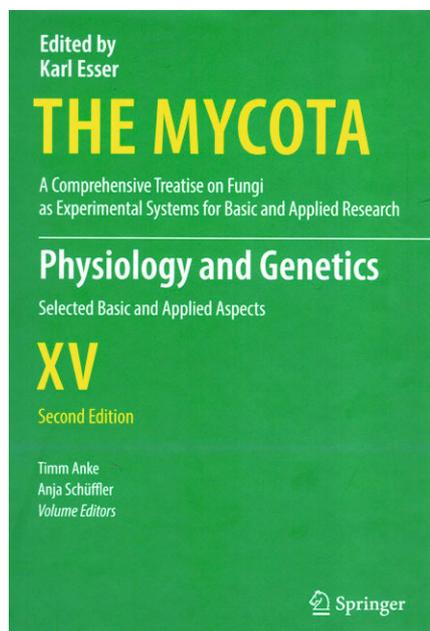


Physiology and Genetics: selected basic and applied aspects. Edited by Timm Anke & Anja Schüffler. 2018. ISBN 978-3-319-71739-5 (hbk), 978-3-319-71740-1 (ebk). Cham: Springer. [The Mycota Vol. 15, 2nd edn.] Pp. xviii + 464, illustr. Price: 207.99 € (hbk), 103.99 € (ebk).



This is a fast-moving field, and as the first edition of this volume appeared in 2009, an update was to be expected. This is not, however, a simple update as only four of the 14 chapters are updates and I was pleased to see the remaining ten were new topics for the series.

The new chapters deal with ascoma development in ascomycetes, fungal inteins,

yeast killer toxins, the fungal MCC/eisosome complex, the *Periglandula/Convolvulaceae* symbiosis, volatiles in communication in *Agaricomycetes*, endophytic fungi and their metabolites, polyketide synthase/nonribosomal peptide synthetase hybrid enzymes, and the occurrence and biosynthesis of three *Penicillium* mycotoxins. The updated chapters are ones concerned with secondary metabolites in basidiomycetes, helminth electron transport inhibitors produced by fungi, cyclic peptides and depsipeptides produced from fungi, and the biosynthesis of fungal polyketides; in most cases at least some of the original co-authors were involved in these revisions.

With such a disparate array of topics, this is necessarily a work to be dipped into when an authoritative review of one of the subjects treated is required. Individual mycologists will consequently vary as to which if any of these may be of interest to them at a particular point in time. My favourite, perhaps not surprisingly, was the extremely detailed overview of ascoma development by Stephanie Pöggeler and colleagues, even though this being entitled as “fruiting-body development”

Fungi: biology and applications. Edited by Kevin Kavanagh. 2018. Hoboken, NJ: Wiley Blackwell. 3rd edn. Pp. xii + 392, figs (including 16 pp. coloured plates), tables. ISBN 978-1-119-37432-9 (pbk), 978-1-119-37416-9 (ebk). Price US\$ 129.95 (pbk), US\$ 103.99 (ebk).

The first edition of this multi-authored text first appeared in 2005, but I must admit that the earlier editions escaped my attention. This one involves 22 authors, 12 of whom are based in Ireland. As the subtitle implies, and is made clear on the back cover, this is no general introduction to mycology, but one covering a range of topics relevant to fungal biologists in academia and industry.

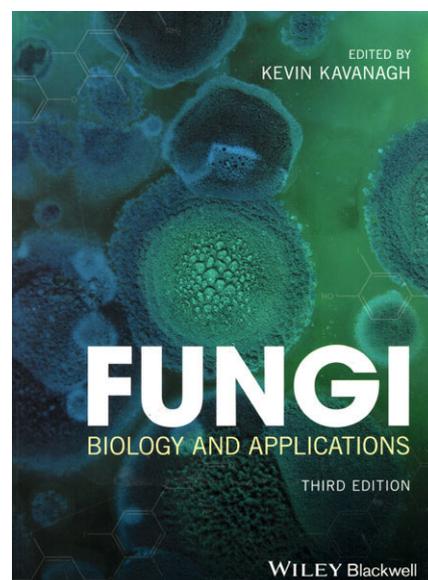
The first five chapters provide overviews of key aspects of fungal biology: physiology, genetics (two chapters), genomics, and proteomics. The next four focus on particular applications: on fungi as food and primarily concerned with cultivated mushrooms, pharmaceutical products and food supplements, uses of fungal enzymes,

and heterologous protein production. I found the last two to be particularly useful overviews bringing together information not as easily accessible elsewhere. Three chapters are concerned with medical mycology follow: an overview of mycoses and mycotoxicoses, immunity responses to fungal infections, and antifungal agents. That on antifungal agents usefully considers drugs targeting the plasma membrane, cell wall, and nucleic acid and protein synthesis separately. The final two chapters seemed rather out of place in a work of this focus to me: rather brief overviews first of fungi in the environment, and then of fungal pathogens of plants.

