missing out on being taught about the importance of an entire kingdom of higher organisms. To try to compensate for this the British Mycological Society has devised resources for use within the current national curricula that address national curriculum topics and also give proper representation to fungi. These are available now for free download from the new website, www.fungi4schools.org, which is described in this article.

Visit http://www.fungi4schools.org

The home page (see Figure 1) welcomes the visitor and offers hyperlinks to all the main levels of the site. There are at least two links to each level – a central 'menu' of one-line descriptors being flanked by two marginal panels containing alternative descriptions. The main levels in the central menu range from beginners to post-16.

Beginners' section

This section contains articles explaining the jargon and other introductory topics, most of which were originally published in the BMS magazines *Mycologist* and *Field Mycology*. They are provided on the website as pdf files, so that the user can download them immediately. Immediate accessibility is a key principle of the design of the website. The Society has decided that if we have published something the reader needs, then we should make it immediately accessible as opposed to merely providing a conventional reference, which leaves the reader with the task of finding a library that holds the printed journal. This section includes:

- **Explaining the jargon**: A series of *Mycologist* articles that explain the terms used to describe fungal fruit bodies.
- **First steps in the classroom**: Articles, with early school years in mind, that advise about collecting in the field and suggest a few activities that can be done in the classroom.
- **Venturing into field study**: To encourage people to start looking at fungi out there in the great outdoors, this section illustrates how diverse fungi are in nature. In this series of articles a variety of authors introduce their favourite places and fungi, with simple straightforward introductions to mushrooms, toadstools, truffles, fairy rings, jelly fungi, birds' nest fungi, puffballs, stinkhorns, brackets, mildew, rusts and much more besides.
- **Mushroom or toadstool?** One of the most common questions asked by the general public is about the difference between 'mushrooms' and 'toadstools'. The usual answer, that both words are unscientific 'folk' terms that in most cases mean what you want them to mean, is made a

