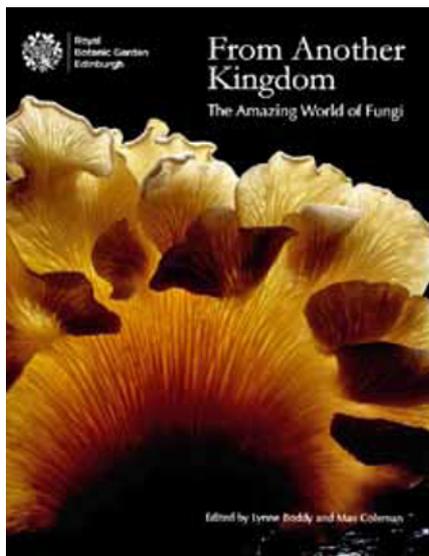


**From Another Kingdom: the amazing world of fungi.** Edited by Lynne Boddy and Max Coleman. 2010. ISBN 978-1-906129-67-5. Pp. 176, illustr. Edinburgh: Royal Botanic Garden. Price: £ 20.



What a superbly presented book! Should you ever require just one to capture the imagination, or to get friends or family to appreciate why you are a fungal fan, this is it. The large format, striking colour photographs on virtually every page (and in some cases a whole page), cannot but enchant. It really lives up to the subtitle, proclaiming that there is an “amazing world of fungi”. Aimed at the general public, this production has been a team effort, involving 21 authors (all based in the UK) – and 72 suppliers of photographs.

The Introduction by Nick Read and Lynne Boddy, designed to catch the imagination, is followed by a characteristic ‘tour de force’ overview by Roy Watling (Ch 1). In this, amongst many other things, Roy illustrates the difficulty in inventorying fungi by his experience at Dawyck Botanic Garden; although recording started there in 1993, the rate of discovery of additional species still showed no sign of reduction in 2009 (p. 30). The first group of chapters have an ecological and exploitive theme: ‘Recycling the World’ (Ch 2), ‘Plant Pests and Perfect Partners’ (Ch 3) which covers symbiotic associations, ‘Animal Slayers, Saviours and Socialists’ (Ch 4) with some stunning pictures of entomopathogens, and ‘Amazing Chemists’ (Ch 5). The

extent to which the potential benefits of fungi will be realized, however, is finance dependent; for example, who will pay for the prophylactic production and spraying of ‘Green Muscle’ for locust control in poor arid regions of the world (p. 77)?

I really enjoyed the chapters on ‘Fungi and Humanity’ (Ch 6) and ‘Fungal Monsters in Science Fiction’ (Ch 7). However, I must admit to being surprised not to see mentions of Aldous Huxley’s last novel *Island* (1964) where the demeanour of the indigens is attributed to hallucinogenic mushrooms they cultivate, nor any reference to Eleanor Cameron’s much collected and delightful *Mushroom Planet* five-book series (1954-67); the first was *The Wonderful Flight to the Mushroom Planet* (1954) – which was appropriately named *Basidium!* ‘Growing Edible Fungi’ (Ch 8) includes commercial and personal approaches, but I do wish anyone coaxing *Lentinula edodes* plugs to produce on logs has a less frustrating and more productive experience than mine! Perhaps citing *Coprinus comatus* spawn kits for growth in lawns instead would have been preferable. ‘The Fungal Forager’ (Ch 9) on collecting for food in the wild, rightly also highlights the issue of the mixed messages in current UK legislation designed to control collecting and promote conservation. ‘Safeguarding the Future’ (Ch 10), devoted to conservation, is politically charged and reiterates that it is first necessary to conserve mycologists with identification skills; this chapter should be compulsory reading for those in government agencies and departments responsible for science management and the environment. Then follows a section with six recipes using different wild mushrooms; the dishes look great, but I do wonder at the appropriateness of including one using *Hygrophorus marzuolus* as it is unlikely to be discovered north of Spain – though I have to admit it does have a rather special taste! What did seem something of an

omission in this series of chapters, was any hints as to reliably identify fungi, whether for food or curiosity – or the wealth of information on distributions and ecologies now accumulated in the Fungal Records Database of Britain and Ireland (FRDBI) and the Association of British Fungus Group’s CATE.

