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Polar Microbiology – Life in a Deep Freeze

R.V. Miller & L.G. Whyte
American Society of Microbiology, Washington DC, 2012.
ISBN 10 1555816045. 416 pp. £120.

The editors entitle the preface of their book "An Exciting Era in Polar Microbiology". This is a fair statement because of the amount of information available, and the development of techniques. In addition recent concerted efforts to co-ordinate polar research have all reached a stage where the synthesis of the subject can be attempted with the aim of developing understanding from a whole book that is greater than the sum of the individual parts. This book takes a large step in this direction. This is a well presented book the origins of which are in the 2008 International Polar and Alpine Microbiology conference held in Banff, Canada. It is not, however, a conference proceedings. The individual chapters have been commissioned to provide an overview of the subject and draw together research from the International Polar Year in 2008. The book has 39 contributors with a strong North American presence. The book is divided into four sections: I. Microbial Diversity in Polar Environments, II. Adaptations and Physiology of Cold-Adapted Microorganisms in Polar Environments, III. Ecology and Biogeochemical Cycling of Polar Microbiology Communities, IV. Challenges to Living in Polar and Subpolar Environments, and comprises 14 separate chapters. The transition from consideration of the diversity of different groups, to adaptations and physiology, to ecology and then to future challenges offers a logical and structured approach to the subject which works well, presumably because the individual authors properly understood their mission and the editors worked hard to ensure good consistency and continuity between the chapters. In addition to leading the reader through the subjects, the individual chapters can stand alone, which is a useful attribute. Polar microbiology is an emerging set of disciplines potentially covering both the aquatic and terrestrial ecosystems which offer habitats where biological activity and processes are governed by extremes of water activity, and which also spans the extremes of latitude and altitude. Therefore polar microbiology spans a full range of taxonomic and physiological diversity. This books covers the topics well, although there are inevitably some gaps - for my part, I would have welcomed greater coverage of the protozoa and the algae, but this is a minor observation rather than a major criticism recognizing the fact that information and investigations on these groups are very sparse. The book is well-referenced, covering both the modern literature consistent with many of the authors being current researchers in their respective fields, and the older literature which is becoming increasingly difficult to access. The book is also strengthened by careful indexing. Of course, I have not checked every entry, but the samples I did check were accurate and helpful. This is to the credit of the editors because multi-author books often suffer from weak indexing, but not so in this book. So would I recommend it? I certainly think it has a place in institutional libraries and would be interesting to advanced level undergraduate and specialist postgraduate students and researchers.

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Life in Antarctic Deserts and other Cold Dry Environments: Astrobiological Analogs

Editors P.T. Doran, W.B. Lyons and D.M. McKnight
Cambridge University Press (Cambridge Astrobiology Series), 2010.
ISBN 978-0521889193, 20 pp. £65.

This book, the 5th in the Cambridge Astrobiology Series, provides a broad review of research in cold and dry Antarctic environments, specifically those in the McMurdo Dry Valleys (MDV), with an astrobiological perspective. Terrestrial analogues are locations on Earth that share physical or chemical conditions or features with other planetary bodies, either at present or in the past. The study of analogues is a fundamental aspect of comparative planetary science and astrobiology. As Sun *et al*. indicate in their chapter: "Studies of microbial ecosystems in analogue environments are the only way to provide a realistic basis for speculations of extraterrestrial biota". In essence, the search for extraterrestrial life begins here on Earth. The cold, dry conditions and various landforms concentrated in the MDV are widely considered to be analogous to places on Mars today or, in some cases, in the past. As well, numerous other terrestrial environments present features that are analogous features on Mars or other planetary bodies.

This is a long-overdue summary of research in the MDV and their study as analogues of Mars. Readers may be surprised to learn that NASA's Jet Propulsion Laboratory had an active soil microbiology programme in the 1960s and this included fieldwork in the MDV. Some of NASA's earliest grantees, including Wolf Visniac, also tested their life-detection instruments in the MDV. Despite the long recognition of the MDV as analogues to Mars and a half-century of astrobiology-related research there, this is, to the best of my knowledge, the first such broad synthesis of research in the MDV in the context of astrobiology.

