

## 21st Century Guidebook to Fungi

### Second Edition

The mysterious world of fungi is once again unearthed in this expansive second edition. This textbook provides readers with an all-embracing view of the Kingdom *Fungi*, ranging in scope from ecology and evolution, diversity and taxonomy, cell biology and biochemistry, to genetics and genomics, biotechnology and bioinformatics. Adopting a unique systems biology approach – and using explanatory figures and colour illustrations – the authors emphasise the diverse interactions between fungi and other organisms. They outline how recent advances in molecular techniques and computational biology have fundamentally changed our understanding of fungal biology, and have updated chapters and references throughout the book in light of this. This is a fascinating and accessible guide, which will appeal to a broad readership – from aspiring mycologists at undergraduate and graduate level to those studying related disciplines. Online resources are hosted on a complementary website.

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**Frontispiece:** A thousand mushrooms crowd to a keyhole ... . They lift frail heads in gravity and good faith ... . They are begging us, you see, in their wordless way ... . To do something, to speak on their behalf. Or at least not to close the door again. (Lines from Derek Mahon's poem 'A Disused Shed in Co. Wexford'. Source: New Collected Poems (The Gallery Press, 2011): <https://www.poetryfoundation.org/poems/92154/a-disused-shed-in-co-wexford>). *Psathyrella multipedata* (crowded brittlestem) photographed by David Moore in the RHS Garden Harlow Carr, Harrogate, Yorkshire.



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## PREFACE TO THE SECOND EDITION

Ten years ago, when we first set out to write this book, we aimed to provide a broad understanding of the biology of fungi and the biological systems to which fungi contribute. We hoped the book that would emerge would provide an all-round view of fungal biology, with a scope ranging over ecology, evolution, diversity, cell biology, genetics, biochemistry, molecular biology, biotechnology, genomics and bioinformatics. We were very pleased, and proud, of the book that was published in 2011. That satisfaction was increased enormously when the book was acclaimed around the world by our peers. Reviewers and purchasers alike were appreciative of the broad scope of our text; their reviews included the phrases: ‘The *21st Century Guidebook to Fungi* is a game changer ...’; ‘Moore, Robson and Trinci have now made fungi accessible to everyone’; ‘All you ever wanted to know about fungi: at last: a university level book on fungi to sit next to the classics of cell biology and biochemistry’; ‘This remarkably comprehensive volume will be useful to every scientist and educator’.

As well as liking the content, our reviewers also approved of the way the book was organised and written. They commented: ‘This is an innovative text, both in its presentation and its organisation’; ‘The authors’ clear, comprehensible and accurate writing style is just perfect for a textbook’; ‘written in a delightful prose, integrating concepts and interdisciplinary knowledge’; ‘very user friendly ... making this an outstanding resource’. Overall, the consensus was that the *21st Century Guidebook to Fungi* was: ‘a valuable contribution to modernising fungal science education’; ‘the best comprehensive mycology text available’. Finally, we were particularly pleased with the *Journal of the American Library Association’s* review, which started: ‘The content and quality of this book is simply breathtaking!’

But, you will have noticed that time passes, even breathtaking books age and go out of print; and that’s what happened to the *21st Century Guidebook to Fungi*. The third printing went out of print in early 2017. In many respects, authors regard their books in much the same way as they view their children, and we couldn’t allow our literary offspring to wither and die on the publisher’s vine. In the belief that it remains essential to maintain the availability of a textbook of such user-perceived value, we decided to produce this thoroughly updated **second edition** of the *21st Century Guidebook to Fungi*. As the original text was so well received, this second edition is not a major reorganisation. We have taken the opportunity to rearrange a few parts of the text, but the key difference is a **thorough** section-by-section update from mycology of the first decade to represent mycology of the second decade of the twenty-first century and beyond.

All sections have been revised, but several sections deserved more extensive treatment. This applied particularly to the

variety of applications of fungal genome analyses developed in the past 10 years: genomics, proteomics, transcriptomics, metabolomics, metagenomics and several other areas of integrative biology, including but not limited to bioinformatics and computational biology, though we have tried to remain succinct even with these. There were also a few of our own recent publications that warranted proper inclusion; including the mycological alternative interpretation of eukaryote evolution from the book *Fungal Biology in the Origin and Emergence of Life* (Moore, 2013), and some aspects from two other books: *The Algorithmic Fungus* (Moore & Meškauskas, 2017) and *Fungiflex: The Untold Story* (Moore & Novak Frazer, 2017).

