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Book reviews

Antarctic ecosystems: ecological change and conservation

Edited by *K.R.Kerry and G.Hempel*
Springer-Verlag, Berlin 1990
427pp. DM 148.00. ISBN 3 540 52101 1.

This volume consists of 45 papers of a total of 80 presented at the Fifth Symposium on Antarctic Biology held under the auspices of the Scientific Committee on Antarctic Research in Hobart, Australia in August/September 1988. This series of symposia was initiated in 1962, in order regularly to summarise our progress towards better knowledge of ecological change and the conservation of Antarctic ecosystems.

The papers have been grouped in five sections with a final review article. The sections respectively deal with long- and medium term changes in Antarctic environments (9 papers); seasonal changes in sea ice zones and off South Georgia (7); ecological and population changes in sea birds and mammals (15); actual and potential fisheries (5), and human impacts on terrestrial and marine systems (9). The subject matter is not restricted to the Treaty area but includes related studies further afield. The range in scale is considerable. The one palaeontological paper suggests that our concepts of the long-term timing and rate at which the Antarctic cooled may have to be substantially revised since fossil wood from the Vestfold Hills appears to be only 4 million years old. In contrast, we learn why the dung of cattle introduced onto Amsterdam Island does not permanently cake the island's grasslands, thanks to woodlice.

There are a number of challenges to conventional wisdoms. for instance "The concept that the tropics are more equable than the polar regions is purely anthropocentric and entirely inappropriate for marine organisms" - "*Euphausia superba* retreats to the ice undersurface during the long winter and feeds with high efficiency on plankton concentrations following ice melt" - in shallow inshore waters benthic microalgae make a major contribution to production - sea ice communities are far from uniform and depend on the history of the ice. There are numerous pleas for the importance of maintaining and even increasing the research effort - for "long-term monitoring studies to determine the direction and rate of environmental and ecological changes, with particular regard to assessing the resilience of ecosystems to, and their recovery from these phenomena" - "to study the processes of primary colonization and succession in land habitats, an important yet poorly documented area of ecology" - " the need for integrated year-round studies of primary production and consumption".

Yet fundamental difficulties emerge in several papers as to how to make objective assessments about rates and even the direction of change. How can the populations of emperor penguins be best monitored? Are the changes in crabeater seal populations real or a function of the census methods? How are we to monitor the communities inhabiting the pack-ice which is almost totally inaccessible without the most powerful icebreakers? How are fish stocks to be monitored in a patchy environment, especially as there remain enormous gaps in our basic knowledge of the ecology of so many of the species. It still amazes me that there is no clear evidence as to what impact the removal of the large whales has had on the Southern Ocean ecosystem. As guardian of the Discovery Collections which contains zooplankton samples dating back to 1925, I know that no attempt is being made to exploit these samples. When my Institute moves to Southampton in 1994, most of this material will have to be thrown away. What opportunities, never realized, will go with it?

One answer to these problems is to monitor the populations of key species. However, there is the basic problem that, in observing the populations, we inevitably have an impact. Penguins apparently sitting comfortably are almost having heart attacks at the approach of observers and helicopters. Ringing experiments reduce the long-term health of sub-colonies of penguins. We compete with the penguins for land space for our bases; even after bases have been abandoned the penguins are slow to recolonize their old nest sites unless low mounds are re-created. Even the mixing of cement has long-term deleterious effects on mosses and lichens.

The insects introduced with fresh supplies of provisions can threaten the existence of island endemics, and other species introduced to control these pest run amok among the native fauna.

Introduced mice on Marion Island survive mostly by eating a flightless moth but, since the moth seems to play a central role in plant nutrients cycling, the long-term impact is uncertain. The cats introduced to control the mice also eat the burrowing petrels, and threaten their continued existence on the island. Their impact on the winter nesting species is particularly severe. Much more serious is the experimental work showing the high sensitivity of algae to quite small increases in ultra-violet radiation.

There are two papers dealing with the management of the Antarctic. The first describes the evolution of the Convention on the Conservation of Antarctic Living Resources, and how the compromises taken to achieve progress can lack scientific rationality. The inadequacies of the International Whaling Commission in conserving whale stocks are alluded to, and would have probably been given greater prominence today. The mineral resources debate has moved on significantly since 1988, as have moves to increase environmental protection for the Antarctic. The second paper sets an agenda for the long-term studies to provide the basic data needed to

improve the management policies being developed for this unique region with such immense global importance.

