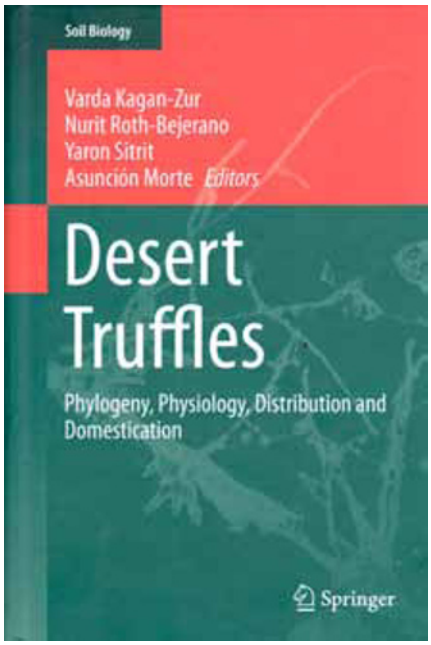
Desert Truffles: phylogeny, physiology, distribution and domestication. Edited by Varda Kagan-Zur, Nurit Roth-Bejerano, Yaron Sitrit & Asuncíon Morte. 2014. Heidelberg: Springer. [Soil Biology no. 38.] Pp. ix + 397, illustr. (some colour). ISBN 978-3-642-40095-7. Price: US$149.00,118.99 €, £100.50.



At last there is a major work synthesizing the information on desert truffles, predominantly species of *Terfezia* and some of *Picoa* and *Tirmania* in southern Europe and around the Mediterranean. I first encountered these 1:1 bottled in a jar at my host's home in Saudi Arabia while teaching there in 1978. Then in 2004 an excited Spanish restaurateur thought he had got hold of white truffles (*Tuber magnatum*) from Morocco that he could sell at a huge profit[1] – he was very disappointed. Yet these fungi, which are important ectomycorrhizals as well as being edible, are not well-known to mycologists and mycophagists at large, despite being described and beautifully illustrated in key works such as that of Montecchi & Sarasini (2000).

This new book is very wide-ranging. The first chapter (Moreno G *et al.*) includes an overview at the family level including keys to 35 ascomycete, 32 basidiomycete, and five glomeromycete truffle genera. Following an overview of what molecular phylogenetics has revealed about relationships in *Terfezia* (Kovács GM & Trappe JM), there is survey of cryptic and new species in the genus (Bordallo J-J & Rodríguez A); molecular approaches have swelled the number of species to 12. Four chapters are then devoted to aspects of mycorrhizal formation, from favoured soil properties, and types of association, to pre-symbiotic interactions with *Helianthemum sessiliflorum* and benefits conferred on plants. Apparently, and perhaps not surprisingly, water stress promotes the formation of these mycorrhizas.

Biogeographical aspects are the topic of seven chapters. There are desert truffles in North America (Trappe JM *et al.*), southern Africa (Trappe JM *et al.*), and Australia (Claridge AW *et al.*), but lack *Terfezia* species. In Europe, *Helianthemum* and *Cistus* species are the main host plants (Chevalier G). Khaber provides an illustrated overview of the North African species, while Kagan-Zur & Akyuz survey the Asian Mediterranean taxa, including Lebanon, Syria, and Turkey. In other arid parts of Asia, including China, Iran, and Pakistan, *Terfezia* species are also to be found, sometimes with *Kobresia bellardi* as a partner; in Iran *T. boudieri* can sell for US$ 10–30 kg^{-1}, depending on quality.

Six chapters address aspects of human use. They have been collected in North Africa since the Bronze Age Amorites and where the Bedouins still harvest them today. Shavit argues that the manna of the Bible was the desert truffle, but to my mind the suggestion of a lichenized *Circinaria* (syn. *Sphaerothallia*) is more probable as they blow around as nodules in the deserts of North Africa, drift, and can suddenly appear overnight in quantity (Sohrabi 2011). Shavit goes on to discuss truffles in classical writings, the meanings of local names, and traditional uses in food and medicine. They were traded extensively in the late 19th century, but their popularity since declined in Egypt in particular, although not in Abu Dhabi, Doha, Kuwait, and Saudi Arabia. Pérez-Gilabert *et al.* report on the enzymes in *T. claveryi*, and Martínez-Tomé *et al.* on antioxidant and nutritional attributes; *T. nivea* apparently ranks amongst the top antioxidant-rich foods. Preservation methods, including drying, refrigeration, freezing, irradiation, canning, and elevated carbon dioxide levels are reviewed by Murcia *et al.* who also consider the various cooking methods employed. Traditional medicinal uses for the treatment of eye and skin lesions are apparently recommended in Islamic writings, and antimicrobial properties have been documented in eight species (Shavit E & Shavit E). Cultivation of some black *Tuber* species is now widely practiced in France in particular, and production methods for *Terfezia*-infected *Helianthemum* seedlings are now under development (Morte A & Andrino A). The preparation and maintenance of planted and wild plots is addressed by Honrubia *et al.*, who recommend planting regimes but also address the location of potential wild sites in Murcia (Spain) using modern mapping approaches.

