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Book reviews

Subantarctic Macquarie Island. Environment and Biology.

P.M. Selkirk, R.D. Seppelt & D.R. Selkirk
Cambridge University Press, Cambridge (1990) 285 pages. £40.00. ISBN 0 521 26633 5.

This is the latest in CUP's excellent series *Studies in Polar Research*. In keeping with the aim of the series, being mostly "...surveys of the present state of knowledge in a given subject...", *Subantarctic Macquarie Island* is a review of virtually all the published scientific work concerning the environment and biology of this fascinating, small remote island in the Southern Ocean. It is, in effect, a sequel to J.S. Cumpston's (1968) highly informative narrative on the history and economic importance of the island.

Macquarie Island, lying at 54°S, just to the north of the Antarctic Convergence, is the crest of the Macquarie Ridge, part of a complex of submarine ridges and deep trenches which borders the Australian and Pacific tectonic plates a few hundred kilometres north of the triple junction of the Australian-Antarctic Ridge and Pacific-Antarctic Ridge. It rises from the Southern Ocean about 1460 km south-east of Tasmania and 1100 km south-south-west of New Zealand. Its origin and hence geology are unique among the subantarctic islands (the others being South Georgia, Prince Edward Islands, Iles Kerguelen, Iles Crozet and Heard and McDonald Islands), its rocks being formed by crustal accretion and subsequent uplift during sea-floor spreading at the Antarctic-Australian spreading ridge.

The authors of this book are well qualified to undertake such a review of the island's scientific background. They have probably spent more time there over the past 20 years indulging in their respective field studies, than anyone else. In the Preface we are informed that the island is politically part of Tasmania, and a UNESCO Biosphere Reserve. Its conservation status is further explained in the final chapter. First it was declared a Nature Sanctuary in 1933 under the Tasmanian Animals and Birds Protection Act of 1928, then designated a State Reserve under the Tasmanian Parks and Wildlife Act in 1972, and declared a Nature Reserve under the same Act in 1978. It was given both Biosphere Reserve and Scientific or Strict Nature Reserve status by IUCN in 1977.

The book comprises 12 chapters covering every aspect of the island's environment and biota on the basis of the published record, supplemented by personal observations and unpublished data. A very brief Introduction is followed by Discovery and Human Occupation, which is largely a resumé of Cumpston's narrative. The Island and its Setting describes the physiography and climate, while seismicity, topography of the Macquarie Ridge Complex, tectonics, and geology are covered in The Island's Origin and Geology. Subsequent chapters are more directly related to the environment of the biota and of the biota itself. Geomorphology and Quaternary History cover the extensive faulting systems, dramatic uplift sequence in relation to sea level changes over the past 80 000 to 297 000 years (depending on the assumed uplift rates ranging from 1.5 to 5 mm per year). The glacial history of the island remains controversial with different workers providing evidence and theories both for and against even partial glaciation during the Quaternary. Erosion and periglacial features are of particular importance as regards habitat stability for vegetation. Unfortunately, despite some commendable research on the island's vegetation history by the authors, this receives surprisingly little attention. Chapter 6 is devoted to The Island's Vegetation in which the history of botanical studies and the composition and distribution of the plant communities are briefly detailed, supported by some fascinating illustrations of the flora and vegetation complexes. Botanists and phytogeographers will be particularly interested in the revised nomenclature and Southern Hemisphere relationships of the flora. The influence of introduced animals on the native vegetation and the establishment of introduced and alien plants (is there a difference?) are mentioned briefly.

The physical and chemical characteristics and vegetation and fauna of Lakes are discussed, but reveal a remarkable lack of available information. The avifauna are described in The Island's Birds, emphasizing the importance of the island as a breeding haven, and the inevitable outcome of Man's deliberate introduction of cats and rats during the 19th century. This is followed by a chapter on Mammals—Indigenous and Introduced. Particular attention is paid to the island's seals, especially to the very large but rapidly declining elephant seal population. Although the cause of this decrease is not clear, a reduction in food resources due to commercial overfishing on the Kerguelen Shelf, increased predation and rising sea temperature have all been suggested. As elsewhere on the subantarctic islands fur seals are increasing, the most abundant of the three species being the Antarctic fur seal. Of the introduced mammals, rabbits, cats and rats have had the greatest impact on the native fauna and vegetation. The few studies of Microbiology, Parasitology and Terrestrial Arthropods reveals a further lack of attention paid to these organisms and the ecological processes in which they play such an important role. Intertidal and sublittoral ecology are briefly discussed in The Nearshore Environment, but most of this chapter concerns aspects of the offshore ocean.