I would recommend that any busy decision-maker, without the time to read the whole book, reads the final review paper written by Professor Hempel and others. It summarizes all the presentations made at the symposium, many of which could not be included for lack of space rather than quality. It gives a clear picture of our patchy knowledge and our mixture of certainty and doubt as to how it should be managed.

Like all conference proceedings this volume is a real pot-pourri of contributions. The selected papers were all subject to peer review and rigourous scientific editing, so the standard is high throughout. The text is set in two columns and the figures are generally clearly printed. Although I doubt if many will have the stamina to read it from cover to cover, the extensive index will help the browser to find the nuggets of personal interest, and there are plenty of these for all biologists - whether directly involved in Antarctica or not.

M.V. ANGEL

North Pole, South Pole: a guide to the ecology and resources of the Arctic and Antarctic

B. Stonehouse
Prion, London 1990.
216 pp. £17.95. ISBN 1 85375 056 5

Although several books have lately been published on the Arctic and the Antarctic, the present one is different in many respects. One of its main features is the comparison of southern and northern polar areas whilst another is its multi-disciplinary approach. The great differences between north and south are clearly pointed out, but at the same time the similarities in climate and biology are explained. Dr. Bernard Stonehouse, a well known authority on polar biology, has written both text books and several popular books on polar ecology. This latest product profits considerably from his experience in popularization. It is a beautiful book with a delicate design and many fine illustrations.

According to the subtitle, the book is a guide to the ecology and resources of the Arctic and Antarctic. It is actually far more. Its multi-disciplinary content also emphasizes history and exploration by man, as well as the science and policies of polar areas. It is not an easy task to include so many subjects in one book. Some readers may find that it contains too little of everything, while others will consider it an exciting introduction to the many aspects of polar discovery, research and policy. In general the author has succeeded very well in presenting a balanced text between the different subjects.

The reasons for polar cold, seasonal and long-term fluctuations in ice and glaciers are well explained. This is difficult material to popularize, but I think more details could have been included. I would have liked some isotherm maps for the polar areas, and more geographical names on the many excellent maps throughout the book would have been useful.

Ice and glaciers are treated thoroughly. The dynamics of glaciers are described from formation to break up. The ice caps of the polar areas have been changing for millions of years. Earth is clearly at present in an interglacial period, and the ice cap will probably spread across northern Eurasia and America in the future. Its growth depends on finely balanced factors that are not completely understood. Human influence, such as the release of greenhouse gases may perhaps counteract natural forces.

Two chapters are devoted to biology, divided between life in the seas and terrestrial life. Perhaps, because I am a biologist, I feel these chapters could have been extended. The marine biology, including birds, seals and whales, is better described that the terrestrial, although more could have been said about krill and the marine ecosystems of the southern oceans. The description of terrestrial organisms is sometimes inaccurate, in particular with regard to the invertebrates. More information on the interaction between marine and terrestrial ecosystems would have been interesting.

About half of the book concerns the activities of man in polar regions. The reader is introduced to the Arctic people, how they invaded their territories, and how some of them still live a traditional way of life. The history and discovery of the Arctic and Antarctic by modern man is also fascinating reading. The history of man in polar areas is brought right up to the present . While marine resources were the main target of exploitation in earlier times, present-day economic interests include oil, gas and minerals. Science in the Arctic and Antarctic is a continuation by more sophisticated means of earlier exploration. The author describes the problems and costs associated with scientific work in these areas. He also points out the importance of polar research in understanding global climates. The discovery of the ozone hole over Antarctica has given an early warning of consequences difficult to foresee. The management of polar ecosystems is important to avoid further irremedial damage.

What is the future of the polar regions? In the last chapter of the book the author points out the importance of International cooperation in the Antarctic through the Antarctic Treaty and SCAR. Recently, perhaps as a result of milder political climates between east and west, the Arctic has finally got its IASC (International Arctic Science Committee) that will promote cooperation among the Arctic fringe countries. Organizations like these may help us to become - as it is expressed on the book cover - responsible custodians of the last great ecosystems on Earth.