I was at first pleased to see lichens had due mention, but then a little disappointed to see them repeatedly referred to as “organisms” (pp. 16, 52, 169) rather than associations, and also by the oxymoron “fungi and lichens” (p. 84); at least on p. 27 we read that they were “once thought to be independent organisms”! Some myths are also slain, for example presenting *Amanita muscaria* as a hallucinogen rather than a poisoner (p. 103), but others are perpetuated, such as that of spores being “spread in the wind” (p.16-17) – something that actually holds for only a rather limited number of species. There are inevitably small slips, for example, it is not *Psilocybe semilanceata* itself which is now categorized as a Class A drug (p.97), but rather the compounds psilocybin and psilocybin in whatever fungi they occur. And while the nomenclature is generally up-to-date, it would have been good to have seen *Gliocladium roseum* replaced by *Clonostachys rosea* (p. 90).

A feature of all the main chapters I particularly enjoyed was the separately authored half-page species profiles; these are wonderfully eclectic, for instance who would have expected to see features on *Coniochaeta polymegasperma* (p. 49) or *Phellinus ferreus* (p. 91)? – access the book to discover why!

The one-page Bibliography unfortunately has a strong mushroom identification and cultivation bias, with not a single text on fungal biology cited, nor even a mention of Martin and Pam Ellis’ (1997) *Microfungi on Land Plants*. The few websites mentioned could usefully have been extended, and an opportunity to draw attention to *Field Mycology*,

*The Forayer*, and courses was missed. A suitably enthused reader could be frustrated and left floundering as to how to reveal even more amazing facts! Four pages are then devoted to portraits and biographies of 14 of the authors, and two to a glossary; the need for the latter could have been made superfluous by a policy of including definitions in the text and

just avoiding unnecessary jargon such as ‘coprophile’ or ‘mycobiont’.

The book was launched to accompany an extravaganza of an exhibition with the same name, which ran from 31 July to 21 November 2010 at the Royal Botanic Garden in Edinburgh which many of the delegates to IMC9 were able to enjoy. The modest cost was made possible by a generous dona-

tion from the Wellcome Trust, and makes the work easily accessible to the public at large. However, it is packed with tit-bits that are sure to also fascinate, or perhaps even amaze, the most hardened of mycologists. Secure a copy while you can, enjoy dipping into it, and do leave it lying around open to help ensnare the next generation of organismal mycologists.

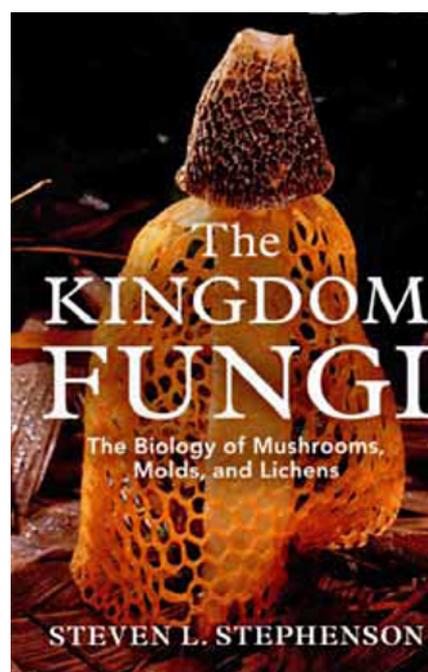
**The Kingdom Fungi: the biology of mushrooms, molds, and lichens.** By Steven L Stephenson. 2010. ISBN 978-0-88192-891-4. Pp. 271, col. pl. 124. Portland, ORE: Timber Press. Price: US\$ 34.95, £ 20.

The flyleaf indicates that this book is aimed at “the general naturalist, amateur mycologist, or interested lay-person who simply wants to become more familiar with, and more appreciative of, the fascinating world of fungi”. The arrangement is primarily systematic, but with chapter titles designed not to deter. In the case of the agarics, there are entries even for families, which are grouped by spore colour, and throughout there is information on collecting and hands-on clues to identification intermixed with notes on ecology and biology. As might be expected from a specialist in myxomycetes, they have their own chapter, and so do lichens – although the trap of calling the latter “organisms” is not avoided (p. 21) and they are hardly “traditionally grouped with fungi” as the integration of lichen-forming fungi into the overall fungal system has only really been achieved over the last three decades. There are final chapters on the role of fungi in nature, interactions of fungi and animals, fungi and humans, and fossil fungi.