The final chapter discusses the island's conservation status under Human Effects: From Mismanagement to Management Strategies. Unfortunately, the management criteria concern

mainly the effects of the introduced biota on the native ecosystems, repeating much of what was said earlier. The last section on conservation and management strategies considers Macquarie Island in the light of several recommendations (proposed for all the subantarctic islands) emanating from a joint SCAR/IUCN workshop in 1986 but there is little discussion of how the existing management plan operates or what the new plan should embrace. A concluding (under-)statement that "The management plan for Macquarie Island must aim at protection of the terrestrial ecosystem and near-shore waters" is an abrupt anticlimax. Surely this would have been an excellent opportunity for the authors to express well informed views on what such a management plan should entail? The current management of Macquarie Island appears unbelievably complex and must make efficient administration and science hard to achieve.

Most of the island's recorded biota are listed in 12 Appendices, and there is an index of generic and specific names as well as a comprehensive subject index.

Macquarie Island is an excellent compilation of the available literature on this little-known remote speck in the Southern Ocean. The authors are to be congratulated on their meticulous and faithful reduction of a large volume of information into a most fascinating, highly readable, largely descriptive narrative. If it has a weakness it must be the lack of critical approach or any attempt to synthesize. Despite a lengthy bibliography (over 370 references) only a relatively small number relate directly to Macquarie Island, revealing a great dearth of quantitative data and virtually no experimental research. Surprisingly, several important relevant papers presented at the recent Macquarie Island Symposium in Hobart, 1987 (Banks & Smith 1988) have not been included. Several major components of the biota and dynamic ecological and physiological processes have received no or minimal attention. The authors could have usefully highlighted these omissions and proposed a general scheme of research which would aim to investigate many of the more critical aspects of the environment, its biological components and ecosystem functioning. Here was an ideal opportunity to influence the various funding agencies which support research on the island.

In conclusion - a first class account of the environment and biology of this subantarctic island, clearly, if a little dryly, written, copiously and well-illustrated and with remarkably few typographic errors - a credit to the editors.

R.I. Lewis Smith

The natural history of seals

W.N. Bonner
Christopher Helm, London (1989). 196 pages.
£14.95. ISBN 0 7470 0203 7

This book is one in a series on mammals which, in the words of the series editor, aims to explore its subject in greater depth than natural history books which set out to delight the eye. Another aim is to make available recent research results. Nigel Bonner has succeeded in both aims.

It should be noted that the book is truly about seals, that is seals of the family Phocidae, which are known as true seals or earless seals. Earless is an odd epithet - true seals lack pinnae, not ears. Members of the family Otariidae (the so called eared seals, comprising sea lions and fur seals) and of the family Odobenidae (walruses) are referred to in the book, but only for comparative purposes. The restriction to true seals is deliberate; the author tells us (p. xv) it is because they "form a natural group which can be covered reasonably well in a book of this size".

It is important to keep in mind Bonner's usage of the word "seals" while reading this book. For instance on p. 47, we read that "As in all seals that have been studied the ... mother does not feed herself during lactation". That applies to true seals, but certainly not to fur seals, sea lions and walruses, which lactate for several months and intersperse feed bouts at sea with suckling bouts ashore.

The book begins with an outline of the differences between seals and other mammals and how seals have adapted to the marine environment. This is followed by an account of feeding, energetics and diving, which debunks the myths that seals have prodigious appetites and that their metabolic rate exceeds that of other mammals. A section on diet refers to the broad food base of seals, and highlights the difficulty of providing a response to the frequently asked question - "what does a seal eat?" Chapter 3 investigates reproduction and growth. Two chapters follow dealing with individual species; in the first, breeding patterns and social organisation are described, which leads to an evaluation of polygyny and its concomitants (large body size in males and dense breeding aggregations). The following chapter covers the distribution, abundance and general biology of each species. It also includes sections on the classification of seals and their origins from carnivore ancestors. Bonner manages to group all of the seal species into tribes, a feat rarely attempted. This required the erection of the tribe Miroungini for the genus *Mirounga*.

The next three chapters are entitled "Interactions with Man", each with a subtitle. Contemporary problems discussed include the decline in numbers of southern elephant seals in the Indian Ocean, the effect of organochlorines on seals, interactions between seals and fisheries, and the outbreak of phocine distemper virus in the North Sea. A more positive note is struck in the final chapter which deals with conservation.

