

work done by other nations, such as Estonia, in the Schirmacher Oasis. Having said that, the review of continental lakes is thorough. It deals with water bodies that have a perennially frozen cover or are frozen solid, or are so saline that they never freeze. Meltwater-fed Dry Valley lakes are compared with atypical lakes of marine origin in the Vestfold Hills. Diverse aspects of the lakes' environment include ice cover, sediment deposition, and light regimes, but skim lightly over the remarkable temperature inversion that characterizes Lake Vanda and the eminently high osmotic stresses of Don Juan Pond. Plankton are discussed in relation to productivity and chemical processes at various depths. The excellent section on the dominant benthic microbial mats (modern stromatolites) is very well-illustrated. It draws attention to their formation being due in part to the conspicuous absence of disruptive metazoans. This chapter captures the uniqueness of Dry Valley limnology.

A contribution by W.F. Vincent and others concisely encapsulates the distribution, diversity, and characteristics of microbiota in flowing waters throughout the Antarctic. Attention is drawn to the 'ubiquitous presence of abundant cyanobacteria in the large majority of Antarctic streams' (page 544). Transient water flow considers sediment load and nutrients. Habitats include rock faces, ice, and saturated mineral soils, dealing with the colonization of soils by cyanobacteria, algae, and diatoms omitted from the earlier chapter. Assessment of photosynthesis and respiration by the microflora is synthesized into conceptual models of growth and loss processes. The influence of nutrients and temperature are discussed along with survival characteristics such as freezing resistance and protection against high-light intensity and UV-B. The illustrations are outstanding.

The chapter by H.G. Muchmore and others is different from the rest, as it concerns the microbiology of the warm homeostatic environment within the human being. Nevertheless, it relates closely to environmental issues. Viability in viruses for growth in cell lines in research hospitals is sustained by growing the cells in field stations. A thorough account is given of long-term studies of staphylococcal and streptococcal distribution within Antarctic communities. Parallels drawn between communities in Antarctic stations and future Mars missions lead appropriately into the next chapter on exobiology by C.P. Mackay.

The McMurdo Dry Valleys region was used in the early 1970s to test life detection systems for the NASA Viking Mars lander vehicle. A photograph from a Mars orbiter shows meandering dry river beds, and the author ably presents the physical evidence for liquid water in former habitats and potential current habitats such as river-bed permafrost. He also discusses the importance of ice cover on former Martian lakes in sustaining favourable physical and chemical conditions long enough for life to originate and evolve. He reviews the possibility of endolithic growth on Mars equivalent to Antarctic systems, and the likelihood of finding chemical and morpho-

logical fossils of endoliths. While referring to lake- and stream-beds as possible sources of residual life, it is surprising that he, too, does not cite the work of Gilichinsky on ancient permafrost microbes, which adds impetus for further microbiological Mars missions and their evaluation in Antarctica.

To maintain the validity of their research, scientists must protect their working environment. It is therefore appropriate that this book ends with a review by S. Draggan of Antarctic sites either protected specifically for microbiological reasons, or of incidental microbiological value. Protection policies and the status of Specially Protected Areas (SPAs) and Sites of Special Scientific Interest (SSSIs) are explained.

The preservation of these unique Antarctic sites rounds off a very comprehensive review volume. It is a shame that it is so highly priced as I recommend it highly as a reference work for all who wish to research into the microbiology of this uniquely challenging region. (D.D. Wynn-Williams, British Antarctic Survey, High Cross, Madingley Road, Cambridge CB3 0ET.)

**DEAD SILENCE: THE GREATEST MYSTERY IN ARCTIC DISCOVERY.** John Geiger and Owen Beattie. 1993. London: Bloomsbury Publishing. 219p, illustrated, hard cover. ISBN 0-7475-1185-3. £16.99.