I was pleased to see the myth that fungal species in general are widely distributed and that long-distance dispersal is a common

phenomenon knocked down (p. 24). There are also numerous pieces of information that may be unfamiliar and sure to interest many professional mycologists. For example, that Pacific Northwest Northern flying squirrels rely on *Bryoria* species as their primary winter food source, the appreciation of the “Asa Gray Disjunction” between eastern Asia and North American closely allied fungi (e.g. *Ciboria carunculoides* and *C. shiraiana*), and a synopsis of what is known and postulated on regarding the enigmatic 6 m tall fungal Lower Devonian fossil *Prototaxites* – including a hypothetical reconstruction in colour (pl 122).

The book is well-presented and I did not detect many proofing slips, although the legend to the plate showing *Arcyria sulcata* in Baltic amber (pl 124) gives a date of “35 to 59 years old” having lost the million (which is correctly included on p. 237). The illustrations comprise 124 superb colour plates on coated paper, arranged in two tipped-in signatures, which are sure to capture the interest of anyone chancing to open it. There are no line illustrations, but the writing style renders the whole most



readable and engrossing – and the author’s enthusiasm for all things fungal permeates throughout. It is perfectly tailored to its intended target audience, and can be unhesitatingly recommended to the general naturalist and citizen scientist.

**Mycorrhizal Biotechnology.** Edited by Devarajan Thangadurai, Carlos Alberto Busso & Mohamed Hijri. 2010. ISBN 978-1-57808-691-7. Pp. x + 216. Enfield, NJ: Science Publishers. Price: £ 57.99.

Knowledge of the operation of plant-fungus interactions in arbuscular-mycorrhizal (AM) fungi at the molecular level has developed dramatically in the last decade, and on seeing this title I expected the focus to be some synthesis of our this new understanding and discussions of the potential for exploitation. The emphasis is indeed on AM fungi, as only one of the 14 chapters deals with ectomycorrhizas (Ch 2) -- and that concentrates on general issues and not technologies for exploitation. But the thrust

of the AM fungal chapters is on pragmatic low technological exploitation rather than blue-skies visions, with some original studies thrown in. The interplay with bacteria, especially nitrogen-fixing rhizobia, is emphasized in Ch 1, and this theme is developed further in Ch 3.

Low-cost production of enough inoculum is a limiting factor to commercial exploitation, especially in tropical countries where there is the greatest need to increase crop yields; the methods tried are covered

in Ch 4, though no mass culture system seems yet to have been developed. There is an account of a research project carried out on a single grassland site in Argentina which was weeded and then planted with two grasses; AM-fungal colonization was assessed and biomass production measured (Ch 5). There was a negative correlation between the development of mycorrhizal associations and biomass production and it is concluded that the associations may not be beneficial where the soil has high levels



of available phosphorous – I cannot but think that such a contribution would have been better-placed in a primary journal. In contrast, in the case of horticultural crops, an increased yield of 20–40 % is claimed (p. 137) but not referenced and the information is stated to be limited (Ch 9).

Mechanisms of reduced resistance to pathogens in plants are reviewed, and the importance of bacteria, including inoculated *Pseudomonas* strains, is stressed; although some promising results with *Glomus* species are mentioned, the incidence of leaf pathogens can be increased (Ch 6)! Rhizosphere management is clearly a complex issue, but bioaugmentation by AM-fungi is again frustrated by difficulties in securing enough biomass for field inoculations (Ch 8). Perhaps of greatest potential is “mycobization”, a term coined in 2005 for the novel process of co-inoculating plants with different functional groups of fungi, for example phosphate-mobilizing *Glomus mosseae* and solubilizer *Aspergillus niger* (along with

rock phosphate) in tomato cultivation (Ch 10). As to the future, the need to inoculate plants being used in bioremediation, actually so-called “phytoremediation”, of polluted soils devoid of AM fungi is pointed out (Ch 7); *Glomus mosseae* can apparently withstand 1200 mg kg<sup>-1</sup> zinc. This theme is also the topic of a second chapter (Ch 11), stressing enhancing the functionality of the 400 or so known “hyperaccumulator” plants in “phytoextraction” where polluting compounds are taken up into harvestable plant tissues.

