

## ELECTRONIC FUNGI - A VIRTUAL POSSIBILITY

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The purpose of this article is to make those interested in mycology aware of the exciting potential of a combination of powerful electronic tools which could well change the face of mycological studies as we advance into the next millennium. One of the tools in question is the flatbed colour scanner, an electronic device about 30 x 60cm which links to a computer and acts rather like a highly sophisticated photocopier. It converts the physical image, such as a photograph, into digital information which is then displayed on the computer screen. Once the image has been captured by the computer, the options for manipulating it are virtually unlimited and include changing a variety of parameters such as size, resolution, colour balance, brightness and contrast to achieve the desired effect. These images can then be saved or embedded in other computer generated documents as required. Obviously their main intended use is in desktop publishing to insert high quality images into text, although they are also useful in copying existing documents. Alternative types of scanner exist which perform much the same function, ranging from the cheaper hand scanners, which are harder to use, to the more expensive professional drum and film scanners.

Where the flatbed colour scanner comes into its own as far as mycology is concerned is in its ability to directly scan three-dimensional objects such as fungi! This technique opens up an entire new vista of possibilities to amateur and professional mycologists alike. A fresh specimen can be collected, placed appropriately on the glass plate to display its main distinguishing features, covered by a pliant, light-reflecting material such as a white cloth with the scanner lid propped open and scanned - all in a matter of moments. Its image, once enhanced to one's satisfaction, can then be saved and held in an archive for display or printing copies as required. This can be cross-referenced to the exsiccatum and used as a valuable visual aid to supplement herbarium material, or as additional information when posting dried specimens for confirmation of identity.

The technique of direct scanning is more valuable using fresh rather than dried material, although it is successful for certain dried specimens such as the *Geastrum fornicatum* (Huds.) Hook illustrated (Fig 1). It is less suitable for very small specimens as definition tends to be poor, the *Scutellinia scutellata* (L.) Lambotte is the smallest specimen with which I have achieved reasonable results (Fig 2). Conversely, very large specimens will give rise to depth of field problems and loss of crucial features. The best results are obtained from keeping as much of the specimen in contact with the glass as possible.

The directly scanned images accompanying this article were produced using a mid-range Hewlett Packard Scanjet 11cx and were sent to the printers in electronic format to cut out colour shifts originating from my printer. Although no one is likely to suggest that the quality of the images is equal to that of a good photograph or slide, they do have the undoubted advantage of achieving rapid post-foray results which can be quickly and easily distributed to large numbers of people in either printed or electronic format.

Electronic fungus images can also be produced by scanning photographic prints or even slides, by using a special scanner slide adapter. A high quality commercial service of this type is provided by Kodak who will scan up to 100 images from 35mm film and compress the information on to one Photo CD with very little loss of definition. The pictures can then be read back to computer via a CD-Rom drive. An exciting way forward for the BMS slide collection, perhaps?

The possibilities for electronic fungi do not, however, end there. With the assistance of another electronic communication tool, the modem, all such images have the potential to be lodged on the Internet - the much publicised information superhighway. This means they are available for download and printing to anyone, anywhere in the world who has access to a modem and an Internet account. Access can, if



Fig 1 *Geastrum fornicatum* (Huds.) Hook., one of the few species which can provide a useful direct scan when dried. This specimen (x1) was found beneath *Thuja plicata* in Glasbury-on-Wye, Powys.

the information is deemed sensitive, be restricted to authorized individuals but mycologists may, with the aid of a very useful program called an off-line reader, achieve rapid download of fungus images plus a huge range of other fungus-related information, all for the price of a local phone call. Such is the popularity of the Internet that commercial facilities are now becoming available for public use on a 'pay as you use' basis in 'Cybercafs', putting the technology within the realms of all, even those without a computer.

In Britain both Kew and IMI already have potentially useful mycology pages on the Internet, but neither yet contain a fungus image archive. Various such archives do, however, exist on the World-Wide Web Virtual Library mycology section. Amongst others there are several which originate from the USA using scanned fungus slides, and a high quality though as yet small archive is available from Italy using the Kodak Photo CD system, as illustrated by the image of *Russula pumila* Rouzeau & Massart shown by kind permission of Marco Floriani.



Fig 2 *Scutellinia scutellata* (L.) Lambotte (x6) demonstrates the computer enhanced result obtainable when fresh but small specimens (4-8mm) are directly scanned.



Fig 3 This image of *Russula pumila* Rouzeau & Massart, a species typically found with *Alnus*, was downloaded from Marco Floriani's Mycepage Image Archive on the Internet. Prior to this the slide was professionally processed using the Kodak Photo-CD system, which appears to achieve excellent on-screen results.

The combination of scanner and Internet technologies has enormous potential for mycology at all levels both to inform and to educate. It would, for example, be an invaluable teaching tool if in the future direct scans of the more interesting larger fungi found at forays were to be displayed on the Internet within hours of their finding, a sort of electronic foray table to educate all, not just those present at the foray. One might also envisage mini fungus workshops on the Internet using a combination of keys and image archives. The possibilities are endless, but it is certain that only by making use of these technologies to increase public awareness of fungi and to improve general levels of identification expertise will it be possible to adequately record, map and ultimately conserve the fungus flora of Britain.

As a move towards this, the incipient state-of-the-art BMS database application being developed by Jerry Cooper at IMI now incorporates fields for fungus images, and once it is operational could greatly assist the BMS database in becoming a resource of which to be proud. Perhaps it is not entirely science fantasy to envisage a time when virtual fungi are available at our fingertips?

I certainly hope this article will stimulate some serious interest in bringing mycology into

line with electronic advances, as I am convinced that the advantages in terms of information dissemination, recording and fungus conservation far outweigh the disadvantage of having to re-manipulate one's budget.

*Reference:*

Scanner review in July 95 issue of 'Personal Computer World'

*Approximate costs of technologies mentioned:*

Mid-range flatbed colour scanner £600; slide adapter £350; Kodak Photo CD 50p per image; Modem £120; Internet account £10 per month plus phone charges.

*Image Archives on Internet include:*

BioEdNet Images of Fungi: <ftp://www.bioednet.uoguelph.ca/biodnet1/orgabiol/fungi/>

Biological Image Archive: <http://muse.bio.cornell.edu/images/>

Marco Floriani's Mycopage: <http://www.inf.unitn.it/~mflorian/mycopage.html/>

Nathan Wilson's mushroom images: <http://www.cinenet.net/users/velosa/photoalbum.html/>

Tom Volk's awesome mushroom images: [gopher://gopher.adp.wisc.edu:2070/11/image/.bot/fungi\\_332/](gopher://gopher.adp.wisc.edu:2070/11/image/.bot/fungi_332/)

*Other myco-resources of interest:*

Mycologists Online: <http://muse.bio.cornell.edu:70/11/directories/mo/>

WWW Virtual library: Mycology: <http://muse.bio.cornell.edu/taxonomy/fungi.html/>