LAURITZ SØMME

University research in Antarctica: Proceedings of British Antarctic Survey Antarctic Special Topic Award Scheme symposium. 9–10 November 1988

Edited by *R.B. Heywood*
British Antarctic Survey, Natural Environment Research Council, Cambridge, 1989
134 pp. £4.00. ISBN 0 85665 137 0

Science is becoming less of an individual pursuit and more organized. The nature of Antarctic science has meant that it has always had to be subject to close scrutiny by committee but an increasingly large proportion of the resources available to it are going to collective enterprises under bureaucratic control. This is necessary for tackling interdisciplinary problems, for gathering data intensively over wide areas, or for carrying out long-term programmes. It does, however, mean that personal discretion in the choice of research topics is severely limited and the inspiration of the individual tends to be stifled. The general problem was discussed by Professor J.M. Ziman in his 1983 Bernal Lecture to the Royal Society, *The collectivization of science (Proceedings of the Royal Society of London* **B 219**, 1-19, 1983). He concluded that innovative research might best be fostered under present conditions by award of block grants to whole university departments on the basis of evaluation of their past work, leaving them the responsibility of identifying and supporting original science. Recognizing this the then Director of B.A.S., Dr R.M. Laws, decided to devote part of the extra funding provided after the Falklands conflict to encouraging more university collaboration in Antarctic research, supporting the ideas of individual research workers.

The first fruits of this venture are before us in this symposium volume. The fifteen papers are from thirteen different university institutions or polytechnics and represent a broad range of interests. Geology, however, is not included although two projects in this field were funded in the first round of the scheme, and two-thirds of the papers are biological. They cover structure and motion in the inner magnetosphere (J.M. Saxton & M.A. Clilverd), ionospheric storms (H. Rishbeth *et al.*), flow in the Southern Hemisphere troposphere (I.N. James), internal gravity waves in the atmospheric boundary layer (S.D. Mobbs *et al.*), satellite radar altimetry of ice (C.G. Rapley *et al.*), growth and mortality of krill (M. Basson & J.R. Beddington), feeding, respiration and shell growth of a bivalve mollusc (J. Davenport), muscles and activity metabolism of fish (I.A. Johnston), lymphoid organ development in teleost fish (J.G. O'Neill), blood circulation and gill water fluxes in the icefish (J.G. Rankin), survival of blue-eyed shags (N. Cobley), temperature responses of bacteria (A.C. Upton & D.B. Nedwell), water relations in mosses (T.D. Noakes & R.E. Longton), temperature relations of a fellfield heterotrophic flagellate (J. Hughes & H. G. Smith), and predation by terrestrial arthropods (M.B. Usher *et al.*). One or two of these are perhaps humdrum but most are innovative and interesting. Not all of these projects involved a visit to Antarctica. Ionospheric storms, the flow in the troposphere and the krill study used information already gathered. Appendices give a full list of awards that have been made under the scheme up to 1989. The presentation is of a high standard but in my copy the hatching on the map on p. 43 was barely detectable using a magnifying glass.

This volume maintains the tradition in Antarctic science of putting the different disciplines together. I must applaud this but fear that most people who consult it will do so for the sake of only one or two particular articles without sparing a glance for the rest. There is no doubt that these papers would reach a wider readership if they were published separately in specialist journals. The editor has made an excellent job of putting everything in context in his preface but failed to ensure definitions of all acronyms and esoteric technical terms. Among those which baffled me were 'monostatic SODAR' on p. 36 and 'm rms' on p.44 and no doubt a non-biologist would have been led badly astray by 'hydroid' on p.106 - if he looked it up in a dictionary of scientific terms he would find it defined as 'hydra-like' whereas in this context it means a water-conducting cell in a moss. The introduction to the paper on satellite radar altimetry in this volume shows very clearly the value to the general reader of presenting a very technical matter in clear simple terms without loss of scientific precision.

The British Antarctic Survey's Special Topic Award Scheme seems to have got off to a good start and the only complaint that I have heard is that more money needs to be devoted to it.

G.E. Fogg

Elsevier's dictionary of glaciology

Compiled by *V.M. Kotlyakov and N.A. Smolyarova*
Elsevier, Amsterdam. 1990
336 pp. US$ 114.25/Dfl. 200.00 ISBN 0 444 88671 0

This glossary of glaciological terms and their definitions has evolved from a more substantial glaciological Encyclopaedic Glossary (*Glyatsiologicheskiy slovar* [Glaciological dictionary]Lenningrad: Gidrometeoizdat, 528pp. 1984), compiled by a distinguished team led by V.M. Kotlyakov. The new work, which contains about 1200 terms in four languages (English, French, German and Russian), covers all types of natural ice and ice/snow phenomena, and includes terminology drawn from a range of linked scientific disciplines which increasingly feed into studies of glaciological processes.