A survey of the actual diversity of AM-fungi, surprisingly, does not feature until almost the end of the book, where there is one chapter providing a general overview of the families and genera of *Glomeromycota* with a summary of the PCR-based studies conducted (Ch 12) – but without illustrations illustrating critical characters used in their morphological identification. More pragmatic for many of those working with these fungi is the survey of molecular tools for detection (Ch 13) which is especially to be commended in ranging from RFLP to sequence data, but more so in its focus on the composition of the different primers available which occupy seven tables. The final chapter (Ch 14) considers the topical and pertinent issue of possible effects of climate change on AM fungi, which respond to elevated soil temperatures; yet the experimental results to date are “contradictory and do not allow general conclusions” (p. 205). One complication is surely that a single patch of vegetation may support 30–40 AM fungal species, which I presume would not necessarily all respond in a regimented manner.

The editors are clearly mycorrhizal chauvinists as they claim “mycorrhizae are the most common symbiotic species on earth” (p. vii). Yet a “mycorrhiza” is not a species but a mutualistic association

between a plant root and a fungus, and I suspect that there would be bacterial contenders for the commonest association title, and possibly also claims from the lichenologists. I was amused to see that the oldest fossil evidence of a bryophyte-like land plant was stated to be from just 100 years ago (p. 103). Five of the chapters are contributed by staff of the Tamil Nadu Agricultural University in Coimbatore, India, where I was privileged to have lectured in 1991; I was much-impressed by the mycological work being carried out there at that time, and am so-pleased to see them feature so strongly here. I enjoyed the delightful and sometimes amusingly phrased Indian-English that features throughout but do feel more rigorous editing in content was needed – how many times do readers wish to be told that Frank introduced the term “mycorrhiza” in 1885? Further, that date was for what later became termed ectomycorrhizal and not endomycorrhizal fungi, two terms he introduced in 1887! Author citations appended to scientific names are of course quite inappropriate for such an applied work, but do crop up in two chapters (Chs 10 and 12), and in one the citations do not even follow the recommended system. And there are some misspellings, such as “*Dydimella*” for “*Didymella*” which are difficult to excuse . . .

There are two main audiences that I feel would profit from digesting this book: (1) those in less-developed countries endeavouring to exploit AM-fungi in increasing crop yields; and (2) those researching AM-fungal mechanisms at the molecular level that need to be aware of the practical difficulties in exploitation. Sadly, the price is likely to prohibit access by the first group, and the lack of state-of-the-art molecular work deters the second from buying a copy.

**Oomycete Genetics and Genomics: diversity, interactions and research tools.** Edited by Kurt Lamour and Sophien Kamoun. 2009. ISBN 978-0-470-25567-4. Pp. xvii + 574. John Wiley & Sons, Hoboken, NJ, USA. Price: £100.00, € 120.00.

Although this book was published in 2009, it only just came to my attention and I am much impressed by the coverage and caliber of the 67 contributors drawn from 14 countries. No less than 27 chapters are accommodated, which leads to chapters with a clarity and pertinence too often absent in multi-authored works. The title understates the contents. As Francine Govers states in her

Foreword, this “. . . is the first time that the existing knowledge on oomycetes has been brought together in one volume” (p. ix).

While it is true that genetic and genomic studies are authoritatively considered, and these are incorporated where appropriate, there is much basic information on these fungal analogues that is not otherwise easily accessible. This is especially true

for the first five chapters which address the phylogeny, ecology, and life-cycles of these fungi. I found the first (by Gordon Beakes and Satoshi Sekimoto) on the overall phylogeny especially useful as these fungal analogues are rarely considered in fungal systems that embrace only the members of the kingdom *Fungi*. The major part of the work, 14 chapters, are concerned with succinct

