

Book reviews

Antarctic Microbiology

Edited by E. Imre Friedmann

John Wiley & Sons, Inc., New York (1993).

634 pages. £140 (\$165). ISBN 0 471 50776 8.

This book adds to the variety dealing with polar biology that have appeared recently, and is a welcome contribution. It is not a completely comprehensive review of Antarctic microbiology, and doesn't claim to be, but does provide authoritative reviews of a number of major areas of microbial ecology. The text contains 16 chapters split into three sections dealing with *Marine Environments*; *Terrestrial and Freshwater Environments*; and *Other Topics*. In the first section, the introductory chapter by Karl on *Microbial Processes in the Southern Oceans*, I found to be a particularly interesting and comprehensive treatment of the role of microorganisms in carbon/energy cycling in this globally important area. The significance of the Southern Ocean as a 'biological pump', removing CO₂ and other elements during primary production when particulate organic matter sinks, is dealt with, together with the environmental factors which appear to limit microbial activity in different areas of the Southern Ocean.

This first chapter acts as an introduction to following ones where some topics are dealt with in greater depth. Phytoplankton and their productivity are considered by El-Sayed and Fryxell. Despite the apparently high nitrate concentrations in much of the Southern Ocean, primary production seems to be nutrient limited, perhaps by iron. I was surprised, therefore, that there was little critical discussion in this chapter of the relative importance of different nutrients in limiting production, nor discussion of nitrate or ammonium as nitrogen sources supporting primary production. A number of recent publications have suggested that ammonium, rather than nitrate, may be the predominant nitrogen source for phytoplankton production, at least on some occasions. The weak critique of the role of nutrient supplies (and their possible interaction) in regulating production in the Southern Ocean seemed odd in view of the topic's importance and the current interest in its ecological significance.

The role of protozooplankton in Antarctic food webs, sea ice microbial communities, and benthic microorganisms are also discussed individually. The latter chapter deals heavily with the structure of benthic microbial communities as suggested by lipid biomarkers, with less emphasis on the dynamics of the community and its ecological function. As a minor point, I have to disagree with the general statement in this chapter on page 221 that sediments in nearshore Antarctic environments have 'relatively few infaunal organisms'.

The section on Terrestrial and Freshwater Environments

starts with a chapter on *Microorganisms in the Antarctic Ice* by S.S. Abyzov. This describes a considerable literature, predominantly of Russian origin, on the survival and distribution of microorganisms in Antarctic ice cores. Survival of viable actinomycete spores in ice layers up to 47000 years old are reported, and the fascinating possibility raised that species of microorganisms that have disappeared elsewhere may have survived in the ice. Subsequent chapters in this section deal with microbiology of Antarctic soils, lithophytic communities, lichens, and microbes in freshwater lakes and streams.

The last section discusses Human Infectious Diseases, Relevance of Antarctic Microbial Ecosystems to Exobiology, and Protection of Antarctic Microbial Habitats.

Overall, the volume provides a valuable synthesis of much of the current information on the microbiology of Antarctic systems and is to be recommended. It is well produced and edited, the chapters uniformly clear and well written, with well produced photographs and figures. It is expensive, though, and at its UK price (£140) I cannot see many individuals purchasing it.

D.B. NEDWELL

Before the Heroes Came: Antarctica in the 1890s

T.H. Baughmann

University of Nebraska Press, Lincoln, USA (1993).

160 pages. £19.95. ISBN 0 8032 1228 3.

In 1797 Samuel Taylor Coleridge became immersed in accounts of early voyages into Antarctic waters. His passionate imagination conjured up images of frozen seas and great icebergs, brooded over the sufferings of the mariners and transformed exploration of the physical world into a representation of the great journey of the soul, from guilt to redemption. From that moment the exploration of Antarctica has had an emotional resonance which haunts the sober historian.

This book is an account of the first voyages South and of the events which led up to Scott's *Discovery* expedition of 1901. The author states his thesis clearly: "Because the men in British geographic circles refused to profit from the knowledge gained during the ten years before the *Discovery* sailed, they squandered the lessons of the 1890s. Instead the prime movers of the *Discovery* took the Arctic adventures of the 1850s as their model. Rather than building on the experiences of the immediate past, the planners repeated the mistakes of fifty years and condemned British Antarctic exploration to tragedy in the second decade of the twentieth century".

The emotional significance of the death of Scott and his companions was enormous at the time and the tragic force of their story has not diminished. It seems at times that biographers

of Scott have reacted as to a personal bereavement, with an obsessive desire to find a reason why or someone to blame. They emphasize decisions which can be explained as historically determined and refuse to accept the accidental nature of many of the key events. Baughman identifies two fatal decisions — Markham's appointment of a naval officer "rather than a scientist" as leader of the expedition and the choice of men rather than dogs to pull sledges on the last part of the Polar Journey. His analysis of the historical context is fascinating but readers with polar experience are unlikely to accept that because of these decisions Scott and his party were doomed.