On 6 June 1719 two vessels of the Hudson's Bay Company sailed from London, bound for Hudson Bay to search for the Northwest Passage, the first such expedition since those of Captain Thomas James and Captain Luke Foxe 88 years previously. The ships were the frigate *Albany*, 80 tons, built in 1716, which had already made two voyages to the Bay, under the command of Captain George Berley, and a small sloop, *Discovery*, specially built for the expedition, under the command of Captain David Vaughan, who had served as a sloop-master in the Bay. Total complement of the two vessels was about 40 men. The ships were well stocked with flour, bread, butter, bacon, stock fish, beef, and pork, as well as with materials for building winter quarters, including 3500 bricks, lime, and lumber.

In overall command of the expedition was James Knight, aged around 70. Knight had first joined the Company as a carpenter and shipwright in 1676. In the intervening years he had risen to the position of 'Governor in the Bay,' and among his varied achievements had recaptured *Albany* from the French in 1693, accepted the surrender of Fort Bourbon (York Factory) from Nicolas Jérémie after the Treaty of Utrecht in 1714, and, in 1717, established the Company's post at the mouth of the Churchill River, which later became Fort Prince of Wales.

During his years in the Bay, Knight had repeatedly heard stories from the Chipewyan of a location to the northwest where native copper was readily obtainable, and, even more alluringly, stories of Indians that 'bring a Yellow Mettle.' Knight had therefore formulated a plan that became an obsession, to search for these minerals in conjunction with a search for the Northwest Passage to the

Pacific. Perhaps the strangest part of his instructions, a reflection of the Company's near-paranoia about possible infringements on their trading monopoly, was that he was not to call at Churchill or York Factory except 'in case of Utmost Extremity,' and that, if he did, he was to place himself under the orders of the post governor.

In 1720 John Hancock, captain of the sloop that made a regular annual run up the coast from Churchill, reported on his return that Knight's expedition had wintered on Marble Island, off the present settlement of Rankin Inlet, but gave no indication that it had encountered any problems. When Knight's ships had not returned home by the spring of 1721 Company officials sent out instructions to the Bay that a sloop should be sent north specifically to look for the missing expedition in 1722. John Scroggs, in command of this sloop, called at Marble Island, where he found evidence that both *Albany* and *Discovery* had been wrecked and that their crews had been killed by the Inuit. When news of this discovery reached London in the autumn, *Albany* and *Discovery* were written off the Company's books, with no further attempt at discovering what had happened to them or their crews. The contrast to the reaction in Britain to the disappearance of the Franklin expedition 125 years later could scarcely have been greater.

It was not until 45 years later that any fairly solid evidence of the fate of the expedition was found. The crew of a Company sloop, on a whaling voyage to the Marble Island area in the summer of 1767, found, in a sheltered harbour at the east end of Marble Island, the remains of Knight's brick house, which had been pulled apart by the Inuit for the sake of the wood and metal components, and abundant evidence (guns, anchors, cables, and a heap of coal) that this was where the Knight expedition had wintered. Samuel Hearne, the sloop's mate, was reported to have found a large number of graves. According to Hearne, the hulls of *Albany* and *Discovery* were clearly visible, sunk in about five fathoms (9 m) of water. On a further visit in 1769, Hearne determined from the local Inuit that 20 men had survived the first winter, but only five the second winter. They died the following summer. The implication of Hearne's account was that all 40 men had died on the island, presumably from starvation and/or scurvy.

For more than 200 years there was no serious attempt at further elucidating the fate of Knight or his men. Then in 1970 a small expedition of amateur scuba-divers, led by Ralph Smith of Toronto, again located the ruins of Knight's house. During the following summer, Walter Zacharchuk, an underwater archeologist with the National Historic Sites and Monuments Branch, made a reconnaissance excavation on the site of the house, while Smith and his companions made an underwater search of the harbour in front of the house and located the wreck of one of the vessels (which they surmised was *Albany*).

