

may experience the first twinges of temptation on being exposed to this handsome book.

Savours' text is pregnant with facts, dates, and unfamiliar place-names (very few of which appear on the location maps), and sometimes the trees obscure the wood. The book does not grip the reader with the same intensity as Berton's *Arctic grail* or Fergus Fleming's *Barrow's boys* (1999), but those word-masters have been journalists by profession, and it is difficult to match their story-telling skills. Savours knows her subject well, however, and she documents her sources carefully. She cites more than 400 references for the 17 chapters, and their diversity indicates the breadth of the research carried out. Most relate to published books and articles, some of them old and rarely read or quoted, and others almost fresh from the printer. A number of relevant North American publications appear to have been overlooked, but for a topic so extensive as this one there are limits to what one can do. There are many references to unpublished manuscripts, in the Scott Polar Research Institute (where she worked for 12 years), the National Maritime Museum (where she worked for 17 years), the Royal Geographical Society, and the British Library. In her use of manuscript resources she has gone further than most other writers.

Davis Strait and Hudson Bay whalers played a role in the searches for the Northwest Passage and for Franklin, and they are referred to in the text from time to time. But the reader deserves better guidance than Savours provides in note 9 to chapter 4, which recommends only two works on the entire subject, neither of which discusses whalers in the context of exploration and discovery in the Canadian Arctic. Again, a number of North American publications on the subject do exist.

I have often thought of how interesting it would be to read a book on recent voyages through the Northwest Passage, or to the North Pole, or elsewhere in the Arctic. It would reveal the extent to which adventure travel has replaced — or succeeded — exploration. Savours (page 142) remarks that the turbulent Back River has been descended 'only a few times since Back's expedition' of 1834, but this is incorrect. In fact, remote Arctic rivers notorious for their rapids no longer discourage travellers; they now attract them. I spoke recently to a man in Massachusetts who has canoed the Back River seven times since 1976, and has written two books about his experiences. He tells me that a few canoe parties go down the river each season, making a total of 50 or more trips in the last 30-odd years. Similarly, the Northwest Passage has beckoned to adventurous yachtsmen; in an appendix Savours lists seven yacht transits before 1990, and there have been more since then. Although technological advances in boat construction, clothing, camping gear, communications, and perhaps climatic change, have made Arctic travel easier, it is part of the ethos of the adventure traveller to keep things a bit on the wild side, so there have been voyages through the Northwest Passage by umiak (Inuit skin boat), by kayak, and alone.

In the book's prologue, Savours quotes four lines from a 'seafarer's song, provenance unknown to me.' Will Canadians ever forgive her? Those unforgettable lines were written and sung by Ontario-born folk-singing legend Stan Rogers. He died in a plane crash during a North American tour, but his wonderful song 'Northwest Passage' (published on cassette in 1981) lives on.

The first and last illustrations in the book provide effective bookends for this history of the Northwest Passage. The first (page 6) shows Frobisher's men in an open boat, discharging muskets at Inuit on a headland, while the Inuit retaliate with bows. Elizabethans were seeking the passage because they thought it would provide a short sea route to the Pacific for purposes of trade, a concept that was dead by 1800. The last illustration (page 316) is a photograph of the super-tanker *Manhattan* cutting a swath — apparently effortlessly — through solid Arctic ice during a voyage intended to demonstrate the feasibility of shipping oil from northern Alaska to the Atlantic — a commercial use of the Northwest Passage such as Europeans dreamed about centuries ago.

The long search for a Northwest Passage has resulted in many books and countless articles. And why not? It is a great story, and it will continue to be told, in different ways and by different writers, for many years to come. Tales of adventure and of human courage in the face of adversity, whether real like Franklin's disappearance, Shackleton's boat journey, and Scott's death, or fanciful like Jack and the beanstalk and Little Red Riding Hood, achieve a kind of immortality and become part of our culture. Among the various accounts of the Northwest Passage, this book will stand high up on the list for its scope, accuracy, and lavish illustrations. (W. Gillies Ross, Department of Geography, Bishop's University, Lennoxville, Quebec J1M 1Z7, Canada.)

**THE LAST CONTINENT: DISCOVERING ANT-ARCTICA.** Bernard Stonehouse. 2000. Burgh, Norfolk: Shuttlewood Collinson Publishers. x + 278 p, illustrated, soft cover. ISBN 0-9537907-0-3. £14.95; US\$24.95.

One of the nice things about a good travel guide is that it informs and delights the reader. This is true regardless of whether one is researching a holiday destination or just trying to give daydreams a boost while piloting an armchair around one's bedsit in Cheltenham.

While several Antarctic guidebooks have hit the shelves in recent years, none of them has really done the job justice. However, the standard has now raised with the publication of *The last continent: discovering Antarctica*, by Bernard Stonehouse. In short, and despite its flaws, this is probably the best available single-volume source geared toward the would-be Antarctic traveller. Sadly, its faults in some areas still mean that the Antarctic tourist will need to pack more than one book if true completeness is to be obtained, but this guide is a big step closer to the 'one book covers all' goal that many travellers desire. *The last continent* introduces the region and its many delights in

clear, easily understood language, and it is pitched extremely well for potential travellers wondering what they are getting themselves into.