Nevertheless this book is exciting reading and makes a wealth of early material easily accessible to the polar enthusiast. It begins with the attempts to locate and define the extent of the southern continent which Greek geographers had suggested must "balance" the Arctic. The first scientific expedition, led by Edmund Halley, studied the Earth's magnetic field, a research topic which remains of great practical importance to this day. Baughman notes that difficulties arose because Halley, a civilian, was given command of *HMS Pink* and suggests that this was why Captain James Cook rather than Alexander Dalrymple, a "candidate" (Fellow?) of the Royal Society, commanded the expedition which circumnavigated Antarctica and crossed the Antarctic Circle for the first time in 1773.

The theme of "scientist good, naval officer bad" runs throughout the book but unfortunately with no discussion of what these professional labels meant in the late 18th and 19th centuries. How far was Griffiths teasing when he suggested Scott should take Tyndall's book on glaciology to the Pole? Markham defined his ideal commander as "a good sailor with some experience of ships under sail, a navigator with a knowledge of surveying, and he should be of a scientific turn of mind". The bemused reader then turns the page to find "Scott met Markham's overarching criterion as a commander: he was a naval officer. It was a further advantage that he was young and willing to take direction from the old Arctic hands who populated British exploring circles". Did Scott have a scientific turn of mind? Just how much of a "boffin" would a torpedo expert have been? Baughman is silent; the hungry sheep look up and are not fed.

Nevertheless, the author has the gift of transmitting the spirit of his sources. His account of the Dundee whaling expedition of 1892–93 is full of lively detail (one pities the ship's cat thrown overboard to end a period of becalmed weather) skilfully combined with an explanation of the economic pressures which lay behind this commercial venture. We hear how the doctor on the *Belgica* treated mid-winter depression by exposing the sufferers to the light of an open fire for several hours a day. The story of Borchgrevink reflects perfectly the exasperation and misery that dreadful self-publicist caused his companions on the *Southern Cross* expedition, as they wintered for the first time on the Antarctic continent. Even the obligatory few paragraphs on seals leap into life because the author has

for his source the inimitable Nigel Bonner.

Where the sources are limited Baughman produces a competent but rather colourless summary. For example, the Kerguelen cabbage, "often mentioned by the old navigators, who found it a good tonic against scurvy" (as Migot writes) is passed over as merely "peculiar". Sennegras is described as "a dried plant". There is a curious silence about non-polar events; by the end of the book the reader feels like the Cape Adare winterers "News of the outside world amazed them—for the first time they heard of the South African War and other events of the previous year". But these limitations must be set against the great achievement of the book: to tell the story of remarkable men and bring to the armchair-bound reader a sense of the excitement of the days "before the heroes came".

The fair wind blew, the white foam flew

The furrow followed free

We were the first that ever burst

Into that silent sea.

E.M. MORRIS

Changing trends in Antarctic Research

Edited by *Aant Elzinga*

Kluwer Academic Publishers, Dordrecht (1993).

161 pages. £39 (\$55.50; Dfl.95). ISBN 0 7923 2267 3.

The role of science and scientists in Antarctica relative to environmental issues and scientific monitoring *vis à vis* basic research began to change during the early 1980s. External relevance and accountability pressures are influencing national science policies from which Antarctic researchers certainly are not immune. Furthermore, there is an increasing involvement of scientists in the political and bureaucratic decision-making process, both at national levels and within the Antarctic Treaty System. The demise of CRAMRA (Convention on the regulation of Antarctic Mineral Resource Activities) has further changed perspectives and the consequences of these changes can already be seen and felt by Antarctic researchers. "Changing Trends in Antarctic Research" is a summary of the proceedings of a symposium held at the University of Goteborg during 1991 to mark the 30th anniversary of the Antarctic Treaty and to look at some of the current issues facing Antarctic research. Hence, this publication is highly topical and timely and it is quite a pity that shoddy editing has spoilt an otherwise entertaining and valuable volume.

The book contains a useful general introduction and has been organized in six parts, each covering a major theme. I still have difficulty in understanding acronyms, so that the glossary of acronyms provided at the beginning of the book is indispensable, although not all of the ones used in the book are covered. Part I, *Historical and contemporary issues*, consists of single chapter, 'The Politics of Science in Polar Regions', by Aant Elzinga and Ingemar Boblin. They place

the issues in the following chapters in perspective and discuss the different institutional motives and driving factors for doing research in both the Arctic and Antarctic.

