

Book Reviews

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Cold-adapted microorganisms

Edited by I Yumoto
Caister Academic Press, Norfolk, UK, 2013
ISBN-13: 978-1908230263, 226 pp. £196.

After Imre Freidmann's seminal text on Antarctic Microbiology, published in 1993, there was long period with few comprehensive reviews of cold-adapted microorganisms. The drought was broken in the late 2000s with a series of books focussing on different aspects of this field. This slim treatise is the latest in that series. Written primarily by Japanese expert authors, it is an interesting, informative, but slightly odd collection of chapters.

The content of the text follows a reasonably logical sequence (biodiversity and habitats; physiology and adaptations; biomolecules), but each section is far from comprehensive. The biodiversity chapters (permafrost, artificial habitats, marine habitats and cryophilic fungi) are up-to-date and well written. However, the absence of a review of cold terrestrial habitats (polar and montane), which represents a small but significant proportion of terrestrial Earth, is a significant gap. One, albeit rather small, element of this 'gap' is covered in the chapter on cryophilic fungi, but this chapter focuses rather narrowly on snow fungi and contains a substantial section on the physiological adaptations of these organisms.

The four chapters on the physiology and adaptive mechanisms of cold-adapted microorganisms are rather broader in scope. The chapter by Pierre Amato on energy metabolism is particularly detailed and informative, with considerable (and excellent) emphasis on the roles of key pathways and enzymes in cold-adaptation. The following two chapters (cold adaptation proteins and heat shock responses) provide very focussed reviews of critical physiological components of cold-adaptation, and precede a broad-ranging review of protein structure and function in psychrophiles, written by the acknowledged master of this field, Charles Gerday.

The final three chapters are an odd-ball selection of bits and pieces. The chapter on H₂O₂-resistant organisms focusses, in great detail, on three psychrotolerant organisms (a *Vibrio*, a *Psychrobacter* and an *Exiguibacterium*) and the structure and function of their catalases. While this will be excellent reading for the specialist researcher in either H₂O₂ resistance or catalase enzymology, it is hard to see how it will be of great interest to the wider readership.

The review of microorganisms in a permafrost ice-wedge could equally well have been positioned in section 1, although the section on the structure and function of

the bacterial Resuscitating Promoting Factor (Rpf) is an interesting divergence into a little known area of physiological adaptation.

The final chapter on lipids in cold-adapted microorganisms covers the true breadth of the field, and reviews the entirety of this subject, including literature as far back as the early 1970s. For researchers in the field of bacterial lipidology, this chapter provides a very comprehensive summary of the distribution of the different lipid classes in cold-adapted bacteria.

In summary, while this text will not satisfy all researchers in the field of cold-adapted microbiology, it has some excellent, interesting and extremely well referenced chapters which will certainly reward closer attention.

DON COWAN

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The vegetation of Antarctica through geological time

D.J. & I. Poole
Cambridge University Press, Cambridge, 2012
ISBN:978-0-521-85598-3 (Hardcover), 480 pp. £85.00.

This substantial book describes a geological history which records the amazing fact that, in contrast to the "icehouse" world of today, and for ~ 300 million years from Paleozoic to Neogene times, Antarctica enjoyed balmy "greenhouse" conditions resulting in a mantle of varied vegetation on the continent. The authors, who have extensive Antarctic field experience and scientific knowledge of the subject matter, review this fascinating record of high southern latitude plant life (concentrating on the macrofossils) and its crucial links to past climate and geography.

The book is organized in chronological order beginning with an interesting preparatory chapter entitled "Historical background and geological framework", which, together with a frontispiece of the geological timescale, provides a useful introduction to the subject matter. Within the first paragraph the authors emphasise the critical influences of changing geographies and climates on the history of vegetation on Antarctica, the discussion of which is pursued throughout the book.

Each subsequent chapter describes a significant set of deposits relevant to a particular period, tying the whole together in a framework of globally significant events including major climate and ice sheet fluctuations and the "invasion" of the angiosperms. The authors concentrate on the macrofossil record, and although including terrestrial palynomorphs (fossil spores and pollen of land plants) in

the text do not illustrate them. Perhaps more could have been included to highlight their value over 'snapshot' macrofossil deposits for reconstructing regional vegetation and palaeoclimate trends through time. However, most chapters do include either a species list or summary table of the fossil floras (including interpretations from palynofloras) presented with inferred botanical affinities and derived climatic information where appropriate. These tables are a very useful reference source. Despite a few typographical errors in the text and figures these do not detract from what is a very detailed and thorough scientific treatment of the theme.

Interesting case studies break up the detailed narrative, providing a welcome addition. These highlight curious features of the Antarctic fossil plant record, e.g. the abundant Permian glossopterid plants. In my opinion, these could also have been used to focus on additional aspects of understanding past polar vegetation, for example, how high latitude plants may have coped with the extreme seasonality of the polar region (particularly the long, continuously dark winters). Similarly, a mention of modern statistical analyses used in palaeobotany, or a description of the basics of molecular phylogenetics with reference to evolution and migration of plant groups, would have added further value.

The illustrations and photographic plates are clear and well produced. The stratigraphic summaries and palaeogeographic maps throughout provide a useful visual context for the detailed information in the accompanying text. Perhaps by involving a palaeo-artist to paint landscape and vegetation

reconstructions, or including some photographs of comparable modern floras, this would have made the past Antarctic vegetation more tangible for the reader.

The authors also include discussion of controversial issues that continue to be of scientific interest today, in particular, the debate about the Neogene stability of the East Antarctic ice sheet based on the Sirius Group deposits in the Transantarctic Mountains, which continues to provoke interest (e.g. Barrett 2013). In addition, they include a list of floras *not* included in the main discussion, which is supplemented by references for an interested reader to follow up. Thus, despite the wealth of information contained in this book, it is evident that there is still more to learn about the interaction of past vegetation, climate and geographies in Antarctica. Such knowledge, particularly from warmer periods of the geological past, is of direct relevance to the modern world as we become increasingly concerned about ice sheet stability in the warmer climates predicted for our future.

Although written as a scientific monograph, it is in a very readable style and I have no hesitation in recommending it to a wide audience.

VANESSA BOWMAN

Reference

- BARRETT, P.J. 2013. Resolving views on Antarctic Neogene glacial history - the Sirius debate. *Earth and Environmental Science Transactions of the Royal Society of Edinburgh*, **104**, 31–53.