After a lapse of a further 20 years. Owen Beattie of the Department of Anthropology, University of Alberta, made a determined effort at solving the mystery of the fate of the expedition, and it is this effort that forms the subject of this

book. In the summers of 1989, 1990, and 1991 Beattie and his colleagues concentrated on archeological work in and around the remains of the house. They recovered silver and copper coins (Danish, English, and even Portuguese) with dates ranging from 1646 to 1713, a pair of brass dividers, a pair of scissors, shoe soles and heels, 97 buttons, fragments of broken bottles, and even two almost intact bottles. Most significantly, more than 600 bones or bone fragments were recovered, two-thirds of them being from local species, including caribou, bear, beluga, Arctic hare, ringed seal, snow goose, eider duck, and Arctic char. This would tend to contradict the argument that has usually been made that Knight's men died of starvation or scurvy. The foundation of the house gave every indication that it had been a substantial, weather-proof structure, and a thin, black layer of carbon on the floor, representing the accumulation of a winter's soot and filth, indicated that the house had been occupied for at least one winter.

Perhaps the most puzzling result of the archeological investigations was the almost-total absence of human skeletal remains. Only a single human vertebra and three tobacco-stained molars were recovered. A thorough search of the entire area failed to reveal any sign of the large number of graves that Hearne allegedly had seen, although Beattie and his colleagues did find an extensive Inuit burial area (with skeletal material visible) in association with a large number of Inuit stone house ruins across the harbour from Knight's house. Could Hearne possibly have mistaken these Inuit burials for graves from Knight's expedition?

In 1991 an underwater search of the harbour again located the wreck of *Albany*, largely intact except for the upper works, and in 1992 ribs and the stump of a mast projecting from the seabed revealed the location of the wreck of *Discovery*. The hulks are lying side by side, almost as if they had sunk at their moorings.

The results of four seasons of work by Beattie and his colleagues are intriguing yet totally baffling. The archeological evidence would not suggest scurvy or starvation, while the lack of skeletal remains and the presence of the hulks of the ships would suggest that Knight and his men left the island, by boat or across the ice, presumably in an attempt to reach Churchill. Their final fate is still unknown, but a solitary reference in the literature to a young lad whom Francis Smith, one of the Company's sloop captains, had met at Whale Cove around 1740, whom the Inuit called 'English Mane,' and who appeared to be of mixed blood, provides a tantalizing glimpse of how at least one member of the Knight expedition spent the remainder of his life — however long it may have been.

The story of the Knight expedition and of its mysterious disappearance is a fascinating and tantalizing one, and the story of Beattie's efforts to solve the mystery is equally riveting. The background history of the expedition has been well researched from archival sources, and the book presents some little-known aspects of the story.

Given the intriguing nature of the story and the clear evidence of solid archival research, one can only regret the

infuriating style in which the book is written. Presumably in an attempt to demonstrate that the work has some literary merit, or to heighten the sense of drama, the text is strewn with redundant, often senseless verbiage. For example, at one point the reader is told that the sunken ships were 'locked for centuries in their frigid stupor,' while elsewhere a reference (presumably to the Knight expedition) to the 'brazen sails of chance' appears simply grotesque in the context of this book.

Presumably also in an attempt to heighten the sense of drama, in the opening sentences Geiger and Beattie state that in 1767, 'The northwest coast of Hudson Bay was utterly unfamiliar, and thus wholly malignant.' As their own text in due course reveals, this statement is totally false. This coast had been visited by a whole series of expeditions, including those of Button, Foxe, Middleton, and Moor, and had been competently mapped by Middleton in 1742, quite apart from trading voyages made by Company sloops from Churchill, which landed on Marble Island at least four times, and possibly even six times, prior to 1767. Such a patently erroneous statement in the opening sentences scarcely enhances one's confidence in what the authors have to say in the remainder of the book.