The book is, however, well-produced, although I would have expected the

caused me to grimace. The involvement of photoreceptors in sexual development is particularly neatly illustrated and described, along with the role of pheromone signals and signal transduction pathways, and an amazing list of transcription factor genes involved is tabulated; although worked out from studies on a few model ascomycetes, similar if not identical processes can be expected in others. I also enjoyed the overview of endophytic fungi by Mysore Tejesvi and Anna Pirttilä, which takes account of the results from Next-Generation Sequencing and provides evidence of cases where bioactive products from these fungi have roles in protecting their hosts from pests.

As expected in this series, the book is produced to the highest standards, and a much greater use of colour than in the 2009 edition aids interpretation of many of the figures. The series is one that remains a must-have for all mycological libraries, as the now 26 volumes (15 original volumes plus 10 which have a later edition) together provide an extraordinary resource of authoritative reviews on an amazing range of topics.



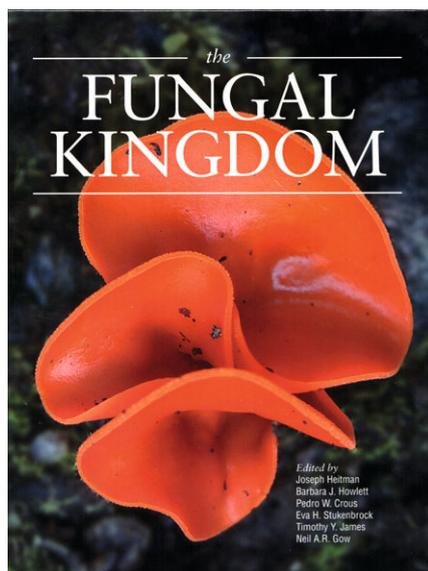
coloured plates to be printed at appropriate places in the text rather than in a separate signature of plates in a work so highly priced; this is a cheap-skate practice I always find annoying. Lists of further reading, and in some cases also of pertinent web sites, are provided at the end of each chapter, but

there is no glossary which might have been helpful to those with limited mycological knowledge.

I was left with the overall impression that the editor had tried to cover too much of an increasingly complex and expanding area in a too limited amount of space. If a

fourth edition is contemplated in the future, it could be advantageous to concentrate on, for example, established and emerging industrial applications. There are, after all, many other texts that can be accessed in relation to, for example, fungal ecology, medical mycology, and plant pathology.

The Fungal Kingdom. Edited by Joseph Heitman, Barbara J. Howlett, Pedro W. Crous, Eva H. Stukenbrock, Timothy Y. James & Neil A.R. Gow. 2018. Washington, DC: American Society for Microbiology Press. Pp. xxiii + 1136, illustr. (many in colour). ISBN 978-1-555-81957-6 (hbk), 978-1-555-81958-3 (ebk). Price US\$ 200 (hbk or ebk) or US\$ 160 (hbk or ebk, members' price).



This large format volume, weighing a hefty 2.8 kg, has taken about four years to prepare. It represents an enormous undertaking, which has involved over 170 mycologists and other researchers. A nine-section structure was worked out by the team of six editors, who stated that it was their “hope, and our goal and intention, that this book both takes stock of the current state of knowledge in the field and also spurs further investigation”

(p. xxi). By mid-2015 the scope of each of the 54 chapters had been sketched out and contributors' names that had tentatively been pencilled-in started to be invited. In order to make the task manageable, the sections were assigned to particular editors, each of whom had the responsibility of securing the delivery of contributions and having them reviewed and revised. Chapters necessarily proceeded at different rates, but when they had been completed, they were published online in final form (apart from pagination) on the American Society for Microbiology's *Microbiology Spectrum* site so that they could start to be used and cited from that source. As anyone who has ever edited a multi-authored volume will know, such works inevitably proceed to completion at the rate of the slowest. It was only after that point was reached in 2017 that the book could finally be put together, paginated, indexed, bound and published.

The nine sections decided upon were: (1) Fungal branches on the eukaryotic tree of life (5 chapters); (2) Life of fungi (10); (3) Fungal ecology (3); (4) How fungi sense their environment (7); (5) Fungal genetics and genomics as models for biology (8);

(6) Fungal interactions with plants: impact on agriculture and the biosphere (5); (7) Fungi and the human host (6); (8) Fungal interactions with animals (fungi, insects, and nematodes) and other microbes (6); and (9) Fungal technology and natural products (4).