The copious illustrations include distribution maps of the 18 species dealt with in the book and colour photographs for 13 of them. One of the latter is misidentified. The book is well referenced and has a detailed index.

The book includes some of Bonner's ideas and speculations about seals and how they function. These have not been subjected to rigorous testing and purists may consider such lateral thinking to be undisciplined in a book of this nature. On the other hand, they are stimulating and, being the result of many years observation and thought, and lucidly described, make a worthwhile contribution. An example is the suggestion that virgins mate at sea (he has spared us the oxymoron of another seal biologist that "virgin seals were not seen to mate")

The author has sifted through a wide variety of publications and synthesized material on his chosen subject in an engaging, careful and concise style. Let us hope that the series editor convinces him to turn his attentions and pen to the eared seals and walruses.

PETER SHAUGHNESSY

Volcanoes of the Antarctic Plate and Southern Oceans.

Edited by W.E. LeMasurier and J.W. Thomson.
Antarctic Research Series 48. American Geophysical Union, Washington, D.C. (1990).
487 pages. US$55.00. ISBN 0 87590 172 7.

The literature on the geology of Antarctica and the islands of the southern oceans is both extensive and widely scattered. Numerous expeditions often nationally inspired and organized, and from many countries have been mounted to the deep south but their scientific findings are often buried in special reports the earlier ones of which, in particular, are not always easy to access. Thus knowledge of Antarctic geology is not, perhaps, as widespread as it should be. This certainly applies to the present reviewer who, although aware of the nature and some of the literature on Gaussberg, Erebus and the McMurdo volcanics, was surprised to learn how numerous are the volcanoes of the Antarctic continent and what a high proportion of them are alkaline.

The book is the product of a 'Working Group on Antarctic Volcanology' of the 'International Association of Volcanology and Chemistry of the Earth's Interior' (IAVCEI). Work started on the project in the early 1970's and represents a substantial updating and expansion of the *Catalogue of Active Volcanoes* for Antarctica (IAVCEI, 1960). It is organised into seven sections. Five cover areas of the Antarctic continent and two the widely scattered islands of the southern oceans, of which the latter are divided into the islands of the Antarctic and the Pacific plates. Each section is preceded by a full summary with much tabulated data and numerous diagrams, generally illustrating chemical relationships. The sections are then organized systematically, each section having a key letter and each volcano a number. The descriptions of the 'McMurdo Volcanic Group Western Ross Embayment' are subdivided into three provinces for each of which there is an initial summary. Individual accounts, after preliminary factual, generally physical, data, are presented under the headings 'form and structure', petrologic characteristics', 'chronological data' and 'extent of knowledge' with a list of papers, which are compiled in full at the end of each section. There is always at least one geological map and sometimes regional maps, numerous photographs. many chemical analyses, including trace element data and CIPW norms, and an abundance of chemical diagrams, particularly of silica versus total alkalis, which are used to facilitate chemical classification. There is a comprehensive locality index.

Much of earth science research involves the accumulation of data and the search for patterns among them, and in these endeavours compilations bringing together such information are an invaluable precursor. This book is particularly valuable in bringing together such widely dispersed information, and will certainly set in train many ideas amongst readers. For instance, I am sure that few will have known, except for those actively engaged in Antarctic research, of the large number of volcanoes on the Antarctic continent that have erupted comenditic and pantelleritic products. These must constitute the largest active group of silica oversaturated peralkaline volcanoes on earth. They are even more numerous than those along the East African Rift and, as such, must be a mental stimulus to those concerned with these rocks. Similarly, there are large numbers of volcanoes with trachytic and phonolitic products, making this a major alkaline province and one to which it is certain that in future greater attention will be paid.

The book is well put together and clearly laid out. There appear to be few errors, except for the spelling aegerene, for aegirine, in one section. The editors, and indeed all the authors, have done a thorough and valuable job for which they must be thanked and congratulated.

ALAN WOOLLEY

Antarctic Sector of the Pacific

Edited by *G.P. Glasby*
Elsevier Oceanography Series No. 51. Elsevier, Amsterdam (1990).
396 pages. US$ 97.50. ISBN 0 444 88510 2.

In choosing to limit this volume to the Pacific sector of the

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Antarctic the editor would seem to have created for himself a particular problem: how to make the result of wider interest? This question is raised implicitly in Holdgate's Introduction and answered by his indication that the volume is "to bring home to students of the Pacific how that great ocean is transformed in its southernmost part". Despite this laudable aim, in the end surely no attempt to understand the Southern Ocean can afford to ignore its circumpolar nature. Indeed much of the recent Antarctic literature has been biassed by concentration of activities around the Antarctic Peninsula area, which although enormously interesting is nonetheless atypical. Perhaps the time has come for the balance to be redressed?