The authors must also be taken to task for what can only be described as a breach of academic courtesy. At no point in their text do Geiger and Beattie mention the names of Ralph Smith and Walter Zacharchuk, who located both the ruins of Knight's house and the sunken wreck of *Albany* in 1970 and 1971 and published fairly precise maps and directions as to their locations; their publications are listed in the end-notes, however. Since Smith and Zacharchuk provided the foundation on which Beattie's research was able to build, good manners demanded that they be named and the debt to them properly acknowledged. (William Barr, Department of Geography, University of Saskatchewan, Saskatoon, Saskatchewan S7N 0W0, Canada.)

**THE INTERNATIONAL LAW OF ANTARCTICA.** Emilio J. Sahurie. 1992. New Haven: New Haven Press; Dordrecht, Boston, and London: Martinus Nijhoff Publishers. xxviii + 612 p, hard cover. ISBN 0-7923-1037-3. £128.00; US\$ 199.00; Dfl 380.00.

This sixth volume of the New Haven Studies in International Law and Order Series is a revised version of a doctoral thesis for the Yale Law School in the mid-1980s. It follows the 'policy-oriented' approach traditionally associated with what has become known as the New Haven School. Therefore, the author does not focus on Antarctica as such, but, as Professor Reisman points out in his foreword, on 'the social, political, and legal processes that deal with the continent and thus make it pertinent to human beings' (page vi).

The book is divided into three parts. Part one describes Antarctica in a global context. In a long first chapter, the author depicts the participants in Antarctic processes, reviews their respective power, and shows the strategies they use to fulfil their expectations. This description ends with some considerations on the factors that influence

Antarctic processes. In chapter 2, the author, in language typical of the New Haven School, identifies the basic community policies that should guide any decisions relating to Antarctica. In this respect, the key issues are: the removal of the threat and use of force; the participation in the decision-making process; the protection of the environment; and a global resources policy.

Part two deals exclusively with the question of territorial acquisition. It is well known that seven states have claimed areas covering some 85% of the Antarctic territory, and that three of these claims (Argentinian, British, and Chilean) partially or entirely overlap. Chapter 4 examines in detail the modes of territorial acquisition on which all the claims are based. With regard to the competing claims, the author believes that the notion of historical rights, discovery, and effective occupation have no decisive value. In the absence of undisturbed occupation, he asserts that 'only geographical proximity may provide what is a residual and yet more objective criterion' (page 342). However, well aware that this dispute will very unlikely be submitted to adjudication, he rightly concludes that: 'Absolute state control, once a basic foundation of the legal order, has now become largely outmoded and has failed to provide a satisfactory solution for Antarctica' (pages 343–344).

Part three examines the specific claims to Antarctic resources. After describing the resources that can or could be found in this part of the world, the author studies the regimes established for the high seas, the deep seabed, outer space, and the Arctic, cases that have often been compared to Antarctica. He rejects these analogies and maintains that only the Spitsbergen case constitutes an experience that is relevant to Antarctica (chapter 5). Chapter 6 concentrates on claims to mineral resources. It starts with a note mentioning that, while this book was in production, the 1988 Convention on the Regulation of Antarctic Mineral Resource Activities, which is discussed in this chapter, was eventually rejected and replaced by the Protocol to the Antarctic Treaty on Environmental Protection. This latter bans all mineral activities other than scientific research in the area for at least 50 years. However, some of the issues presented in this chapter (like the question of responsibility for environmental harm) continue to be relevant. Chapter 7 looks closely at problems relating to offshore areas of Antarctica. The author first discusses the existence and the extent of a continental shelf; he then tries to determine, in the light of the 1982 Convention on the Law of the Sea, what regime should regulate the Antarctic deep seabed. Claims to marine living resources are considered in chapter 8. Conservation policies are described in the light of the different treaties adopted to regulate overexploitation of whales, seals, krill, and other components of the marine ecosystem of the Southern Ocean. Chapters 9 and 10 focus on the regimes that govern the use of maritime and aerial spaces in Antarctica and show in what they differ from the regimes traditionally applicable to such areas.

In his conclusion, the author rejects the claims of the