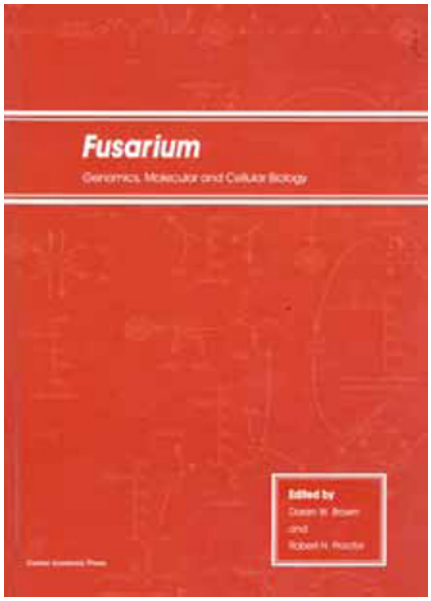
The editors are to be commended for bringing so many researchers together to produce such a wide-ranging and authoritative synthesis, which will surely be the key reference work in desert truffles, in the Mediterranean region particularly, for some decades. If you are in desert regions, do look out for cracks in the soil, near *Helianthemum* species in particular, as that is the way desert truffles were traditionally found.

Montecchi A, Sarasini M (2000) *Fungi Ipogei d'Europa.* Trento: Associazione Micologica Bresadola.

Sohrabi M (2011) *Taxonomy and Phylogeny of the "Manna lichens" and allied species (Megasporaceae).* [University of Helsinki Publications in Botany no. 43.] Helsinki: Yliopistopaino.

[1]See *IMA Fungus* **4**: (28), June 2013.

Fusarium: genomics, molecular and cellular biology. Edited by Daren W. Brown & Robert H. Proctor. 2013. Norfolk: Caister Academic Press. Pp. vii + 182. ISBN 978-1-908230-25-6. Price: US$ 319, £ 159.



The genus *Fusarium* includes species which are amongst the most devastating plant pathogens, and others with produce some of the most dangerous mycotoxins known, but also one used for the manufacture of the fungal protein Quorn – currently delivering around 500 000 meals every day in the UK alone. It is thus not surprising that it has been a focus of intensive genomic studies aiming to explore just what genes are responsible for particular attributes. The most commonly studied species using new molecular technologies is *F. graminearum* which has a high profile in most chapters included here. There are now so many separate papers on the genetics and genomics of the genus, there can be no doubt that a synthesis was required; this book fulfils that need. Following a short but authoritative introduction to the genus, eight chapters address different areas of enquiry.

The sexual cycle proves to be complex and involve suites of different genes for the various stages: mating, ascogonia formation, perithecium development, spore development, and ascus structure. Comparative genomic studies on the chromosomes and their dynamics suggest that the ancestral type in the *Fusarium* clade could be a heterothallic species with 11 core chromosomes; supernumerary chromosomes can also occur, and may have been derived from different fungi by horizontal transfer, a phenomenon which is gradually emerging as much more widespread in fungi than hitherto contemplated. In the case of *F. graminearum* infections of wheat floral tissues, a huge number of virulence genes have been characterized; the list extends over six landscaped pages. Proteomics is also now starting to be used to explore interactions with host plants, but is currently at a rather early stage from which to make any generalizations. A repeat-induced point (RIP) mutation aimed at limiting the expansion of repeated DNA has been known in some ascomycetes since the 1980s, but now is documented also in sequenced genomes in *F. graminearum*; RIP mutations can also affect genetic diversity enhancing or reducing fitness. Nitrogen is essential for fungal growth and the production of metabolites, and can also affect the way they interact with plants. Detailed routes for the progression of nitrogen from uptake to incorporation into amino acids and a regulation network have now been worked out; this is potentially important as nitrogen availability can affect virulence. Considerable variability in the kinds of polyketide synthase (PKS) genes present in different species occurs, and these can be used to produce phylograms; further elucidation is expected as more genomes become publicly available. A final chapter focuses on plant responses to *Fusarium* metabolites; these can inhibit root or shoot growth, inhibit seed germination, cause leaf chlorosis or cell death, and even suppress defence responses in the host.