The eleven chapters concentrate on the area outlined by Glasby in the opening chapter, namely that south of 40°S and between the west of the Antarctic Peninsula (60°W) to Victoria Land (140°E) - almost half the Southern Ocean! Of the fifteen authors, four are from the United States and eleven from New Zealand. The references (55 pages of them) are collated at the end of the book, and titles are given in full. References up to 1988 are included, though authors vary in the extent to which they cover the most recent literature. There is a useful index and the book is produced to a high quality with clear diagrams and reasonable photographs.

The opening chapter (Glasby) is a useful history of Antarctic exploration in general, though with a bias towards the Pacific region. So many of these histories concentrate on the heroic era, and dismiss the years since IGY as uninteresting. Glasby, thankfully, does not and he comes right up to date, outlining recent exploitation of marine living resources and the evolution of CCAMLR (with a personal view of its effectiveness). The next four chapters are on Meteorology (Mullan & Hickman), Physical Oceanography (Patterson & Whitworth), Ice (Keys) and Structure and Tectonics (Davey). These are outside my area of expertise, but I found them generally well-written and interesting.

There follows a clear and well-argued chapter on Hydrocarbon Exploration and Potential (Cook & Davey). The authors emphasize the scanty nature of the data, and present a careful analysis of just how reliably we can estimate the hydrocarbon potential of the three Ross Sea basins by analogy with the Gippsland and Taranaki Basins further north. Despite immense speculation on this emotive subject in recent years it seems clear that our best estimates of the resource potential remain little more than guesses. The next chapter on Sediments (Anderson) discusses primarily the Ross Sea area, although there is also some wider discussion of superficial sediments. There are useful sections on scour and manganese nodule distribution.

Biology is introduced with a chapter on Plankton (El-Sayed). This chapter ambitiously combines both phytoplankton and zooplankton and opens with a short historical introduction. The discussion of phytoplankton emphasises the biassed nature of the available samples (most are from open waters, away from more productive coastal waters and ice-edge). Following a description of the various taxonomic groups El-Sayed discusses the problem of what limits the standing crop of chlorophyll in the Southern Ocean (the recent iron-limitation hypothesis is dismissed on the basis of nutrient enrichment experiments) and draws attention to the way that the paucity of work on physiological and population dynamics impedes our understanding of this basic level of the food web. There are brief discussions of nanoplankton/picoplankton and ice algae before animals are introduced. As usual *Euphausia superba* gets pride of place, but there are also discussions of standing crop, seasonal variations and recent exploitation.

We then jump straight to Marine Mammals (Baker). This chapter starts with the traditional inverted pyramid diagram of the Southern Ocean food web (phytoplankton at the bottom, krill in the middle, and a devastating array of vertebrate predators at the top). This is a distortion of reality, and one that is not necessary to make the point that krill are important to the system (the reference for this diagram is also somewhat unusual: *Let's Save Antarctica*! - could not a primary science source be found?). There follows a valuable short history of exploitation, essentially that of the great whales, which comes right up to date with brief references to exciting modern developments such as DNA fingerprinting, photographic identification of individuals and vocalization studies. Baker provides a most interesting discussion of evolutionary history, and continues with a short discussion on each species. I was disappointed that there was no discussion of recent developments in marine mammal physiology, much of which has involved studies at McMurdo Sound. Perhaps this was outside the remit for the author, but there can be no excuse for the almost complete lack of scientific nomenclature in this chapter. Colloquial names, particularly those of the lesser known species, are notoriously variable. Is the Pilot Dolphin referred to *Cephalorhynchus commersonii*, the species I know as Commerson's Dolphin?

The chapter on Seabirds (Harper, Spurr & Taylor) also starts with a discussion of evolutionary history. Perhaps because of the paucity of seabird data from much of the area under discussion, this chapter has one of the widest interpretations of the 'Pacific sector of the Antarctic', for there are extensive discussions of the seabirds of the New Zealand subantarctic islands. Much of the material in this chapter is distributional, although there is also a discussion of the food and feeding biology of Southern Ocean seabirds. This is an area of seabird research which has received a great deal of attention in recent years in both the Atlantic and Pacific sectors, but the authors conclude (correctly in my view) that the Pacific sector is not the most appropriate place for future developments in this field.