Stonehouse presents information about the region and its many features from the perspective of the shipborne visitor, a perspective of which he has a good grasp, since he has worked on board tour ships as a naturalist/guide and also as a researcher of the Antarctic tour industry. The book is split into logical divisions covering geography, flora and fauna, modes of travel, the many different landing sites, and the politics and management of the continent. Wisely, the discussion of political issues is left for last, after the reader has read the other sections and is therefore more likely to care about this driest of subjects. The description of the Antarctic Treaty and the history of Antarctic management is particularly well presented and helps to put this unique political situation in context.

Stonehouse has obviously been around Antarctic tourists long enough to anticipate the kinds of information they will seek, and he generally provides it in fluidly readable form. He even puts a smart spin on some of the old clichés in Antarctic descriptions, that it is the highest, coldest, and driest continent. Instead of just trotting out such a statement, we are given easily understood reasons why these adjectives apply. Also of great value are the descriptions of the specific sites that tourists may visit. The site information is best for the areas around the South American sector of the Antarctic, while the entries for the Ross Sea and East Antarctica are not quite as detailed and thorough.

The book's shortcomings are the occasional bits of incorrect information (often because it is out-of-date) and the coverage given to the plants and animals of the region. This latter is a surprise given the author's biological background. Having correctly stated that wildlife is one of the main attractions for visitors, this book is a disappointment as an identification guide to the birds and mammals of the far south. Accurate illustrations comparing the various penguins, volant seabirds, and seals would add only three pages to the book's length, but would increase its usefulness considerably. Also, it would be helpful to have species lists of the seabirds at each island group, rather than just stating that '3 species of albatross' nest there.

In a number of places the information presented is out-of-date. A few examples: the former station at Cape Hallett has largely been removed; cattle and rabbits have been eradicated from the Auckland Islands; the term 'southern fur seal' has long been replaced by more specific names for the eight species in the genus (the older names used in the book equate to the current names thusly: southern = Antarctic; Falkland Islands = South American; Amsterdam Island = sub-Antarctic); and you will be disappointed if you go to the Canterbury Museum (Christchurch, NZ) to see the blue whale skeleton: it is no longer on display. Each chapter ends with a list of suggested further reading, and while this is a very good idea, these lists have

conspicuously ignored the many excellent recent publications that could have helped the reader. Then there are the things that are just wrong. Otto Nordenskjöld's hut at Snow Hill Island is not the oldest building in Antarctica (that is Carsten Borchgrevink's hut at Cape Adare), Vinson Massif is not in the Eternity Range (it is in the Ellsworth Mountains), royal albatrosses do not breed below the Antarctic Convergence, the Chilean station at Pendulum Cove (Deception Island) is not inside the Site of Special Scientific Interest there, and so on.

The author has researched the potential impacts of visitors in Antarctica, but sends some mixed messages about how to behave while visiting there. There are several mentions of moving slowly and not too closely to seals and nesting birds, but also some suggestions for far-ranging hikes at some of the sites most familiar to the author. With visitor numbers increasing, is it a good idea to suggest to people hikes that take them farther away from supervision? In places like Half Moon Island, visitors looking to 'get away from the crowds' could easily be tempted to traverse the scree slopes, running the risk of inadvertently crushing the Wilson's storm petrels that nest in the crevices, or of dislodging rocks onto wildlife below. And with birds as skittish on the nest as giant petrels, wouldn't it be more responsible to caution visitors to simply avoid them by a very wide margin, rather than count on a novice's ability to 'read' the bird's stress behaviours correctly?

The boxes and asides are generally appropriate and pertinent, and there is good practical information of how to contact tour operators for those wishing to do some serious planning (or dreaming). However, those wishing to explore the continent's interior will be disappointed at the omission of the only operator there, Adventure Network International. Are they not listed because they chose not to renew their membership in IAATO?

The author's writing style makes it easy to dip into a chapter at random, or to follow the book from cover to cover. The text is illustrated with many colour photographs and maps. Unfortunately, the quality of most of these is not on par with the writing. Far too many are out of focus and most have faded colours. And the photograph of the Adélie penguin clearly shows that the photographer is greatly disturbing the bird! It is a pity that more use wasn't made of the many excellent photos available from libraries.

The maps are a mixed bag. On the plus side, there are many of them and the ones inside the front and back covers are especially handy and useful. Elsewhere, however, the use of green and blue to denote land and water areas creates maps of so little contrast that they are hard to read. One exception in the middle of this is the map of the Ross Sea. Its combination of white and blue should have been used throughout.

As the number of Antarctic tourists continues to increase, so will the need for easily accessible information about the region. All in all, this book is a very useful addition to the growing collection of volumes aimed at

informing the Antarctic traveller. It will ably introduce the reader to this most beautiful of places and help create a group of travellers who are well informed and, one hopes, more appreciative of the splendour around them. Even if they are just sitting in their bedsit in Cheltenham. (Peter W. Carey, 21 Radbrook Street, Christchurch 4, New Zealand.)

