

have included tourism along with science activities as part of their responsibilities. Thus, codes of conduct exist for all visits by humans, with one for tourists resembling that practiced by tour operators for many years prior to a recent recommendation enacted at the Treaty meeting in 1994. The latter stresses protection of wildlife and vegetation, as well as guidance for station visits to prevent interference with science programs.

Tourism in both polar regions is currently being used to support territorial claims (such as the Northwest Passage in the Canadian Arctic), and in Antarctica offers a potential mechanism to justify claims which are held in a suspended state by Treaty signatories. Territorial claims in Antarctica by seven countries did not have to be surrendered according to the 1959 Treaty, but are unenforceable and not recognized by other Treaty signatories. No passports or visas are required to enter Antarctica. In the Arctic, passports are required to travel among the land areas in polar latitudes, and visas in some cases. Tourism practices vary with the individual country, but do not approach the standardization seen among tour operators in Antarctica, some of which also conduct tourism in the Arctic. The formation of the International Association of Antarctica Tour Operators (IAATO) in 1991 was a major step in setting aside the commercial competition of the operators and acting as a single body to initiate standardized guidelines of operations for themselves and for their tourist clients. The IAATO members have cooperated with the Antarctic Treaty members at meetings to adopt management policies that are certain to lead to stricter controls on tourism, but will also protect wildlife. In Antarctica, science is the primary reason for a human presence, but properly managed tourism has found a niche that is compatible with science.

“Co-operation among tour operators is less common in the northern polar regions, probably because it has not seemed necessary or possible” (editors, p. 304). But there has been both self-regulation and governmental regulation there, with many policies for particular aspects of tourism. The eight countries that have circumpolar territory have individual policies for tourism, and within some of the countries (e.g., political units within Canada) more specific regulations. With the tourist frontiers (polar regions) receiving more interest, it appears that other areas are no longer unique, or are becoming overly crowded, and tourists want something a little different and more adventurous. Mass tourism in polar areas sounds repulsive, however: hence the need for the appropriate authorities to provide management policies that are environmentally sound. A step in this direction might be to adopt a comprehensive code for visitors to the Arctic that covers the various types of tourism activities there (road, rail, air, ship), and would also be agreeable to all involved countries (Mason, 1994). The existing IAATO Guidelines and the recently enacted “Guidance for Visitors” (Antarctic Treaty Consultative Meeting, 1994) are a start, with a counterpart of IAATO to be instituted for the Arctic tour operators. The next polar tourism conference is a good place for dialogue on this subject.

Overall, the book satisfies the objective of covering all salient aspects of polar tourism, both north and south, and

bringing the reader up to date on current regulations that pertain to each area. The quality of printing and illustrations is excellent, and the book has few mistakes or omissions. The map on p. 19 could have been better chosen to illustrate the territorial claims in Antarctica (no northern boundary is shown, and Norway’s claim is inaccurate). The audience for the book can conceivably include not only tour operators, but also tourists, environmentalists, policy-makers for tourism management, and officials in offices of economic development. There is an overriding message in this book: protection of the environment in the remaining pristine polar areas of our planet is possible, and lessons learned there can be applied to areas of comparable vulnerability elsewhere.

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MARTIN FROBISHER’S NORTHWEST VENTURE, 1576–1581: MINES, MINERALS & METALLURGY. By D.D. HOGARTH, P.W. BOREHAM and J.G. MITCHELL. Hull: Canadian Museum of Civilization, 1994. Mercury Series, Directorate Paper 7. xiii + 180 p., maps, illus., bib., index. Softbound. Cdn\$21.95.

The story of the three Frobisher expeditions to the eastern Arctic, 1576–78, remains deeply fascinating for many of us. This is partly because despite much research, both archaeological and historical, many questions remain answered. The most notable of these is why, with the relatively advanced technology of the late 16th century, could so much effort have been expended in mining worthless rock? How could the assays have given such erroneous and diverse results? What are the geology and mineralogy of the ore that was mined, and how was a gold content first linked with this ore? What is the actual gold content of this ore? This book addresses these technological questions using a modern scientific and analytical approach.

