

with George Simpson, meteorologist on Scott's expedition. And why is there no index? This is a serious omission in a book of this class. (H.G.R. King, Scott Polar Research Institute, University of Cambridge, Lensfield Road, Cambridge CB2 1ER.)

RECENT CLIMATIC FLUCTUATIONS

THE LITTLE ICE AGE. Grove, J. M. 1988. London, Methuen. 498 p, illustrated, hard cover. ISBN 0-416-31540-2. £85.00

This is a major work about the period of relative cooling and glacier expansion from the 13th century to the end of the 19th century. Associated with the cooling were meteorological, geomorphological and vegetational changes around the world. This book examines the characteristics, causes and consequences of this period of cooling, mainly from a study of the glacial record. A synthesis of knowledge of the little ice age has long been needed, and this is the nearest we can expect to a comprehensive review in a single volume. *The Little Ice Age* explores both the record and the world wide significance of the period. Seven of its 12 chapters cover the northern hemisphere record, principally in Europe, a demonstration of the intensity of European research on this event.

The introduction includes an important discussion of the term Little Ice Age, and the first five chapters examine in detail the glacial record in Europe from historical, scientific and other sources. The second chapter discusses variations in Icelandic ice masses and changes of the sea ice around this island. The glacial history of the main ice caps is examined, particularly of Drangajökull, which has not been directly affected by volcanism and therefore provides the best record of local climatic change. Changes in Scandinavian glaciers (in particular the record from Jostedalbreen, Norway), and three chapters are devoted to changes in different parts of the Alps, using paleoclimatic and historic information. In the next three chapters the author seeks evidence of concurrence of the little ice age worldwide, including brief reviews of glaciers in the USSR, China, Himalaya, and more thorough reviews of North American glaciers. Lack of historical data makes the interpretation of glacial advances very difficult, and generally restricted to the last 100 to 130 years. The rest of the world, including equatorial and southern regions, is summarized in a single chapter, reflecting the dearth of material from these regions. This situation might be corrected in the next decade, mainly with new information from ice cores and other data from the Andes.

Very little information is provided from the polar regions; a more detailed discussion of their evidence would have been useful, especially in the discussion of Holocene glacial chronology in Chapter 10. This chapter reviews the question of whether or not Holocene glacial advances and retreats were contemporaneous and discover if fluctuations on a scale similar to the little ice age occurred after the end of the last glaciation. Chapter 11

considers possible causes of the little ice age and of other phases of cooling during the Holocene. The work concludes with an assessment of physical, biological and human effects, followed by a very comprehensive bibliography divide by chapters and sections.

Illustration and maps are of very high quality. I particularly compliment the author and publishers on the 57 plates, containing several reproductions of 18th and 19th centuries paintings of glaciers with advanced terminus. This is a book to be strongly recommended, and essential for scientists investigating climatic change in the Quaternary. The only problem is the exorbitant price. At £ 85.00 not a lot of researchers can afford to have a personal copy; in these difficult times it may well be beyond the reach of departmental libraries as well. (J. C. Simões, Scott Polar Research Institute, Cambridge CB2 1ER.)

ANTARCTICA — THE GREENPEACE VIEW

THE GREENPEACE BOOK OF ANTARCTICA: A NEW VIEW OF THE SEVENTH CONTINENT. May, John. 1988. London, Dorling Kindersley. 192 p, illustrated, hard cover. ISBN 0-86318-283-6. £14.95.

In February 1987 Greenpeace established a permanent Antarctic base in the hallowed ground of Cape Evans, overlooked by Mount Erebus and within walking distance of McMurdo station (USA) and Scott base (New Zealand). Despite an unfriendly welcome from the scientists, Greenpeace intends to stay in order to monitor present scientific activities in the Antarctic and, if possible, to prevent any kind of commercial development. But this book is remarkably free from Greenpeace polemic: it presents the concepts of *Common Heritage* and *Antarctica as a World Park* in a more subtle and persuasive manner than that of comprehensive outrage.

The book is divided into short topic sections rather than chapters, and these deal with essential information on the earth and biological sciences, the weather, marine resources, political problems and conservation issues. Whilst endeavouring to be encyclopaedic the text is inevitably short although informative and well-informed. The longest section is: 'Birth of a Treaty', the history of involvement of all the Antarctic Treaty signatory countries in the exploration and development of the seventh continent and the adjacent Southern Ocean. A scientist's view of Antarctica over forty years is admirably presented as an interview with Charles Swithinbank. He and Bob Headland, as consultants, must be given credit for the general structure and contents of the book, but cannot be blamed for the large number of factual errors in the text — dates, dimensions, photo captions etc. These blemishes of inadequate editorial proof-reading can easily be put right in a well-deserved second printing. The publication is an excellent example of modern colour printing techniques and is lavishly illustrated as a photo collage of exquisitely beautiful pictures, maps and diagrams. Indeed, the pic-

tures take over from the text.

