

negotiating his own training as a reindeer herder and inchoate *tundrovik*. These anecdotes enliven the book, as do the numerous photographs. Anderson also employs potent and charming analogies, for instance likening politics of identity to geological structures (page 74) and Russian administrators to archers (page 167).

I find few faults with this book. Anderson's meticulous attention to terminological precision sometimes slows the reader's pace, but such decelerations are justified. A few of the maps are missing scales. Gender analysis is limited: the ways of knowing the environment are much more thoroughly and explicitly examined for males, a situation not surprising, given the author's gender. More attentive is Anderson to the gendered dimensions of identity construction, although further explication would be welcome here.

I disfavor Anderson's choice of the term 'sparse peoples' as an awkward attempt at shorthand for 'numerically small peoples'; I find the term 'aboriginal' preferable, but given his arguments, this may have been a counterproductive choice for the book. But ultimately, these criticisms are rather trivial. I can promise the potential reader a highly rewarding read, and apologize for being able to address but a fraction of the arguments that Anderson so skillfully packs into his tome in this short review. (Gail Fondahl, Geography Programme, University of Northern British Columbia, Prince George, British Columbia V2N 4Z9, Canada.)

SNOW ECOLOGY: AN INTERDISCIPLINARY EXAMINATION OF SNOW-COVERED ECOSYSTEMS. H.G. Jones, J.W. Pomeroy, D.A. Walker, and R.W. Hoham (editors). 2001. Cambridge: Cambridge University Press. xx + 378 p, illustrated, hard cover. ISBN 0-521-58483-3. £50.00; US\$80.00.

Snow, like its alter ego water, is too frequently taken for granted. The public interest is too often coloured by its link to recreational activities for its more fundamental importance in high-altitude and high-latitude regions to be considered, and many of the publications on it are specialised and narrowly focused. It is therefore with considerable enthusiasm that I welcome this interdisciplinary volume that tries to bridge the gaps between physics, chemistry, and biology and to show how the holistic approach provides new opportunities for understanding at a system level.

The book starts with a chapter on snow cover and climate by P.Y. Groisman and T.D. Davies. Their contention is that seasonal snow cover is so important to the global climate system that all ecosystems are directly or indirectly affected. Given the increasingly strong evidence for climate change in the latest IPCC report, this would seem a reasonable hypothesis, and the data linking ENSO and global temperature with annual changes in large-scale snow cover are a good example of feedback processes that need to be properly understood for global climate modelling.

Chapter 2, by J.W. Pomeroy and E. Brun, describes the physical properties of snow. They identify five key interactions with ecosystems where the biologist or ecologist needs to understand how these physical properties are manifested. Snow provides an energy bank, a radiation shield, an insulator dampening down temperature fluctuations, a reservoir of water and nutrients, and a transport medium both as snow particles and as meltwater. The authors provide a wealth of useful material for ecologists. In discussing the penetration of snowpack by solar irradiance, they unfortunately make no mention of UV penetration, a feature of some topicality at present. Nor do they recognise that during early melt, in at least some areas, recrystallisation in meltwater channels appears to form 'light pipes' through the snowpack, allowing much greater radiation penetration to the underlying vegetation.

Snow cover is also a source of nutrients for both those organisms that live within it and those that receive meltwater. Much of the research has concentrated on the scavenging of chemical ions as ice particles form in the atmosphere, reflected in the composition of the local snowpack. In chapter 3, M. Tranter and H.G. Jones examine the chemistry of snow not only in terms of its ionic constituents but also the processes that affect availability of nutrients such as volatilisation, photochemical reactions, and leaching. Perhaps surprisingly they show that mediation by the snowpack of gas exchange between the ground/vegetation and the atmosphere is of considerable importance not only for CO₂ but also for a number of trace gases such as NO_x and will need to be included in global climate modelling.

Having described the physics and chemistry of this ephemeral habitat, the four remaining chapters all deal with biology. R.W. Hoham and B. Duval first provide an excellent overview of the microbial ecology of snow and fresh-water ice. Hoham's extensive contributions on snow algae have been a major contribution to this field and illustrate, by contrast, just how little is known about bacteria and fungi in snow. Not only do these authors try to relate the physiology of the organisms to the physical and chemical features of the habitat, but they also have a short section that considers human aspects, such as the effects of eating snow algae and their potential for biotechnological development.

In chapter 5, C.W. Aitchison looks at the effects of snow cover on small animals, in which the emphasis is mainly on invertebrates. I was surprised to see virtually no reference to any of the extensive physiological work undertaken in the Antarctic on Collembola and no mention at all of anaerobiosis in nematodes.

Everyone who works in snow-covered regions knows just how closely vegetation is related to length and depth of snow lie. Despite studies in many alpine and Arctic sites, the authors (D.A. Walker, W.D. Billings, and J.G. de Molenaar) contend that we still know far too little about the general characteristics of snow-bed vegetation, whilst there are considerable problems in scaling interactions

from what we do know at the snow-patch level to landscape level. The key to the way forward is a greater level of field experimentation at a wide range of sites to provide the basis from which general principles for snow-vegetation interactions can be deduced.