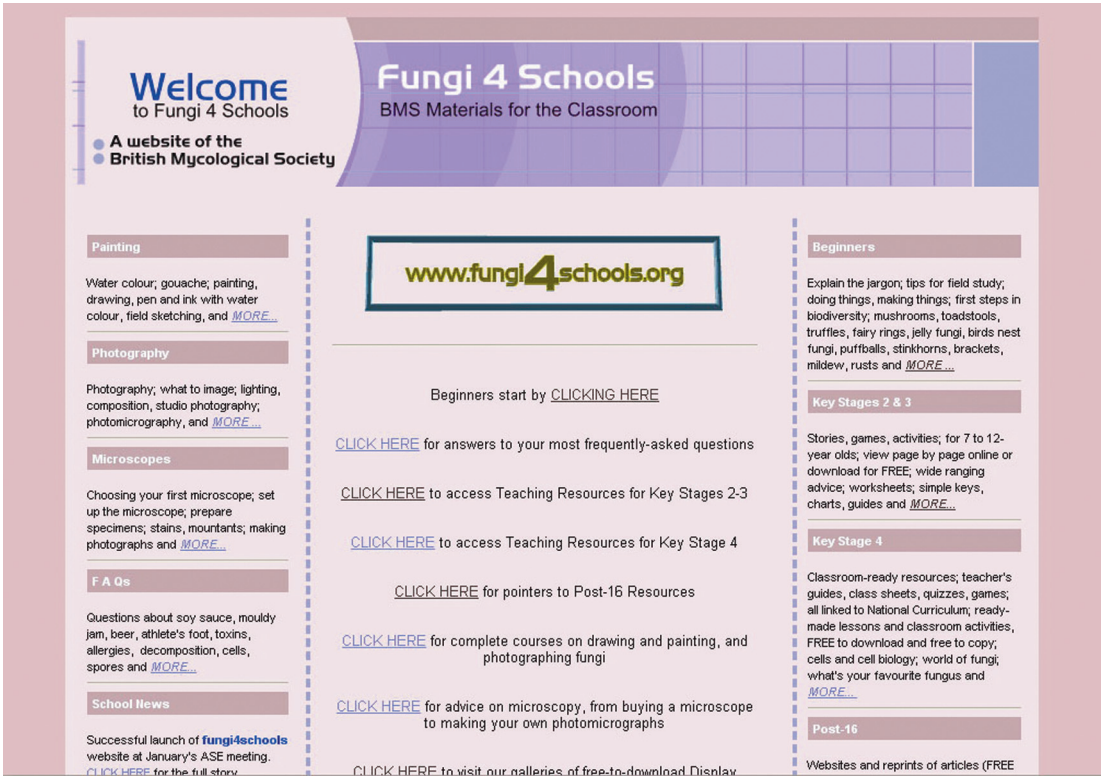

Figure 1 Screen shot of the home page of the fungi4schools website.

little more helpful here with two *Mycologist* papers which explore the origins of the two words.

- **More serious field work**: We hope that people will be inspired to get seriously interested in collecting fungi, so in this section we provide immediate access (that means click the hyperlinks to download them) to the British Mycological Society's advice on striking a balance between picking and conserving fungi: *British Mycological Society conservation policy* and *The wild mushroom picker's code of conduct*. As they get more serious about collecting, users are given access to the *List of recommended English names for fungi in the UK* and the guide *Collecting and recording fungi*, and they are introduced to Teachers' Guide 5 from our *Key stages for fungi* teaching resource (available elsewhere on the site), *TG05: Discover more*, which has a collection of information and advice about local fungus groups, books (especially field guides), and Internet resources. This section also offers hyperlinks to the British Mycological Society's fungal records database (*BMSFRD*) and *BMS distribution maps*.
- **Organised help with field study**: There are almost 40 local fungus-recording groups around the country, and the British Mycological Society organises a network to which most belong. They are made up of enthusiasts who run them on a voluntary basis. We recommend schools make contact with their local group(s) because they are very often keen to share their knowledge of wild fungi. The groups offer a friendly and welcoming environment that helps new members thoroughly enjoy the world of fungi and improve their identification skills. Members of these groups are sometimes willing to give talks or organise workshops in schools. This web-page provides a hyperlink to a list of contact addresses, and a list of hyperlinks to the URLs of those local fungus-recording groups that have their own web-pages.

A section containing answers to your most frequently asked questions

A series of articles called '*Mycology answers*' in the *Mycologist* between 1993 and 1999 dealt with a wide range of common questions about fungi. Users can browse through the questions on this web-page and download the explanation. There are 27 of these articles, covering topics such as: *'Why does jam go mouldy, even in the fridge?' 'How are soya beans fermented?' 'Why does "athlete's foot" itch?' 'What are mycotoxins?' 'How are beer and lager produced?' 'Peanuts, fungal toxins and the health of wild birds' 'Is pigmentation an advantage to fungi?'* and 20 more.

Teaching resources for 7–14 year-olds

This is a page that offers access to stories, games, and activities for children in the age range 7 to 14 years. It starts with a reprint (pdf file) of an article by Liz Holden in *Field Mycology* (2003, vol. **4**, pp. 19–24) describing a whole day of games and activities for 10–12 year-olds.

The storybook *Fungus Fred goes foraying* tells an engaging story about how Fungus Fred investigates the different types of fungi in nature. It is suitable for children in the age range 7–11 years. The book is full of fungi facts and encourages children to have fun learning. The website offers the chance to see the entire book, page by page. Users can also order the printed version by mail using an order form downloaded from the site. Of course, there's nothing to stop you printing the pages from the website – just hit the F11 key to remove screen 'clutter' and remember to set your printer's paper orientation to landscape. There are no copyright issues for educational use.