It would be invidious to highlight particular chapters here, but in general I have found them not to be only dry reviews, but also to contain new syntheses and insights into many of them; a consequence of the editors having gone to great efforts to secure the world leaders in the assigned topics where possible. Indeed, the list of contributors reads rather like a *Who's Who* of mycology.

The whole is well-presented with numerous figures, many of which are in colour, and all chapters have extensive reference lists. The price is far from unreasonable for such a massive hard-bound work, and as this is a real *vade mecum* for mycology all mycological libraries should acquire a copy, and I am sure most mycologists will also aspire to own one. The editors are to be congratulated on this truly momentous achievement.

The Fifth Kingdom: an introduction to mycology. By Bryce Kendrick. 2017. Indianapolis: Focus (Hackett Publishing). 4th edn. Pp. x + 502, illustr. (some in colour). ISBN 978-1-58510-459-8. Price US\$ 54.95, £ 47.99.

When this title first appeared in 1985, Bryce's enthusiasm for fungi was apparent on almost every page, occasioning comment at the time as the style was so different from that of the more turgid contemporary mycological texts. Now at 85 years young, Bryce's commitment and enthusiasm for promoting the study of fungi is clearly undiminished. The engaging style and approach that made

the original text so attractive to young and aspiring mycologists in the 1980s has been maintained through all subsequent editions and is still evident throughout.

The importance of fungi is “sold” in the first couple of pages, before a series of chapters explaining the diversity of organisms studied by mycologists, introducing essential terminology, life-

cycles, and accounts of the main groups, both fungal analogues and members of the kingdom *Fungi* (for which he uses the name *Eumycota*). These chapters are well-illustrated, and in most cases provide treatments down to order, in some instances accompanied by keys.

Eighteen topical chapters follow, just as in the third edition published in 2000.

THE FIFTH KINGDOM



An Introduction to Mycology
Fourth Edition

Bryce Kendrick

This may seem a large number, but most are 10–20 pages in length which works well making them easily read and digested. Introductions to a huge range of topics are provided, including yeasts, lichens, spore dispersal, physiology, genetics, ecology,

plant diseases, fungicides, biocontrol, mutualisms with animals, mycorrhizas, mycophagy, food processing, food spoilage, mycotoxins, poisonous and hallucinogenic mushrooms, medical mycology, and commercial exploitation of fungal products and mycelia. The extent to which the text has been revised varies considerably between the chapters. In many cases the figures have been re-sized or supplemented, tables added, and in some cases there are now coloured photographs, none of which were included in the previous edition. The use of colour is a particular advantage in the treatments of microscopic fungi, not least the sections of ascomata and details of ascus types.

Perhaps the most important chapter, however, is the last. An entirely new one with an intriguing title that only Bryce could have come up with: “But how do you actually *do* mycology? And how can you earn a living doing it?”. This covers collecting and preserving, culturing, describing new taxa (with his treatment of *Zancluspora* presented as a detailed example with drawings and a key) – and now molecular techniques. *Lichenomphalia ericetorum*, a

lichen-forming agaric, featured on the cover of the third edition; is now featured here as an example of research problems that still merit study, just to show how little we know and topics which even a new mycologist with few facilities might tackle. As to jobs for mycologists, Bryce points out that he has used his mycology in a staggering 22 areas, and reproduces the eye-catching Mycological Society of America’s poster on “What can you do with training in mycology?”.

The layout and even the paper quality is a great improvement over the third edition, and it was good to see the re-formatted glossary and that the comprehensive index was retained. Readers should also not forget that numerous superb colour photographs supplementing the text are available on www.mycolog.com. This is a super book, at a very reasonable price, that I cannot commend too highly to anyone starting to enquire about fungi, whether as a naturalist or an aspiring student. We should all be grateful to Bryce for continuing to update this tool we can all use to help enthuse the next generation of aspiring mycologists.

No Fungi No Future: Wie Pilze die Welt retten können. By Jan I. Lelely. 2018. Berlin: Springer. Pp. xii + 266, figs (col.), tables. ISBN 978-3-662-56506-3. Price € 19.99.

This semi-popular soft-covered book, by one of the world’s leading authorities on cultivated mushrooms, has the potential to heighten the awareness of German-speakers to the importance of fungi, particularly macromycetes, in the world today.