The work is prefaced by a perceptive essay that traces the history of the development of glaciological science and its terminology and then proceeds to examine the relationship

between Russian and English terminology. Development of the terminology has closely followed the evolution of scientific method, from a mainly physical approach to Alpine glaciology in the 19th century by Agassiz, Forbes and Tyndall, leading to new discoveries on the continental ice sheets in the late 19th century. Since IGY the subject is now evolving through the more process-orientated approaches of large international programmes, including IHP and IGBP. Developments in dynamical glaciology, ice-core drilling, and remote sensing are continuing to introduce new terminology. The authors also discuss the problem of glaciological terms which have multiple meanings, including the transformation of common words into terms. Whilst synonyms are an important feature of the expressiveness of a language their use should be limited in science. The authors have in general selected the most widely used terms, favouring those that reflect the genesis of a phenomenon.

The core of the glossary is a numbered, alphabetical organisation of English terms with brief dictionary-style definitions. Each English term is followed by equivalent terms in Russian, French and German and includes a definition in Russian. There is some essential cross-referencing of English terms and synonyms. This section is followed by indexes of the Russian, French and German terms containing direct, user-friendly cross-references to the main dictionary entry. The difficult task of compiling this work has involved substantial international collaboration - in part requiring decisions on the international acceptability of particular expressions. Clearly, the original dictionary (with around 2200 terms) contains expressions that are unfamiliar to western scientists. A few still remain in this glossary, e.g. terms like *ice concrete, sandy ice, ice constructions*' and '*blackening of ice*' connected with the use of ice for technical/ engineering purposes. Subtle differences between the definitions of '*consolidating of ice*' and *consolidation of ice*' may not be recognized by a western glaciologist. On the other hand some expressions are included for which a definition may seem unnecessary - e.g. '*age of ice*' - any period of time beginning with ice formation in a glacier.

Such small difficulties however, do not detract from the overall value of this important effort to move towards a better international unification of glaciological terminology. It represents the first serious effort to present to western scientists the language of glaciologists. If it helps to stimulate a more systematic approach to the introduction of new terminology, then this will be a major achievement.

DAVID PEEL

The growth and decay of ice

G.S.H. Lock

Studies in Polar Research, Cambridge University Press, Cambridge (1990).

434 pp. £65.00. ISBN 0 521 331331

The growth and decay of ice is written for engineers, physicists and mathematicians. There are very few books which tackle its subject and none currently at this level; to our knowledge the material treated by Professor Lock does not appear together in any other single publication. Consequently the book is timely and, thanks to the author's breadth of experience in the field, its coverage is up-to-date. The author is to be congratulated on successfully spanning a number of interdisciplinary boundaries, tactfully showing no favouritism to any particular field. It is, however, an expensive book which is unfortunate as it may be beyond the reach of graduate students. To be fair to the publishers it is beautifully printed, is in hardcover, and it certainly does look expensive.

Although called *the growth and decay of ice*, the lion's share deals with the growth of ice. After some standard thermodynamics, the book discusses the bulk growth of ice and examines methods of solving the Stefan problem. The four major chapters then follow; "Ice and water", "Ice and air", "Ice and earth" and "Ice and life", and it is in these chapters that the author brings together the glaciologists, meteorologists, geomorphologists and cryobiologists. This is a beneficial union for there is no doubt that each discipline can learn from the others. The final chapter of the book is reserved for the decay of ice.

The book is refreshingly different from the usual glaciological mould and in many ways is closer to an engineering or physics textbook, though the organization of material is rather innovative. Difficult ideas are presented clearly and succinctly, with liberal use of uncluttered diagrams. A superscripted number is used to reference a note appearing at the end of the textbook when more details are needed. While better than footnotes, it does mean that the reader is forever thumbing over pages towards the end of the book to glean additional information and this can be annoying. It is reminiscent of novels by Russian authors which provide the genealogy of characters - we have heard it said that the best way to read these books is to rip out the notes first!