The final chapter (Gregory) covers Environmental and Pollution Aspects. This very welcome chapter includes topics such as garbage disposal, entanglement of marine mammals in fishing gear, and ingestion of plastic by seabirds.

There is also an extensive discussion of possible effects of petroleum hydrocarbon exploration and extraction.

Overall I feel that the book has succeeded and provides a welcome addition to the Antarctic literature, with an added bonus in its different geographical perspective. Although most authors have taken pains to give their comments a wider relevance, there are instances of different chapters presenting varying opinions with no cross-referencing (for example the Southern Ocean is shown to have a low chlorophyll standing stock in one chapter, and described as richly productive in another). There are also some unfortunate omissions. In particular it is a great pity that there are no chapters on fish or benthos. Studies at McMurdo Sound have been central to our understanding of the way fish adapt to living in temperatures at which their more temperate relatives would freeze, and the long (albeit intermittent) history of benthic research in the Ross Sea is amongst the most important such work in Antarctica. Finally, since the editor has given welcome space to environmental issues, perhaps it would have been sensible also to cover tourism? These comments, however, detract only slightly from a book I am pleased to have on my bookshelf, and which I shall use extensively.

ANDREW CLARKE

Geosciences in Victoria Land, Antarctica

Edited by *C.A. Ricci*
Memorie della Società Geologica Italiana, **33**, 1989, (for 1987) 219pp

Earth Science in Antarctica

Edited by *C.A. Ricci*
Memorie della Società Geologica Italiana, **43**, 1990 (for 1988), 205 pp

Italy is one of the newer signatories to the Antarctic Treaty but as a nation it has taken its membership seriously. With the construction of their station, Terra Nova Bay, in Victoria Land Italian scientists embarked on a varied programme of research, which includes a substantial earth science component. Antarctic geoscientists will recognize their Italian colleagues as enthusiastic attenders of and contributors to Antarctic earth science meetings.

These two volumes of memoirs of the Italian Geological Society contain papers presented at meetings in Siena in 1987 and 1988. As pointed out by Carlo Ricci in the foreword to the first volume, the purpose was to 'present and discuss within an international framework the results obtained by the Italian geologists and geophysicists'. Contributed papers cover aspects of regional geology, with particular emphasis on metamorphic terranes, geomorphology, satellite imagery and geomagnetism. Although most are by Italian authors there are also papers by American and New Zealand workers, who have long-established programmes in Victoria Land, and also one from Germany. Two impressive full colour geological and geomorphological maps, included in the back pocket, were produced in a far shorter time than that taken by many other national groups working in Antarctica.

The second volume is dominated by contributions from Italian workers. Papers address more detailed issues and there is a stronger geophysical component, all perhaps signifying the establishment of a confident national programme.

All the papers are in English and, as those familiar with *Memorie della Società Geologica Italiana* would expect, are generally well produced with clear maps and diagrams; some half tones are, however, disappointing. The *Memorie* is not a series most Antarctic geologists would be familiar with but these two volumes provide a substantial collection of Antarctic papers and suggest that from now on we should keep a watchful eye on it. A third meeting was held in Siena in October 1989 — presumably we can expect another volume in 1991?

M.R.A. THOMSON

Proceedings of the International Symposium on Antarctic Research

Edited by *Guo Kun et al.*
China Ocean Press, Beijing (1989)
540 pages. Price not stated. ISBN 7 5027 0987 8/P111

This major symposium was organized by the Chinese Committee on Antarctic Research to celebrate the first ten years of their Antarctic research activities. The all embracing range of science presented makes the volume impossible to review in detail throughout but a number of general points emerge.

Firstly, it was clearly a national symposium but the organisers invited a number of foreign contributors to add greater weight to the proceedings. This has resulted in a volume of 70 papers of which 14 are by non-Chinese single authors and at least a further six are co-authored with foreigners.

Secondly, what is the place for such general volumes as this? True, the editors have gathered the papers into five disciplinary sections and within sections grouped them by subject. I would be the first to support the need for cross-fertilisation between disciplines but is a volume such as this going to attract many readers? Under present circumstances I think not.

Thirdly, as is often the case with symposia whose proceedings contain all the papers presented the quality is very variable. The contributors and editors are to be commended for publishing everything in English but it seems clear that some papers should not have been published at all. There are a

very large number of spelling mistakes throughout the Chinese papers in the volume but it is no easy task writing or editing in a second language. All concerned with the symposium have clearly made a considerable effort to allow maximum accessibility to their work.