Originally planned as a voyage of exploration in search of a Northwest Passage to the Orient, the first Frobisher expedition (two barks plus a pinnace, with a total of 37 men), reached what is now known as Frobisher Bay in 1576. It brought back to England a black rock, which initial assays showed to contain appreciable quantities of gold. Although almost all of the many subsequent check assays showed that the rock was in fact worthless, the organizers of the expedition chose to pursue the issue and to undertake another expedition the following year (with three ships and 146 men) as a prospecting and mining venture. This expedition

succeeded in recovering 158 tons of “black ore.” The assays, although mixed, were sufficiently positive that the sponsors, the Cathay Company, and the court backed a third expedition the following year (1578). This final venture employed 15 ships and at least 397 men. In addition to mining ore, the third Frobisher expedition planned to leave 100 men to overwinter in the area, thus establishing a claim to the land. The accidental sinking of a supply ship prevented the establishment of the colony. However, mining operations were more effective: a total of 1136 tons of ore was loaded into the ships. Most of this was brought back to Dartford in the Thames estuary, where the Company had established a pilot mill, smelter, and refinery to extract the precious metals from the ore. Although some small amounts of gold and silver were recovered at Dartford, it soon became obvious that the operation was uneconomic, and it was closed. The subsequent investigations forced several of the sponsors (not including Martin Frobisher) into bankruptcy, but they also produced an extensive documentary record, which has been mined by historians on many occasions over the subsequent centuries.

Within the past several decades, expeditions have revisited the Frobisher Bay area in search of archaeological evidence from the Frobisher expeditions. Many of the Frobisher sites have been located, excavations carried out, objects analysed, and results published (e.g., Alsford, 1993; Fitzhugh and Olin, 1993).

Why, then, another book about the Frobisher story? As the authors point out, previous works have viewed the subject from the perspective of arctic exploration or of anthropology. The present authors—a geologist, a historian, and a geophysicist—have instead traced the technological aspects of the expedition, an approach not taken previously. The book begins with a chapter describing the Frobisher literature, the principal characters in the ventures, and contemporary mining technologies. This is followed by a chapter which presents descriptions of the voyages based on historical records and reports by participants, with emphasis on the mines and mining activities. Attention then turns to the fate of one of the ships of the third expedition, the *Emanuel* of Bridgwater, which was forced by circumstances to deliver its cargo, some 108 tons of ore, onto a beach at Smerwick Harbour, County Kerry, on the west coast of Ireland. The subsequent history of that locality and the fate of that ore provide an interesting sidelight to the main thread of the Frobisher story.

This is followed by a detailed consideration of the various assays performed on the “ore” from all three expeditions, and of the assayers involved. This is of critical importance to one of the major long-standing mysteries: why were there such discrepancies among the assay results? Assay techniques were well developed by the late 16th century, and it is not obvious how errors of this magnitude could have arisen, unless by total incompetence or by fraud, nor is it obvious how the assayers could have benefited from fraudulent behaviour. This section of the book also describes the history of the metallurgical installations at Dartford, which were built specifically to process the Frobisher ore. A substantive chapter deals with the ores and mines, including the geology and

geochronology of the ores, their mineralogy, their outcrops in the Frobisher Bay area, and the associated Frobisher mining sites as we now understand them.

Discussed here are the results of analyses of 123 ore samples recovered from the Frobisher mines, from the beach at Smerwick Harbour and from Dartford (where some Frobisher ore is presently incorporated into a Tudor stone wall, and other ore samples have been recovered from archaeological excavations). The Frobisher ore is complex but distinguishable: its principal mineral constituent is hornblende. The reasons why it was first suspected that this material was gold-bearing remain unclear. Modern assays of 66 of the 123 ore samples have shown gold values to be extremely low in almost all cases. It is conclusively shown that the ore contained no pyrite, the “fool’s gold” customarily assumed to have been involved in this misdirected mining venture. The book concludes by showing that the three expeditions made minor contributions to the contemporary understanding of Arctic geography, and more important contributions to Inuit ethnology. As well, it summarizes the subsequent lives of some of the major participants.

A major strength of the book is its significant compilations of data, often in table format, which include data on expedition personnel and supplies, mined ore, assay results, and mineralogical information. The book is well enough illustrated, and has a useful bibliography and very detailed source notes. It is highly suitable as a general-interest book for laypersons, but will also be an important reference for those involved in arctic history or in technological and economic history.

By addressing the technological questions while clearly explaining them and illustrating their importance, this book provides a valuable addition to the corpus of knowledge concerning the Frobisher expeditions. However, although it makes a major contribution to our general understanding, the answers to some of these technological questions remain disappointingly unclear.

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