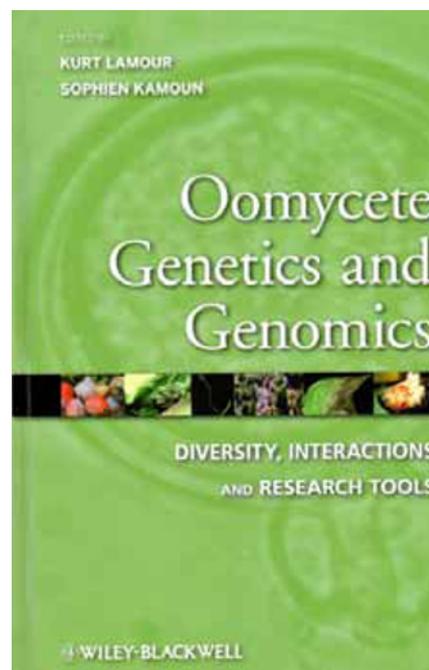
accounts of studies of particular genera and species. These include many groups of major economic importance as pathogens of crops, fish, and even humans, for example different species of *Phytophthora*, *Saprolegnia* on fish, various downy mildews on particular crops, and *Pythium insidiosum* in mammals (including humans!). This last chapter on *P. insidiosum* I found to be an especially valuable synopsis with fine SEMs of appressoria. The *Phytophthora* species selected for particular attention are, not unsurprisingly, *P. brassicae*, *P. capsici*, *P. infestans*, *P. ramorum*, and *P. sojae* – but I missed a chapter devoted to *P. cinnammoni* which causes such devastation of native forests in Australia in particular.

The last six chapters focus on some of the cutting-edge molecular approaches to work on these fungi, which from the title might have been expected to dominate. These cover transformations, expression systems, the promise of gene silencing, proteomics, and the strategy towards genome sequencing (the last with a useful glossary for the non-geneticist).

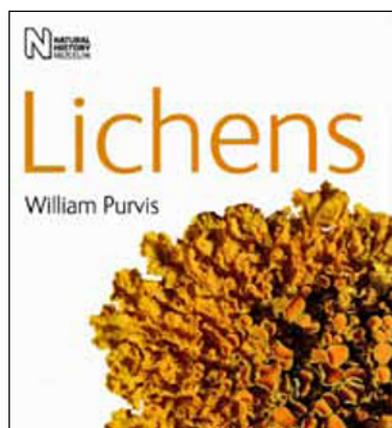
These fungal analogues tend to be increasingly not, or rather poorly, represented in mycological treatises and textbooks, since it became recognized that they were not real *Fungi*, but merely fungi (i.e. organisms studied by mycologists). This book would thus help address this situation in mycological libraries, and should be seen in that context and purchased for that reason. Its scope would have been better reflected in a title on the lines of “*Oomycete diversity, interactions, and molecular biology*” – and it is unfortunately that the actual title may deter many mycologists and plant pathologists that would actually find much to interest them here.

The whole is extremely well-produced, and I especially liked the tipped-in signature of colour plates on coated paper comprising colour versions of eight half-tone figures from various chapters. It also seems as well up-to-date as can be expected in such multi-authored works, with many papers from 2008 being cited. And the price is reasonable by current standards for a book of this

quality. The editors are to be congratulated on marshalling such a work, which clearly merits wide circulation amongst the broader mycological community.



**Lichens.** By William Purvis. 2010. ISBN 978-0-565-09153-8. Pp. 112, illustr. London: Natural History Museum. Price: £ 12.99.



First published in 2000, and reprinted in 2007 with a different cover, this well-illustrated introduction to lichen ecology and biology has now been re-issued “with updates”. The updates have been rather modest, and will be difficult to spot; even the cover is identical to the 2007 reprint, though there is a different illustration on the title page inside. Even the list of selected books (p. 111) has not been revised from the 2000 edition despite two of the listed titles having subsequent new editions or replacements; that would hardly have been

a costly exercise. It is unfortunate that the opportunity was not taken to prepare a thorough revision to accommodate at least some of the new information now available, and revise sections such as that on pollution effects where the influence of nitrogenous compounds might have had a higher profile. Nevertheless, with no equivalent full-colour book aimed at the general naturalist now on the market, it is pleasing that this little book is available once more – but if you have one of the earlier editions, do not put acquiring this one high on your list of desiderata.