**FUNDAMENTALS OF GLACIER DYNAMICS.** C.J. van der Veen. 1999. Rotterdam: A.A. Balkema. x + 462 p, illustrated, soft cover. ISBN 90-5410-471-6. 80 Hfl.

*Fundamentals of glacier dynamics* focuses strongly on the quantitative description of physical processes that are by no means restricted solely either to glaciers or to their dynamics. A more accurate title would therefore be 'Fundamental physics of ice masses,' thereby explicitly attracting direct comparison with *Physics of glaciers* (Paterson 1994) and the more recent *Principles of glacier mechanics* (Hooke 1998). With *Fundamentals of glacier dynamics*, however, C.J. van der Veen has found a relatively small, but well-founded, niche in this rapidly expanding library of glaciological texts. The publishers correctly point out that the text 'presents an introduction to modelling the flow and dynamics of glaciers. The emphasis is more on developing and outlining procedures than on providing a complete overview of all aspects of glacier dynamics.' Consequently, this book is best seen as a practical, users' guide to developing the equations and models that describe the physical behaviour of ice masses. As such, it serves as an excellent reference text both to glaciologists and, equally important, to scientists outside the discipline who may wish to familiarise themselves with state-of-the-art numerical glaciology. Topics and treatments are introduced from their fundamental principles and developed quantitatively at a level that can be followed by readers with mathematics or physics to undergraduate level. The text is neither designed for, nor suitable for, readers who are not familiar with this level of mathematics.

The book has 12 chapters that are probably best viewed as independent topics, rather than as a narrative to be read sequentially (although many chapters are closely related and characterised by a degree of progression). After a short and rather bland first chapter (entitled 'Ice in the climate system'), the text begins in earnest with 'Ice deformation,' which, as occurs throughout the text, is treated from first principles. Concepts of continuum mechanics are introduced and the deformation of ice is covered, both as individual crystals and, more comprehensively, as a crystalline aggregate. The chapter is well-referenced and informative, including useful sections on the influence of non-uniform crystal fabrics and incorporating the consequent strain enhancement into models of ice flow. This topic is extended in scale and scope in chapter 3, 'Mechanics of glacier flow,' which focuses largely on the author's own ideas on the force-budgets that underpin approaches to modelling ice masses. Limitations of the approach are also discussed in section

3.6. Basal sliding of ice masses is dealt with in chapter 4, although not in as comprehensive a manner as is ice deformation. This chapter also includes an interesting subsection concerned with subglacial hydraulics. In general, the emphasis here is on theoretical and quantitative treatments, rather than on an exhaustive presentation of field-based information. However, the chapter does end with an insightful discussion of the relationships between field-based time series of subglacial water pressure and ice velocity. This section is, unfortunately, one of the few extended interpretative discussions presented in the text. Chapter 5, on 'Modelling glacier flow,' again presents essential insights into how glaciologists approach this task, focusing in particular on each of the principal drag forces involved. The problem is extended in chapter 6, dealing with the 'Equilibrium profiles of glaciers,' which provides a useful discussion of how the longitudinal profiles of a variety of ice-mass geometries are modelled and of the assumptions that underpin these methods.

The thread is continued and developed further in the following three chapters, entitled 'Glacier thermodynamics,' 'Numerical ice-sheet models,' and 'Large-scale dynamics of ice sheets.' Each of these provides not only a comprehensive discussion of the quantitative approaches involved, including the surface-energy budget in chapter 7, but also at least one extended example. These include a treatment of the thermal character of firn at the South Pole (end of chapter 7) and ice-mass response to climate forcing during the Pleistocene (end of chapter 9). Finally, chapters 10, 11, and 12 deal respectively with 'Mountain glaciers,' 'The Greenland ice sheet,' and 'The Antarctic ice sheet.' Although this geographical classification cuts across the process-based structure adopted up to this point, these sections complement the rest of the book well, providing region-specific background and process-based information. Chapter 10, 'Mountain glaciers,' thus deals, albeit rather cursorily, with special cases of models of glacier response to changes in mass balance based on kinematic wave theory, and the special cases of tidewater and surge-type glaciers. 'The Antarctic ice sheet' includes interesting sections on the potential instability of the West Antarctic ice sheet, ice streaming (focusing on the Siple Coast ice streams), and, perhaps the most important of all, an operational model of the Antarctic ice sheet.

*Fundamentals of glacier dynamics* is a well-written and well-produced text which is fair value. The book is adequately illustrated, with cartoon asides to keep the reader interested in many of the line drawings (although figure 3.9 may be a little much). Unusually for a glaciological text, it contains no photographs — but this is, in a way, symptomatic of the approach of the book, focusing on a theoretical and quantitative treatment rather than on empirical information. The subject matter is broad but not exhaustive, largely reflecting the author's own perspective (including little about, for example, finite element modelling, cumulative strain and glacier structure,