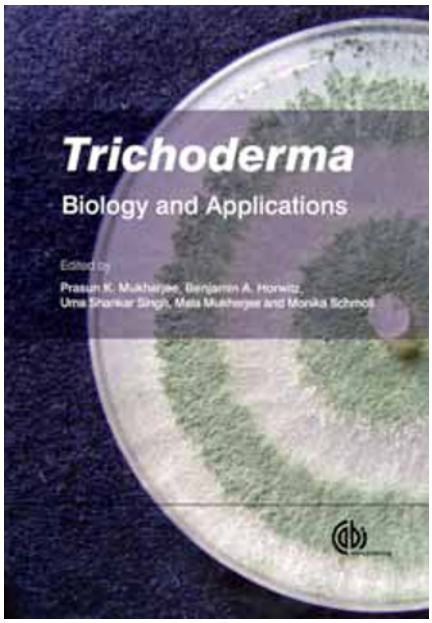
A high price was to be expected for such a specialist text, but the volume is also produced and edited to the highest of standards. It will be required by all working at the genomic level to combat diseases caused by *Fusarium* species, but will also be of interest to those working on that level on other filamentous ascomycetes in which similar genes and activities can be expected.

Trichoderma: biology and applications. Edited by Prasun K. Mukherjee, Benhamin A. Horwitz, Uma Shankar Singh, Mala Mukherjee & Monika Schmoll. 2013. Wallingford: CAB International. Pp. xv + 327. ISBN 978-1-78064-247-5. Price: £ 95.

Much has happened in our understanding of *Trichoderma* (syn. *Hypocrea*) in the 15 years since the last multi-authored overview (Kubicek & Harman 1998, Harman & Kubicek 1998). Most spectacularly, molecular phylogenetic and more critical studies in pure culture have led to the 33 species of the 1998 volumes rising to 200 species, with more surely still to be found. In addition, following a poll of researchers in 2012 reported here, *Trichoderma* is being adopted over *Hypocrea* as the name for all the species, whether they have a sexual morph or not. The 33 page chapter on the taxonomy, with an emphasis on the latest molecular phylogenetic results by Lea Atanasova and colleagues from Vienna has been very carefully produced and merits a wide readership amongst workers with the genus.

Five chapters deal with different physiological aspects: the influence of light; sexual development; asexual development; volatile organic metabolite biosynthesis; and tools available for molecular studies. A further five are concerned with interactions with plants: the role in the rhizosphere; as endophytes; promotion of plant growth by induction of defence mechanisms; elicitor proteins; and metabolomic approaches. The last group of chapters concerns applications: production of animal feed from biomass, and also enzymes and biofuel; exploiting mycoparasitic properties as a biocontrol agent of plant pathogens (including a novel delivery mechanism using colonized cow dung); marine species as a source of new bioactive compounds; and production of proteins and, through metabolic engineering, using *Trichoderma reesei*[2] as a "factory" to make ethylene and an antiviral

[2]See this issue p. (42) concerning the original publication of this species name.



drug precursor from chitin. The last chapter focuses on effects on human health; allergic reactions were to be expected, but I did not appreciate that there had been so many reports of actual infections – an extensive compilation from published case reports is included.

This book is not simply a successor to the 1998 volumes, however, but rather complementary as there are some aspects not or hardly addressed in the 2013 one. Amongst these "missing" topics are treatments of applications in hemicellulose degradation, pathogenicity to cultivated mushrooms, use in "stonewashing" denim, and in the pulp and paper industry.

The diversity of topics in which *Trichoderma* strains have been exploited is quite remarkable. In consequence, in addition to the main value of this book as a reference work for researchers, it is also something to be shown to students so they can marvel at the multifarious ways just one genus of fungi may be put to.

Harman GE, Kubicek CP (eds) (1998) *Trichoderma and Gliocladium.* Vol. 2. *Enzymes, biological control and commercial applications*. London: Taylor & Francis.