For polar specialists this book will revive happy memories: they will wish to give it to their friends. For those coming new to polar studies it is an excellent introduction. (Peter Speak, Scott Polar Research Institute, University of Cambridge, Lensfield Road, Cambridge CB2 1ER.)

ANTARCTIC MINERALS

ANTARCTIC MINERAL EXPLOITATION. Orrego Vicuña, F. 1988. Cambridge, Cambridge University Press. 615p, hard cover. ISBN 0-521-32383-5. £60.00, US\$89.50.

This is a very comprehensive examination of what probably is currently the most discussed Antarctic subject. The subtitle, 'The Emerging Legal Framework', indicates the evolutionary and developmental nature of the work which examines in detail the large number of aspects in this complicated problem. At present the exploitation of minerals in Antarctica is unlikely for many years but investigation and, in as far as practicable, clarification of the legal basis for such operations prior to their beginning is an essential preliminary. The work will be of interest to international lawyers and others involved in Antarctic affairs, and of importance to the legal advisers of mineral companies.

The work is in three main parts. It starts with an analysis of the beginnings of exploration of Antarctica and the origins of the several national claims which resulted. A note follows on claims of sovereignty, with the development of the Antarctic Treaty which places these in abeyance. The evolution and extension of the Treaty to adjust to many factors which have arisen in the years since it was written (1959) is described. Similarly a discussion of other aspects of International Law, especially the Law of the Sea, which provide examples and precedents is included.

The second part discusses alternative approaches to conservation and development of Antarctic minerals, with processes of internal accommodation. Conflicting interests and desires are examined with an analysis of the criteria for determining suitable regimes in a quest for an equilibrium between them. This section gives attention to the complexity of interests involved, with discussion of a wide range of subjects that will need analysis. It leads to the third section where the application of the Antarctic Treaty is specifically treated, in particular the present participation of states and relation with the international community. It concludes with a consideration of the future of the Treaty.

The work is characteristically provided with very comprehensive notes and details of sources which make it a useful reference for Antarctic legal studies in general. A series of appendices summarises legal and national situations, and an excellent 54 page bibliography follows. The index is efficiently arranged and a useful guide

through a complex subject. (R. K. Headland, Scott Polar Research Institute, Lensfield Road, Cambridge CB2 1ER).

TO THE NORTH POLE

NORTH TO THE POLE. Steger, Will and Schurke, Paul. 1987. London, Macmillan. 339p, illustrated, hard cover. ISBN 0-333-47490-2. £14.95.

The official narrative, based on the leader's, co-leader's and other journals, of the Steiger International Polar Expedition 1986; this was a joint U.S.-Canadian-New Zealand enterprise, and one distinguished by its single woman member, Ann Bancroft, who can now claim to be the first woman to sledge to the North Pole. The object of the expedition — much in the spirit of R. E. Peary — was to achieve the Pole 'unsupported', ie aircraft would be used only to evacuate casualties and superfluous dogs and equipment. This policy was rigidly adhered to.

The expedition of eight members and 49 dogs left northern Ellesmere Island on 7 March. Going proved heavy in the early stages with heavy pressure and temperatures in the minus seventies Fahrenheit. Later conditions improved, and over 30 miles travel daily was not unusual. Light relief from frostbite and painful drudgery was provided by the occasional visit of a relief plane bearing a media circus of reporters and cameramen (the inevitable price of sponsorship) and a serendipitous meeting with the solo French explorer Jean-Louis Etienne. The pole was achieved on 1 May, the expedition having traversed nearly twice the actual distance of 488 miles due to ice drift relaying and navigational errors. This is a readable account, with much in the appendices and elsewhere of value to any potential assailant of the North Pole. The black and white photography is disappointing, though. (H. G. R. King, Scott Polar Research Institute, University of Cambridge, Lensfield Road, Cambridge CB2 1ER.)

ICE MECHANICS

ICE MECHANICS: RISKS TO OFFSHORE STRUCTURES. Sanderson, T. J. O. 1988. London, Graham and Trotman. 253 p, illustrated, hard cover. ISBN 0-86010-785-X. £75.00, US\$ 141.00.

This is a book for which Arctic ice engineers and scientists have been waiting for years. It is the first reference text to deal in a comprehensive way with ice loads on marine structures. It is also written in a clear and attractive style and is a pleasure to read.

Beginning with two chapters of the physical properties and distribution of sea ice and icebergs (which in themselves constitute an excellent text for students of oceanography), the author then deals with the mechanical properties of ice as measured on a laboratory scale and on the full scale. The description of full-scale measurements of ice forces on islands (natural and artificial) and drilling platforms is particularly useful and authoritative, since it