There are nine chapters in this book, including an introduction by the three editors. The latter are all recognized experts in polar and Antarctic science and all three have abundant Antarctic field experience. All but one chapter deal with the MDV; the last chapter by Cabrol *et al*. surveys non-Antarctic analogue environments. The introduction provides a nice historical review of some of the important work that has been done in Antarctica. Chapter 2 by Marchant & Head, the longest chapter in the book, summarizes in great detail various geologic and geomorphic features found in the MDV with extensive comparisons with actual Mars data. They also develop the concept of geomorphic features as indicators of climate conditions, both in the MDV and likely on Mars. Subsequent chapters cover in depth soil chemistry and aqueous processes in soils (Barrett *et al*.), cryptoendolithic microbial ecosystems (Sun *et al*.), fluvial environments and processes (Gooseff *et al*.), saline lakes and ponds (Mikucki *et al*.), and glaciers (including cryoconite holes and cryolakes; Tranter *et al*.). The chapter by Takacs-Vesbach *et al*. considers ecological and physicochemical factors (e.g., flow rate, wind, freeze-thaw, salt content) in controlling microbial diversity in the different environments of the MDV. The final chapter by Cabrol *et al.* provides a survey of analogue sites and recent analogue field campaign projects in places such as the Atacama Desert, high-altitude lakes in the Andes, Arctic springs, and specific localities such as Rio Tinto and the Haughton Impact Structure and surroundings on Devon Island. Each of these chapters addresses, to varying degrees, analogous features or processes on Mars and speculates on possible implications for the existence of life on Mars, either past or present.

Generally, the material is thorough, well written and well referenced. As with many books, truly up-to-date references are often lacking. For example, only a few chapters contain references to the Phoenix Mars Lander mission. This mission to the North Polar Region operated throughout the summer and fall of 2008 and certainly many of its results are relevant here. There are a few minor typographical or spelling mistakes, but generally the book and its figures are of high quality. A few minor quibbles include some authors' unconstrained speculation about life on Mars and author biases (with occasional lack of appropriate references) in reviewing some material. There is surprisingly very little on subsurface environments, including ground ice and polar permafrost. Also, the title is perhaps a little misleading. Only in the last chapter are "other cold dry environments" discussed. This chapter discusses a wide range of other analogues, many of which having very little in common with the MDV, and it feels a little out of step as there is little attempt by the authors to compare and contrast with the rest of the book and the MDV. This chapter, or the book, would have benefited perhaps from a more detailed comparison of non-Antarctic sites. Sadly, this final chapter, and hence the book, also lacks an appropriate conclusion or summary section. My biggest criticism of the book as a whole is the unequal consideration given by the different authors of the analogue aspects and relevance of the features or processes to Mars and astrobiology. While some authors (e.g. Marchant & Head, Barrett *et al*.) provide ample comparisons with Mars and suggest practical lines of investigation on Mars, others fail to make a strong case of how the material presented is truly relevant to the search for habitable environments or traces of life on Mars, either past or present.

The expected audience for this book would be any practicing researcher working in or interested in Antarctica and the McMurdo Dry Valleys, or more generally those interested in Mars analogue environments on Earth. The book would certainly be relevant and useful in any senior undergraduate or graduate course in Antarctic science, comparative planetary science, planetary/polar geomorphology, or astrobiology.

Although this book is a timely contribution, and is a very useful reference, it may require updates in the near future as important analogue missions have recently been funded by NASA to integrate science-driven investigations with mission-relevant technologies in realistic operational scenarios in Antarctica in order to prepare for future space exploration missions. These include "IceBite", a robotic drilling and sample handling system being developed by NASA Ames, and "ENDURANCE", an under-ice robotic explorer led by the book's lead editor (PTD). As well, the continued exploration of Mars by ongoing and future missions will continue to shows us the great diversity of environments, some similar to those on Earth, of our planetary neighbour.

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With Hillary at Scott Base: a Kiwi among the penguins

Vern Gerard
Bateson Publishing, Wellington, 2012.
ISBN 978 1 877520 07 5. 147 pp. Obtainable outside New Zealand only from bateson.publish@xtra.co.nz at £20 post free.

The recent International Polar Year has stimulated historians to look back to IGY and examine more closely what was achieved and exactly how decisions taken then have structured Antarctic activities since. Amongst all the academic writing some of the still living participants found the time and energy to dust off their diaries and recount what life was like almost 60 years ago. Vern Gerard was one of those early New Zealand scientists who took part in building Scott Base as a platform for Edmund Hillary's