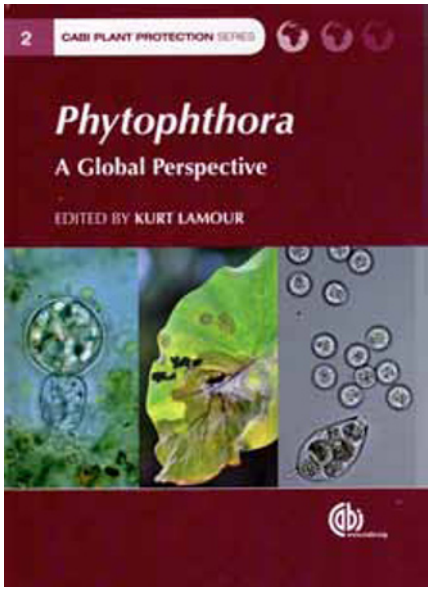
Kubicek CP, Harman GE (eds) (1998) *Trichoderma and Gliocladium.* Vol. 1. *Basic biology, taxonomy and genetics*. London: Taylor & Francis.

Phytophthora: a global perspective. Edited by Kurt Lamour. 2013. Wallingford: CAB International. [CABI Plant Protection Series no. 2.] Pp. xi + 244. ISBN 978-1-78064-093-8. Price: £ 85.

The genus *Phytophthora* includes some of the most devastating plant pathogens known, with new virulent species continuing to be discovered. At the same time, the battle continues today to thwart some of the first described, not least *P. infestans*[3] recognized in 1846. The name *Phytophthora* itself, fittingly, means "plant destroyer". The focus of the book is on the diseases caused rather than fundamental aspects of the biology and genetics. It starts with a scholarly historical and well-referenced review, which is followed by an overview of the taxonomy and relationships with other groups in the *Oomycota.* With about 124 species currently recognized, and diagnostic morphological characters often being somewhat cryptic, molecular methods will increasingly be necessary for species recognition. That will be even more so if estimates of there being around 600 species globally prove to be accurate. In addition to species identification, molecular methods are coming to be used to characterize populations. A particular feature of pathogenicity in the genus has been the formation of hybrids between different species, some of which have been given separate species names (e.g. *P. alni*), and I was pleased to see a whole chapter documenting these cases.

Nineteen of the 25 chapters concern diseases on particular plants or in different countries. The crops and other plants treated are potato, other *Solanacaeae*, soybean, chilli peppers, taro, tobacco, pine, avocado, and tree crops. In addition some chapters consider species with wide host ranges, for example *P. cinnamomi* and *P. tropicalis*. The geographically focussed chapters are concerned with Africa, China, Europe, Mexico, and the USA. *Phytophthora ramorum,* the cause of Sudden Death of Oak, is treated within one on US forests in general; I think many would have expected a fuller treatment of that species and its effects. The accounts would have benefitted from better-quality photographic illustrations; those that are included are all half-tones, but helpfully the editor has made colour photographs to accompany the chapters available on his personal website (www.Plantdestroyer.com).

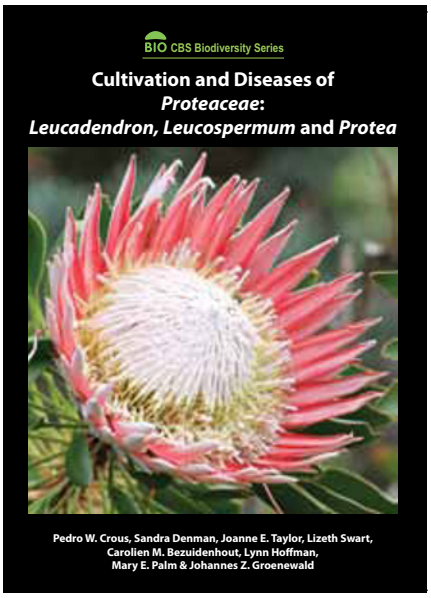
The final chapter looks at the effects of globalization on *Phytophthora* diseases. Many of the most devastating evidently were introduced from different parts of the world to where they cause problems. They can be moved on live plants, in soil, and by water. Soil on the boots of hikers and ecotourists has been found to move *P. cinnamomi* around in Western Australia. In some cases, the sources of invading species have been uncovered, but in many they remain obscure. As the inadvertent transport of spores on human footwear, clothing, and vehicles is unlikely ever to be preventable, I fear that yet more



devastating *Phytophthora* diseases are to be expected in the future. Plant pathology libraries around the world should clearly have a copy, so they can be forewarned of what might be at risk when a previously unfamiliar species of the genus turns up in their area.