The attention-grabbing English title, perhaps first used as a figure caption in Palm & Chapela (1997: 297), gets quickly to the issues of concern after a short introduction to fungi. It discusses their roles in bioconversion with particular attention to cultivation of the “Big Five”: *Agaricus bisporus*, *Auricularia auricula-judae*, *Flammulina velutipes*, *Lentinula edodes*, and *Pleurotus ostreatus*. He then surveys the nutritional value of mushrooms and their benefits to health, including uses in “mykotherapie”; the conditions treated and recommended doses are tabulated for *Coprinus comatus*, *Cordyceps sinensis*, and

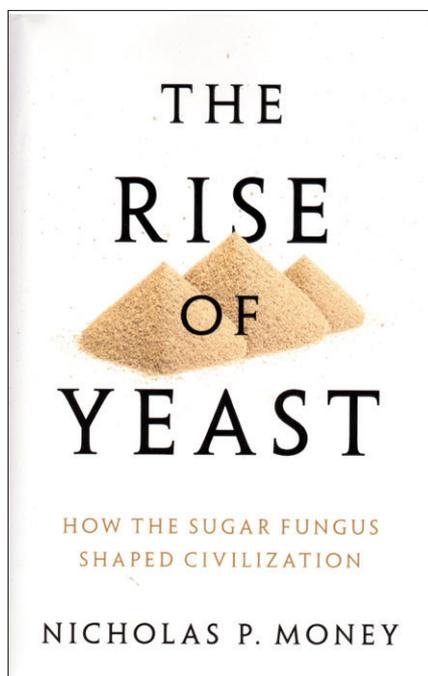
Ganoderma lucidum. Chapters on nutrient cycling and their importance as mycorrhizas in forests follow, and there is a final forward-looking chapter on fungi as problem-solvers with an emphasis on the bioremediation of contaminated soils and waste utilization.

The book is nicely illustrated in colour, and an extensive further reading list arranged by chapter and a detailed index then conclude the book. It will surely fascinate those who love eating mushrooms and, provided that this reaches this and a more general audience, it will make a useful contribution to raising the profile of fungi. I hope that the publishers will consider issuing translations in other languages!

Palm ME, Chapela IH (eds) (1997) *Mycology in Sustainable Development: expanding concepts, vanishing borders*. Boone, NC: Parkway Publishers.



The Rise of Yeast: how the sugar fungus shaped civilization. By Nicholas P. Money. 2018. Oxford: Oxford University Press. Pp. xi + 210, figs 22. ISBN 978-0-19-874970-7. Price £ 18.99.



Nicholas Money is maintaining his output of popular books aimed at illuminating general audiences to aspects of the importance of fungi. Last year it was *Mushrooms* (see *IMA Fungus* 8(2): (78)–(79), Dec. 2017), and this year it is the yeasts. Yeasts are especially welcome as a topic as I find that many non-mycologists I talk to have no concept of how much they depend on them. There is an eye-catching poignant message on the back of the dust-jacket to attract the attention of bookshop browsers: “Every time you raise a glass, or rejoice in the aroma of freshly baked bread,

you are praising yeast”.

following an introduction to their nature, reproduction, and physiology, which includes ethanol production from sugars, he first turns to drink, from earliest times to strain improvement in modern breweries. I particularly enjoyed the following chapter on breads, covering the different terms used in Roman times through to the Chorleywood standard process of how to make the perfect loaf in the shortest possible time; Chorleywood was the home to the British Baking Industries Research Association in the 1950s and the place where the “alveograph” to measure the extensibility of dough was developed in 1920. He also explores the microbial cocktails that go into sourbread production, and the often passed over role of yeasts in chocolate manufacture. There are also tales of yeasts as dietary and health supplements for both humans and animal feed, some of which remain big business, including Marmite and Vegemite, and religious traditions with respect to unleavened bread.

I was pleased to see the chapter amusingly entitled “frankenyeast”, which considers the use of *Saccharomyces cerevisiae* as a model organism for research, with the entire genome first sequenced in 1996 – a project that had involved 600 scientists and cost around US\$ 40 million; that compares with around US\$ 50 per genome today! Examples of how the role of genes has been determined and engineered are helpfully explained in layman’s terms. He

then turns to biotechnology and particularly biofuel, ethanol produced from corn in the US and from sugarcane waste residue (“bagasse”) in South America. CRISPR gene editing is seen as a way of advancing such technologies, and the immensely important use of yeasts as cell factories for the production of a wide range of pharmaceutical products, not least insulin, is not forgotten. He also warns of the potential for missuse.

The penultimate chapter considers the diversity of yeasts in nature, and the illuminating discoveries of Ingold and Buller, with many amusing asides. Some unusual yeasts are discussed and described, and also those found in habitats not normally considered as ones for yeasts, such as the deep sea; the full extent of novel species in natural environments could, however, have been stressed. Finally, the reader’s attention is drawn to yeasts of medical concern, including *Candida* and *Saccharomyces*, accompanied by case histories and with attention drawn to roles in digestive and bowel conditions.

I enjoyed this more than Money’s earlier works I have seen, and his attention-grabbing style has certainly improved. There are also extensive notes provided for those wishing to discover more. The book can be commended to mycologists wishing to extend their own horizons, as well as to the more general audience to which it is aimed; a great read for a long flight.