All the chapters in Parts I to V have been produced by a rapporteur or rapporteurs and it is therefore difficult to ascertain whether some of the impressions I gained were intended by the speakers. In attempting to give a true reflection of the speakers' comments and the discussions, but simultaneously keeping the reports concise, parts of the chapters appear stilted and seem to end rather abruptly. The second theme, covered in Part II, is *The Functional Role of Science in the Antarctic Treaty System*, and consists of three chapters based on discussions following introductions by Finn Sollie, Nigel Bonner and Anders Karlqvist. Sollie discusses the role of science in the negotiations of the Antarctic Treaty. Probably the most important point he makes is that it was *science* which turned out to be the common ground where nations could meet at a crucial point during the Cold War. Bonner analyses the development of the science/politics interface in the Antarctic Treaty and the role of scientific advice. He is extremely forthright in his opinions on 'bureaucrats who have never been down to Antarctica, but have condoned regulations that are contradictory and hinder regular scientific activities'. He feels that scientists are fully justified in their concern about the effects of environmental regulation on science and that SCAR should play a more leading role within the Antarctic Treaty system, otherwise 'international diplomats may become even more the captives of populist ideas and media manipulations'. Anders Karlqvist's discussion on relevance pressures and the strategic orientation of research is informative and a little alarming for the future of science in Antarctica. He predicts fewer scientists operating in the continent and an increase in the number of journalists and tourists, among others!

Part III poses a question: *Is Science in Antarctica facing the Prospects of increasing Bureaucratization?* and consists of two chapters stemming from talks by Olav Orheim and James N. Barnes. I found these two chapters very valuable, because of the strongly divergent perspectives on the future of science in Antarctica. Orheim believes that not all aspects of the introduction of environmental impact assessments are necessarily bad, but scientists may be tied up in a 'net of bureaucratic rules' which will be detrimental to basic research: 'science needs free hands' (this may be a good catchphrase for those who are part of the bumper sticker culture). Barnes issues a challenge to scientists; he suggests that scientists have themselves to blame for a bad press and suggests that SCAR should be more pro-active, but also believes that science will be even more important than before.

Orientation Shifts in Antarctic Research Agendas, the topic of Part IV, comprises three chapters based on Bruce Davis' report on the Australian Research Programme, Barry Heywood's discussion on environmentally-driven research and Kent Larsson's presentation on geoscience. I particularly

enjoyed Davis' paper (chapter 13 in Part VI), which gives more details of the chapter in Part IV, because so much of the Australian experience and the underlying politics is repeated in other national programmes. Part V is another single-chapter contribution, which summarizes panel discussions and a plenary on multi-disciplinary and multi-country perspectives. The most important aspect emerging from these discussions is that the future of science in Antarctica undoubtedly will rely on international cooperation, with the most important examples being the formal links which exist among the Scandinavian countries and the approach of the Netherlands. Although the current Eurocentric nature of this cooperation leaves out many other countries involved in Antarctic research, this clearly points to the future *modus operandi*.

Part VI consists of four symposium papers and a review of SCAR. These papers by Nigel Bonner, James N. Barnes, Bruce Davis and R.B. Heywood, unfortunately result in a certain degree of repetition of the summarized versions in previous parts of the book. A better arrangement would have been to present the full papers with the discussion added as addenda. Chapter 15, by Rita R. Colwell, reviews the role of SCAR and contains a summary of challenges for the future, which include the creation of mechanisms to improve access of Third World scientists to Antarctica, modernizing and interacting more strongly with international programmes, and improving SCAR's organizational structure and provision of leadership for 'cutting edge' scientific research. A proposal that SCAR will have to consider is the formation of an Antarctic Science Foundation in order to attract funding.

I should have liked more access to the existing literature: only the contributions by Elzinga and Boblin (Chapter 1) and Davis (Chapter 13) contain lists of references. An irritating aspect of the book is that it seems to have been produced in a hurry. There is an unacceptably large number of typing errors, starting with the first line on page 1 ('incringement' for 'infringement'), words that have been left out of sentences, incorrect use of words ('mitigate against' instead of 'militate against', 'improductive', etc.) and incorrect scientific nomenclature and place names. This latter group includes 'sea-floorbed spreading', reference to the 'Rushfield Massive in South Africa' (presumably the Bushveld Complex) and a Gondwana reconstruction that is very out of date. A further observation is that there are some comments on the future involvement of scientists from Third World countries, but not a single Third World representative appears on the list of invited speakers. Despite this criticism, "Changing Trends in Antarctic Research" is recommended for Antarctic science managers, researchers and policy makers alike. Scientists are dependent on the science policies of their countries for funding and often take no interest in understanding these policies and/or do not know how to influence them. This book may go some way to remedy these problems.

JOHAN KRYNAUW