Another page-by-page offering is the 'explainers' guide to fungi *How the mushroom got its spots*. This booklet is aimed at anyone who wants to tell children, or non-experts of any age, more about the fascinating world of mushrooms, toadstools, moulds and other fungi. There are 18 worksheets that can be downloaded as pdf files, and the complete text of the booklet can also be downloaded from the website. The printed version can be ordered (it's free, but we charge for postage), using the order form you can download from the site. The same form allows users to order *The fungi name trail: a key to commoner fungi* (2003), which is in the form of a fold-out chart, as well as the *Pocket guide to common fungi*.

Teaching resources for 14–16 year-olds

This web-page links users to an extensive range of specially written classroom-ready resources (teacher's guides, class sheets, quizzes, games), which have been well received by pupils in classroom trials. Links are shown to the national curricula of all nations in the United Kingdom. They are all free to download and free to copy, and are provided in two formats: pdf file (for easy printing) and *Word*. doc so the user can edit and modify the documents to their own requirements. As well as being available as free downloads, a printed package is available for

distribution (free) from the author. These resources include:

- class sheets dealing with cells and cell biology, which ensure proper representation of both yeast and filamentous fungi;
- a series of five ready-made lessons (that include class sheets for pupil and teacher) comprising an introductory *'Welcome to the world of fungi'*, *'Reproduction and conservation'*, *'Favourite or nastiest fungus'*, *'Fungi and industry'* and *'Fungi and disease'*;
- a series of class sheets describing 15 different *'What's your favourite fungus?'* stories from which the pupils extract important points, a pack of playing cards that mirrors the class sheets and can be used to play a variety of games (and all the time the players are holding cards that each carry a different 'fungal fact'), and a 'name-game' starter exercise.

Post-16 resources

Post-16 students can explore a range of biological features at 'close-to-research' level with materials accessible here. This page links to websites and an annotated collection of reprints of articles written by an international panel of research scientists (and free to download from this website) suggesting projects on exploring genomes and genomics, medical and health topics, toxins; fungi as food; fungal growth, kinetics and mechanics; biotechnology; fungi in the environment; soil, minerals, mycorrhizas, alien fungi, and geomycology.

The intention is to provide teachers and pupils with ideas and starter references (in the form of 'get it now' reprints as free-to-download, free-to-print, and free-to-copy pdf files) for investigations that could become AS or A2 level projects. We plan to expand this section steadily. The section also offers chapters taken from the book *Slayers, saviors, servants, and sex: an exposé of Kingdom Fungi*. These are in the form of non-printable 'read-on-line' pdfs as the book is still commercially available.

Complete courses on drawing and painting, and photographing fungi

This web-page offers pdf reprints of botanical artist Lorna Minton's complete eight-part course on sketching and painting fungi from *Mycologist*, as well as an eight-part master class in fungal photography by wildlife photographer Gordon Dickson. This page also offers a few other articles, for example, how to use a flat-bed scanner to take photographic images, and photography through the microscope for absolute beginners. This latter theme (microscopy) is picked up in the next web-page, which features articles from *Field Mycology* that together provide the beginner with advice about choosing a microscope, setting up the microscope, preparing specimens, and stains and mountants. Links are repeated to articles about photomicrography, and to the compilation of movies that illustrate key aspects of the cell biology of living filamentous fungi on the CD, *Biology of living fungi*.

Galleries of free-to-download display posters and graphics files

From this page users can access a variety of galleries of display posters and images. The display posters are text-based posters describing the main features of fungi in the form of displayed bullet points, together with a set of six pictorial stories written by Roland Weber about interesting fungus facts. Posters are offered as pdf files (these should preserve our formatting), and as *PowerPoint* files so the user can use them for projection or edit the content and/or design to suit his/her own purposes. The image galleries include cover pictures from the Society's fungus magazines and many digital images of fungi. Users can click on any low-resolution image in the gallery on the web-page to download high-resolution jpeg graphic files suitable for image manipulation or poster-making projects. As with other items on this website, there are no copyright issues for educational users, but all rights are reserved for any commercial use.

References

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