[3]See pp. (50)–(54) in this issue on the Irish Potato Famine caused by this species.

Cultivation and Diseases of *Proteaceae*: *Leucadendron*, *Leucospermum* and *Protea*. 2nd edn. By Pedro W. Crous, Sandra Denman, Joanne E. Taylor, Lizeth Swart, Carolien M. Bezuidenhout, Lynn Hoffman, Mary E. Palm. & Johannes Z. Groenewald. 2013. Utrecht: CBS-KNAW Fungal Biodiversity Centre. [CBS Biodiversity Series no. 13.] Pp. 360, figs 152, plates 34. ISBN 978-90-70351-95-3. Price: 75 €.

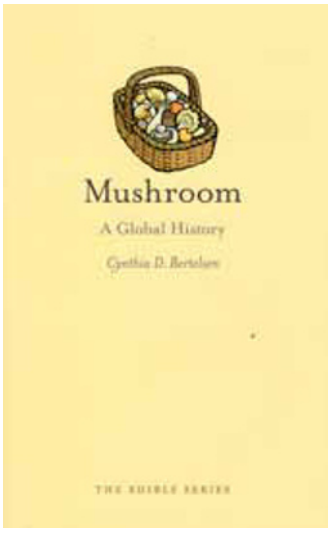


The first edition was issued by CBS in 2004 (Crous *et al*. 2004) and really made an impression because of the holistic approach adopted; a vademecum for pathologists and horticulturalists as well as mycologists concerned with these so-attractive plants that are increasingly used in the cut-flower trade. This edition has increased in size by a massive 55 % (148 pages), and benefited from having three additional authors to improve the depth of coverage. Topics covered embrace crop improvement, propagation, cultivation, harvesting, post-harvest handling, and export/phytosanitary regulation – and of course the diseases. Sixty-two diseases are treated, some caused by more than a single fungal species. These are arranged in groups according to the parts of plants affected: foliar; stem, shoot and flower; and root – followed by a chapter on diseases caused by bacteria and phytoplasms. The fungi involved are described and illustrated, with full bibliographic information and synonymy, and notes on culture characteristics, hosts and geographical ranges, disease cycles and epidemiology, disease management strategies, and control. The illustrations are a combination of line drawings and photographs, many in colour, and these are supplemented at the end of the book by 34 superb colour plates showing diseased plants and taken in the field or in cultivation. The upgrading of the illustrative material is perhaps one of the most obvious changes from the 2004 edition, where the text photographs were mostly half-tones. Overall, this work is a combination of sound taxonomy and pragmatism, and one which also will surely not only increase the alertness of those exploiting these plant genera to diseases, but provide a tool for their identification. It is also serves as a model for a type of one-stop-shop reference source that groups concerned with other plant diseases may wish to endeavour to emulate.

Crous PW, Denman S, Taylor JE, Swart L, Palm ME (2004) Cultivation and diseases of *Proteaceae*: *Leucadendron*, *Leucospermum* and *Protea*. [CBS Biodiversity Series no. 2.] Utrecht: CBS-KNAW Fungal Biodiversity Centre.

Mushroom: a global history. By Cynthia D. Bertelsen. 2013. London: Reaktion Books. Pp. 160, illustr. 56 (46 in colour). ISBN 978-1-78023-175-4. Price: £ 9.99, US$ 18.

This little book is a part of "The Edible Series" which includes over 20 titles on topics that include global histories on bread, caviar, the hamburger, ice cream, lobster, pizza, and even offal. They are designed for "foodies" to provide background on foods and how they have developed. Cynthia Bertelsen is a culinary historian and photographer based in Blacksburg, Virginia (USA) and has produced a very readable and wide-ranging work. There are introductions to structure, problems of classification, use through the ages, cultivation, preservation, nutritional, neurotropic, and toxicological aspects, as well as foraying and cooking. There are many references to classical literature and the whole is nicely illustrated, mainly in colour. I particularly enjoyed the 19th century engravings of mushrooms being retrieved from Paris caves, and the pre-AD 330 mushroom mosaic from a Christian basilica in northern Italy. Although some mushrooms, notably truffles, receive less attention than might have been expected, an author has to be eclectic in preparing what have to be short texts. There are a few historical and modern recipes at the end, and also a select bibliography. The latter sadly missed some books I would have thought might have been referred to, not least Hall *et al*. (2003) and Spooner & Roberts (2005), but included a couple which were new to me: Bone (2011) and Kelso (2009). There is also a list of websites and associations, mainly ones from North America. If you know a serious mushroom cook, and would like a birthday present to extend their mycological background, this elegantly presented and delightful little book would be spot-on!