Chinese scientists began their Antarctic activities by working closely with Australia in glaciology, geophysics and geology in the Vestfold Hills and Prydz Bay areas. More recently work in upper atmosphere physics, marine biology and oceanography has been based on and around King George Island. At present the Chinese have two active stations - Great Wall on King George Island and Zhong-shan in the Larsman Hills - and several active collaborative programmes.

The symposium is a clear indication both of the range of science undertaken by them in the Antarctic and of their commitment to Antarctic science in general over the last decade. The value of the studies remains to be assessed; I would encourage them to aim in the next decade for fewer papers of higher quality published in refereed journals.

D.W.H.WALTON

Antarctica's Future: continuity or change?

Edited by *R.A. Herr, H.R. Hall and M.G. Haward.*
Australian Institute of International Affairs, Hobart, Tasmania.
388 pages.Price not stated. Paperback ISBN 0 7246 2528 3

This book is a compilation of nineteen papers delivered at a conference organized by the Australian Institute of International Affairs in Hobart on 18-19 November 1989. As the editors claim, the papers capture the essence of the debate on the future of Antarctica as it then stood, but writing this review in Viña del Mar, as the XI Antarctic Treaty Special Consultative Meeting proceeds, it is clear how rapidly positions are changing. By the time this review is published yet more shifting of ground will have taken place and the final instrument for the comprehensive protection of the Antarctic environment may look rather different from the aspirations of some of the contributors to this volume.

Like all symposia volumes, that papers are of differing value. This book starts badly with a vapid political address by Bob Hawke, but soon gets into its stride with a useful account of the Antarctic Treaty System, particularly in relation to the United Nations, by Richard Woolcott. This theme is returned to later in a light, but very readable, piece by Désirée Edmar. Next is a chapter on Antarctica as a continent for science by Patrick Quilty. This seemed to me to miss the opportunity to point our to the lawyers and diplomats the vital importance of Antarctic science to the world at large. Bruce Davis urges the scientific community to become more political if it is to continue to play a significant role in Antarctic affairs; scientists should persuade governments of the value of Antarctic science, and should take a proactive role in environmental conservation. Chris Beeby writes what is probably the definitive account of the ill-fated Convention on the Regulation of Antarctic Mineral Resource Activities, pointing out to all the unbelievers the over-riding theme of environmental protection in CRAMRA. Darry Powell gives a useful account of the progress of the Convention on the Conservation of Antarctic Marine Living Resources. In a rather defensive section on the performance of CCAMLR he points out the difficulties created by the limited state of knowledge of Antarctic marine living resources. Calls for further research to support management fall largely on deaf ears. Despite obvious problems with fish, funds have been provided only for a single krill stock assessment project.

Phil Law contributes a chapter which sets out, rather effectively, to debunk several of the favourite ideas about Antarctica and its ecosystems. He pours scorn on the idea of returning rubbish from the Antarctic to Australia as an absurd waste of labour and resources and declared the concept of a World Wilderness Park absurd.

Lee Kimball and Lyn Goldsworthy tackle conservation issues, the former in practical legalistic terms, the latter more emotionally, though still rationally.

Tucker Scully reviews the Antarctic Treaty System, warning of the dangers of a "theological" approach to Antarctic issues. Gillian Triggs sets out the framework of a comprehensive environmental regime for the Antarctic, deploring the inadequacies of CRAMRA and outlining what was to become the joint Franco-Australian approach at Viña del Mar. W.M. Bush provides a long and detailed account of the Antarctic Treaty System. It gave me the overwhelming impression of a lawyer arguing about the wording of treaties, questions of jurisdiction, etc., with very little reference to how things actually are, or should be, in the Antarctic. I found it hard going. (There are 261 notes to this chapter). By way of relief, this is followed by a typically controversial chapter by John Heap in which he sets out to show that the stresses caused by sovereignty claims in the Antarctic have had some very positive effects there.

The book concludes with two chapters reviewing militarism in the Antarctic. Peter Beck gives an excellent account of the stresses prior to the signing of the Treaty, their resolution in 1959, the Falklands Factor, and the military significance of the Antarctic to Australia. Alan Hemmings questions whether Antarctic is, in fact, demilitarized, and refers to military-utility research in the Antarctic. All in all, this is a useful and generally interesting book. The editors are to be congratulated on getting it out so promptly, though a few more hours spent on reading the proof properly would have been time well spent.

NIGEL BONNER