The final short chapter looks at the effects of snow on trees and how this can be used to date past snow regimes. This application of dendrochronology to the polar regions seems fairly recent and as yet not well exploited. Y. Begin and S. Biovin show that this method will not allow the reconstruction of past precipitation regimes as has been achieved elsewhere. Rather it could give qualitative data for dating extreme snow events in critical areas. Again this appears to have valuable potential for assessing the extent and importance of variability of historical snowfalls.

As the editors observe, the book is not comprehensive even as far as 'snow ecology' is concerned, with no chapter on large mammals or birds, and nothing on the impact of technology and management on snow systems. It would have been nice to see some recognition of how human activities such as skiing or watershed management affect the essential features of snow-covered ecosystems. The editors and contributors all recognise that a better understanding of snow-covered ecosystems is essential, not just for scientific reasons but for the key part they play in Earth system science.

The book is produced to the high Cambridge University Press standard of copy-editing and design but seems, as usual, to suffer from a long delay in press. All of the chapters have very few references later than 1997. Readers will be grateful for a very useful glossary to explain furcula to chemists, saltation to biologists, and chrysolaminarin to physicists, thus ensuring a level playing field for all users of this valuable and timely review volume. (D.W.H. Walton, British Antarctic Survey, High Cross, Madingley Road, Cambridge CB3 0ET.)

CHELTHENHAM IN ANTARCTICA: THE LIFE OF EDWARD WILSON. D.M. Wilson and D.B. Elder. 2000. Cheltenham: Reardon Publishing. 144 p, illustrated, soft cover. ISBN 1-873877-45-5. £10.99.

Polar explorer and saint: Edward Wilson, of all explorers of the Heroic Age, is probably the most revered and least criticised, and, despite this, there has been remarkably little written about him. This well-illustrated book complements the three volumes of his principal biographer, George Seaver, namely, *Edward Wilson of the Antarctic: naturalist and friend* (1933), *Edward Wilson: nature lover* (1937), and a little book, *The faith of Edward Wilson of the Antarctic* (1948).

David Wilson is a great-nephew of the explorer and has had access to family journals and diaries not previously published. He has used many of the hundreds of original pencil sketches from the Cheltenham Art Gallery, as well as hitherto unpublished family photographs and delightful colour reproductions, both of birds and landscapes. The sketches, skilfully integrated with the text, range from

Wilson's earliest drawings when a child to the sophisticated pictures of colleagues on ship or skiing across the Antarctic ice. The ornithological and zoological illustrations nicely complement those published in *Edward Wilson's birds of the Antarctic*, edited by Brian Roberts (1967), and the quotations from the diaries extend and supplement those published in *South Pole odyssey* by Harry King (1982).

The authors have produced a short biography from Wilson's earliest days in Cheltenham, to his undergraduate years in Cambridge, his spell as a junior doctor in London, his first Antarctic journey with Scott in *Discovery* (1901–04), and the fateful second in *Terra Nova* (1910–11). There are also numerous quotations from letters to his parents and to Oriana Souper, whom he married in 1901. Each chapter is prefaced with an appropriate homily, from Wilson's diaries and letters, which jointly reveal his abiding care for others rather than for himself, such as, 'Love is the forgetfulness of self in the thought of the interests of another.'

Scott was blessed to have Wilson as his chief of the scientific staff on *Terra Nova*, and hence ostensibly second-in-command. Each had a great respect for the other, and although Wilson did not have the ultimate burden of final decision, Scott discussed all his plans with him. When Wilson led the winter journey to search for the emperor penguin's egg, he succeeded brilliantly in what has since become known as 'the worst journey in the world.' Seaver summarised their relationship: 'Wilson was regarded by all his comrades as the soul of it, as Scott was the brain; and a friendship was forged between these two which may be said to have outlasted death.' To his shipmates he was simply known as 'Uncle Bill.'

Wilson was a natural scientist from an early age, collecting as a boy, from hedgerow and field, and then illustrating small animals and birds in his sketchbooks. Had he never been south, he would still be remembered today as a fine water-colourist and pencil illuminator. From natural scientist, he proceeded to medical student and never spared himself in caring for the sick and poor in London. 'This is the most fascinating ideal I have ever imagined to become entirely careless of your own soul and body in looking after the welfare of others.' As both scientist and doctor, he became indispensable on both his Antarctic trips. But it was his deep sense of religion and his intense spirituality that his comrades particularly remembered. On the *Discovery* Expedition, he frequently ascended to the crow's nest, not just to sketch the view across the ice, but to meditate and pray, for he treated it as a private chapel.

The authors have cleverly organised these new extracts into the fabric of a story well known and largely, through his own words, illumined Wilson the mystic, scientist, doctor, artist, explorer, and near-saint. The final chapter of the book consists of four walks around Cheltenham encompassing his two homes, Westal and Crippetts, the fine memorial statue of Wilson by Lady Scott, and the art gallery on the Promenade, as well as many of Wilson's