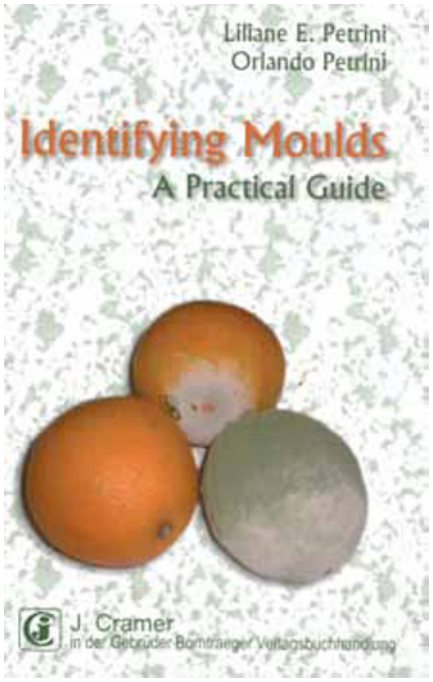
Bone E (2011) *Mycophilia: revelations from the weird world of mushrooms.* Emmaus, PA: Rodale.

Hall IR, Stephenson SL, Buchanan PK, Yun W, Cole ALH (2003) *Edible and Poisonous Mushrooms of the World.* Portland, OR: Timber Press.

Kelso F (2009) *For the Love of Mushrooms: a one hundred year bibliography of mushroom cookery, 1899–1999.* Oxford, PA: F. Kelso.

Spooner B, Roberts P (2005) *Fungi.* [The New Naturalist Library no. 96.] London: Harper-Collins.

Identifying Moulds: a practical guide. By Liliane E. Petrini & Orlando Petrini. 2013. Stuttgart: J. Cramer. Pp. 191, figs 37, tables 12. ISBN 978-3-443-50038-2. Price 44.80 €.



This text is based on the German third edition of *Schimmelpilze und deren Bestimmung* published in 2010, with some updating. The aim is to provide a grounding in the fundamentals of fungal life-styles and structures and an identification manual for common moulds. The first chapters cover the major groups and their features and identification methods, including notes on microscopy, mountants, culture media, and morphological features used in identification. The accounts of spore-formation in conidial fungi, and the terminology used for conidiogenesis and spore types, are particularly clear. Surprisingly for a text published in 2013, however, there is little on molecular identification and its associated pitfalls. I felt that was unfortunate as many applied mycologists today are more likely to rush and extract DNA from a sample than study it critically under the microscope. Some general topics, notably ecophysiology and health considerations, are added at the back, but the meat of the book comprises keys for identification down to genus, and then notes on the genera. I was pleased to see that the generic treatments were arranged alphabetically, which so facilitates quick location. For each genus, information is given on the family to which it belongs and the number of known species – something too often absent in identification manuals. That is followed by selected literature references, the most pertinent for identification being placed in bold type, "examples" of species in the genus, what they do and/or where they occur, and "notes" that touch on a diversity of topics. In the case of pleomorphic fungi, the names of both sexual and asexual morphs are used. The book was perhaps in an advanced stage of preparation or translation when the decision to abandon the separate naming of morphs was taken in July 2011, and this is alluded to on p. 10, but it would have been a great opportunity to implement the new provisions in clear-cut cases. The illustrations mainly comprise high-quality half-tone photomicrographs, but there are none of cultures in colour that would have been helpful to the audience for the book. There is also a lucid glossary of terms, a valuable 18 pages of references, and a comprehensive index.