It is particularly difficult to write an outstanding interdisciplinary book. One problem is that each field has its own jargon which can make a topic unintelligible to the uninitiated. Professor Lock could have made life easier for his informed but non-specialist readers by including a glossary of jargon for those of us who are not so widely read (and that is most of us).

In some of the chapters the author has achieved an excellent balance between theory and experiment, notably in his chapters on ice formation from water and air. However we could not help feeling that a portion of the introductory

chapter on the thermodynamics of ice-while useful as a starting point for calculations on ice — is rather redundant. It would have been far more instructive if this chapter had been more liberally illustrated with data pertaining to ice, and with examples from the freezing of ice. As it stands it covers material to be found in standard texts on thermodynamics.

On a few occasions the author refers to an equation by name, e.g., the "interface equation", omitting its number; in a chapter with several instances of "interface equations" this can make the mathematical development more difficult to follow. On other occasions equations are not numbered when perhaps they ought to be and important, though admittedly standard, results are quoted without a reference, e.g., Reynold's transport theorem. In chapter 2 the same symbol is used for extensive properties per mole, per volume and per mass; this is annoying, particularly if the reader has a rather shaky hold on thermodynamics. Occasionally the same symbol appears in a set of equations carrying two different meanings. This is unfortunate and could have been avoided.

There are few typographic errors, but some do occur and in unfortunate places. In chapter 2, for example, a different vector notation is used in a figure as compared to the emboldening used in the text; in chapter 3 an incorrect subscript can lead the reader astray, although the final results are correct.

We end by emphasizing that we thoroughly enjoyed reading this book, and were particularly delighted by the author's succinct account of the elegant experiments of Gilpin and co-workers. The book is dedicated to the memory of R.R. Gilpin, and it is a fitting tribute to such a skilled experimentalist.

PATRICIA J. LANGHORNE AND VERNON A. SQUIRE

Penguin Biology

Edited by *L.S. Davis and J.T. Darby*
Academic Press, London, 1990.
467 pp. ISBN 0 12 2066335 X

Described as papers presented at the "First International Conference on Penguins" in Dunedin, New Zealand, August 1988 the volume really represents the fruits of the "second" international conference on penguins. Its predecessor was the assemblage of research papers contained in a volume edited by B. Stonehouse in 1975 (*The biology of penguins*. Macmillan). The authors contributing to *Penguin biology* have cited virtually every contribution contained in the earlier volume, thus demonstrating the progression of ideas and data about penguins that has ensued over the past 15 years. Only three authors contributed to both volumes suggesting perhaps that continuity could be served better with a shorter interval to the next "symposium" — the professional life among penguinologists appears to be shorter than the longevity of penguins! I say this partly in jest, but if the contents of the volume are any indication, one hole that still exists in the studies of penguins, as of other vertebrates, are results from long-term studies. This is only a comment on penguinology, not a criticism of the book. The book is dedicated to L.E. Richdale, who with M.M. Nice, established long-term research on birds.

After an overview of penguin research through the 1960s by B. Stonehouse, *Penguin biology* comprises a collection of 18 papers organized into five subject areas: breeding biology (5 papers), foraging (5), energetics (3), behaviour (4), and taxonomy (1). No one group or genus is overly emphasized. A majority of the papers represent primary results of specific studies; the remainder are of a review nature.

The section on breeding biology includes results of a study on reproduction and historical population changes of magellanic penguins (*Spheniscus magellanicus*); a review of the breeding biology of yellow-eyed penguins (*Megadyptes antipodes*), and other reviews on the breeding ecology, including diet, of gentoo penguins (*Pygoscelis papua*); results of a study comparing the courtship period among the gentoo and the two other pygoscelid penguins; and, in the only truly long-term study contained in this volume, a report on the reproduction and demography of little blue penguins (*Eudyptula minor*).

The section on foraging contains review chapters on the diets of crested penguins (*Eudyptes* spp.), the energetic costs and foraging behaviour of crested and pygoscelid penguins, the foraging ecology of spheniscid penguins, and the diving physiology of *Aptenodytes* spp. Results of a study on the foraging movements of Adélie penguins (*Pygoscelis adeliae*) are also presented. The theme of energetics, introduced in the previous section, is continued in the next. Review articles include one on water, sodium and energy turnover, and another on the energetics of moult, both chapters being comparisons between the several penguin genera. A third chapter discusses the metabolism of fasting in *Aptenodytes* spp.