One intended omission from the second edition is the compact disc (CD) that was included with the first edition. Although this was widely appreciated as a valuable accessory at the time, we believe that a CD format is no longer appropriate, simply because CD players are so rarely encountered today. Instead, with the second edition, we are expanding the online representation of the *21st Century Guidebook to Fungi*.

In writing the second edition, we have continued our intention to show Kingdom *Fungi* as a **biological system** with its own intrinsic interest rather than as a diverse group of individually fascinating, but still separate, organisms. In addition, we have maintained our model of a tourist guide to a holiday destination. Tourist guides do not attempt a comprehensive depiction of a location, but they bring attention to a broad range of places you might visit, describe enough for you to decide if you are interested, and tell you how to get there. We called this a *Guidebook* because we have always been aware of the impossibility of writing a comprehensive, monographic treatment of an entire kingdom, so each section of **your** *Guidebook to Fungi* directs **you** to an interesting aspect of fungal biology and, perhaps unusually for a textbook, provides references to external resources that will provide more information; and there are more references in the second edition.

These references include internet URLs or DOI URLs. The acronym DOI stands for Digital Object Identifier, which uniquely identifies where an electronic document (or another electronic object) can be found on the internet and remains fixed. Other information about a document may change over time, including where to find it, but its DOI will not change and will always direct you to the original electronic document. To access one of these references, enter the DOI URL into your browser and you will be taken to the document on the website of the original publisher. Almost always you will have free access to the abstract or summary of the article, and an increasing number of publishers provide free access to the full text. But even for those that do not provide free access, if your institution maintains a subscription

## Preface to the Second Edition

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We want to restate our sincere thanks to our families for their help and understanding while we produced this text, and all those students of ours who have made constructive comments on this *Guidebook* as it developed over the years. We also thank **Dr Dominic Lewis**, our Commissioning Editor, and the rest of the Cambridge University Press staff and contractors (especially Charlie Howell in Cambridge, and Rajeswari Azayecoche at Integra Software Services) for all their efforts on our behalf in achieving the publication of this book. We extend our appreciation to those anonymous reviewers of the first draft, and Professor David L. Hawksworth CBE for his comments on the proof, all of whose suggestions have so improved the final text.

Special thanks go to **Professor Paul S. Dyer**, School of Life Sciences, University of Nottingham, who was so insistent that we do something about the *21st Century Guidebook to Fungi* going out of print that we were driven to write this second edition. We also restate our gratitude to the many other friends and colleagues who supplied illustrations used in this book: **Professor M. Catherine Aime**, Louisiana State University; **Dr G. W. Beakes**, Newcastle University; **Professor Meredith Blackwell**, Louisiana State University; **Dr Manfred Binder**, Clark University; **Professor C. Kevin Boyce**, University of Chicago; **Professor Jacques Brodeur**, Université de Montréal; **Professor Mark Brundrett**, University of Western Australia; **James Burn**, emapsite.com sales team, Reading; **Sheila and Jack Fisher**, Chichester; **Forestry Images**, <http://www.forestryimages.org>; **Dr Elizabeth Frieders**, University of Wisconsin–Platteville; **Professor G.M. Gadd FRSE**, University of Dundee; **Dr Daniel Henk**, Imperial College; **Professor David S. Hibbett**, Clark University; **Dr Kentaro Hosaka**, National Museum of Nature and Science, Japan; **Dr Carol Hotton**, National Museum of Natural History, Washington, DC; **Dr F. M. Hueber**, National Museum of Natural History, Washington, DC; **Dr Timothy Y. James**, University of Michigan; **Dr P. R. Johnston**, Landcare Research, New Zealand; **Tom Jorstad**, Smithsonian Institution; **Pamela Kaminski**, <http://pkaminski.homestead.com>; **Dr Bryce Kendrick**, <http://www.mycolog.com>; **Geoffrey Kibby**, *Field Mycology*; **Dr Cletus P. Kurtzman**, USDA/ARS Peoria; **Dr Roselyne Labbé**, Agriculture and

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We must end this Preface on an unwelcome sad note. As the text of this second edition was reaching completion, our kind and gentle friend, greatly valued colleague and co-author, **Geoffrey David Robson**, died suddenly on 15 May 2018. This volume is dedicated to his memory as a mycologist of distinction.

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