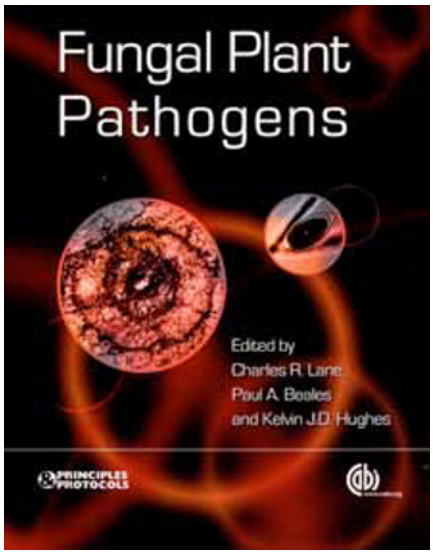
I would have left all author citations out of such a work, but where they are included here they do not always follow the internationally recommended abbreviations or have other slips such as extraneous or missing stops (e.g. "Cke.", "DC", "Lge.", and "Lk." in Tables III.4.2 and III.4.3). I also noted that the date of one of my publications was given as "2006" and not "1991" in two places (pp. 18 and 171) which makes be a little concerned over what other bibliographic oversights there might be.

The inspiration for the format of the generic entries is acknowledged as von Arx's keys, and the work as a partial update. The last edition of von Arx's keys was issued by the same publisher in 1981 (Arx 1981). Von Arx's work has many more genera, but no photographs and many fewer notes. It would be great to have a full update of that work available at some point in the future, but at least now there is start in English, that can usefully supplement the selected species-level treatments in Samson *et al.* (2010).

Arx, JA von (1981) *The Genera of Fungi Sporulating in Pure Culture.* 3rd edn. Vaduz: J. Cramer.

Samson RA, Houbraken J, Thrane U, Frisvad JC & Andersen B (2010) *Food and Indoor Fungi.* [CBS Laboratory Manual Series.] Utrecht: CBS-KNAW Fungal Biodiversity Centre.

Fungal Plant Pathogens. Edited by Charles R. Lane, Paul A. Beales & Kevin J. D. Hughes, 2012. Wallingford: CAB International. [Principles & Protocols Series.]Pp. xv + 307. ISBN 978-1-84593-668-6. Price: £ 39.95.



This is very much a hands-on book, as might have been expected as the three editors are on the staff of the UK Food and Environment Research Agency. It is designed for plant health personnel at the front-line of endeavouring to prevent fungal diseases of plants. The first chapters consider the examination of plant materials, detection from soil, water, and air, and detection in seeds. Identification through morphological characteristics, cultural features, serological techniques, DNA methods, and fingerprinting is introduced. Easy-to-follow protocols are provided at the end of almost all chapters, and of particular interest is the series for the identification of different groups of fungi, for example *Colletotrichum*, rust fungi, *Fusarium*, and sclerotial fungi. An overview of maintenance and storage methods by three of those responsible for the UK National Collection of Fungus Cultures (Egham) is especially useful. The final chapters are devoted to quarantine procedures and the UK current obsession with protocols, quality assurance, and quality systems. The three Appendices will be particularly useful as they provide information on culture media, mounting agents and stains, slide sealants, and sterilizing agents. The book claims to be "unique in its practical focus", and that statement can be endorsed. This is

a book that clearly merits a place in plant health laboratories worldwide, and many of numerous protocols included could be used by technical staff or others without in-depth plant pathological or mycological training.

[*Note*: A further book review is included on pp. (43)–(45) of this issue of *IMA Fungus*.]

STOP PRESS - HAPPY BIRTHDAY BRYCE[1]!

After his PhD at the Universal of Liverpool, and a post doc at the Biosystematics Research Institute in Ottawa, Bryce settled into a professorship at the University of Waterloo in Canada. There, he established a productive research, teaching and mentorship programme, training a succession of students and post docs such as Gary Cole, Gareth Morgan-Jones, Frank DiCosmo, Shannon Berch, T. R. Nag Raj, John Klironomos, De-Wei Li, and Keith Seifert. Bryce was one of Canada's most influential mycologists internationally, famous for editing the seminal Kananaskis books, *The Taxonomy of Fungi Imperfecti* in 1975, and *The Whole Fungus* in 1980, as one of the co-authors on the 1980 and 2011 versions of the *Genera of Hyphomycetes*, and the author of the popular undergraduate textbook *The Fifth Kingdom* (first edition 1985). Upon retirement, Bryce returned to his first love, the sea, and now lives in a cliff-top house outside of Victoria, BC, with his wife Laurie. He is active with the local naturalists, and is furiously removing invasive plants popping up in John Dean Provincial Park, a gorgeous rainforest mountaintop area where this photograph was taken last year. Bryce's many international friends take pleasure in joining *IMA Fungus* in wishing Bryce the happiest of 80th birthdays, and many more years of exploring the ocean, the forests, and the world of ideas. – *Keith A. Seifert*.

[1]3 December 2013.