The fourth section, entitled "Behaviour; a theoretical perspective", comprises four chapters. Included are analyses of circadian rhythms in Antarctic species and social interactions among little blue penguins, as well as contributions on the problems of mate choice and another on the implications of hatching asynchrony in penguins. The final chapter of the book presents new information on the prehistoric history of the penguin family.

The book is well edited and contains much new information; in the case of review material, we receive new insights into penguin biology by looking at published data presented in novel and interesting ways. The volume demonstrates that the days of the individual pioneers — L. Richdale, W. Sladen and B. Stonehouse are gone. No one can now be pointed out as THE penguin authority; the penguin research scene is

progressing rapidly on may fronts mainly as team efforts. *Penguin biology* also extends appreciably the foundation redefined by J.P. Croxall in 1984 (Seabirds *in Antarctic ecology Vol. 2* edited by R.M. Laws) and Croxall & Lishman 1987 (in *Seabirds: feeding ecology and role in marine ecosystems.*, Cambridge University Press.). I especially like the chapters on physiology and, judging from this book, I foresee the day when physiologists and ecologists are actively collaborating much more than in the recent past. Though *Penguin biology* presents some tantalizing glimpses of the application of technology to field biology and studies combining foraging and breeding productivity, lacking is much in the way of an appreciation for interannual variability, but that too, is an area where the future holds promise. Multi-year efforts in these subjects are now finally underway; completion will bring an exciting evolution to our understanding of penguins and seabirds. In the future, I am sure that the collection of chapters in *Penguin biology* will be well cited as results of studies now underway are readied for publication.

D.G. AINLEY

Antarctica: the Ross Sea region.

Edited by *T. Hatherton*
DSIR Publishing, Wellington 1990
287 pp. NZ $ 89.95. ISBN 0 477 02586 2

New Zealand is a small country with a small population, yet its continued interest and commitment to Antarctica put many larger countries to shame. The New Zealand Antarctic activities have attracted some of their best scientists and writers with the result that the Ross Dependency has figured large in the written record.

What, you may ask, is special about this volume? It is very well illustrated, attractively laid out and easy to read. Its importance lies more in its approach than in the package. Here we have another attempt to make science accessible to the non-specialist. Not just one area of science but all fields, and with the limits to the activities clearly set in the historical, logistic and political background. Before delving into the book it is important to recognise that subjects are not treated equally, exhaustively or even, in some cases, at all. That will never be possible in a book of this size.

There are five parts divided into 16 chapters. Part 1 deals with exploration in two chapters, with the earliest material printed on sepia coloured paper! Part 2 covers the land with chapters on geology, geomorphology, soils, Mount Erebus and the coast. As a biologist I must say I found this section unusually easy to read - a tribute to the authors and editor.

Part 3 is devoted to climate, glaciology and the Dry Valleys. Inevitably there is some overlap between a geographical treatment of the valleys and the science conducted in them but they are such an important feature that it seems right to devote space to them. This would be the appropriate section to contain material on ionospherics, geomagnetics and other purely physical sciences but it is unfortunately missing.

In Part 4 there are four chapters devoted to the biology of the native inhabitants. One covers marine biology, a second life in terrestrial, ice and inland water habitats, a third looks at the birds of the region whilst the fourth deals with animal adaptations. I was impressed by the biological material. Although I would not necessarily have provided quite the same emphasis as each of the authors all the most significant areas have been mentioned in excellent summaries of what is now a very extensive literature.

The final section deals with the principal introduced species - Man. The first of the two chapters looks at living and working. For me the chapter dwells too much on early historical material and on aspects of psychology, missing the opportunity to show that the special attributes of Antarctica have been very effectively utilised in a wide variety of medical and physiological research. The final chapter on international affairs again spends too much space for my liking on the historical to the detriment of a better understanding of present and future activities.

Not all science could be illustrated with examples from the Ross Sea and the authors have used appropriate material from elsewhere in Antarctica when necessary. With eye-catching double page colour photos, simple yet highly effective diagrams summarising major scientific points and a well edited narrative this book is a nice one to have. There is much that can be learnt from this volume by scientists and the public alike. I only hope its title does not persuade potential purchasers that the Ross Sea area is not of interest to them - it should be. Take a look in this book not at your own science areas but at others and be better informed!

D W H WALTON