

landscape structure, and nutrient availability and cycling” (p. 408). In contrast, the AMAP report (p. 152) describes marginal hydrocarbon contamination of Alaskan Arctic biota: “Measurements of hydrocarbons in fish tissue show that fish from the southern Beaufort Sea are more contaminated than fish from the northeast Pacific Ocean, which is considered a clean environment. Other biota from Alaska also show indications of some contamination with petroleum hydrocarbons.” A reason for the different conclusions in the book and the report might be that, while hydrocarbons have been detected in animal tissues, their effects on individuals, populations, and ecosystems have not been detected.

One minor shortcoming is that the book focuses on highly valued species and overlooks some of the common, opportunistic ones, for which there might not have been much data. For example, the book includes a key chapter on arctic foxes by Robert Burgess from ABR in Fairbanks, but excludes the gulls and ravens. Co-editor Truett helps to correct the imbalance in the concluding synthesis by noting that several chapter authors recommend additional research on the opportunistic species to reassess their impact on water birds.

But despite its somewhat limited information on ice pads and some opportunistic species, I still highly recommend the book for all Arctic wildlife managers and for lay people who want to be better informed about Arctic land-management decisions. For the latter, I suggest especially the introductory chapter on construction of the oil-field facilities, the two chapters on caribou, and the concluding synthesis.

#### REFERENCE

AMAP (ARCTIC MONITORING AND ASSESSMENT PROGRAMME). 1997. Arctic pollution issues: A state of the Arctic environmental report. Available from AMAP, P.O. Box 8100-Dep., N-0032, Oslo, Norway.

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THE COLDEST MARCH: SCOTT'S FATAL ANTARCTIC EXPEDITION. By SUSAN SOLOMON. New Haven and London: Yale University Press, 2001. ISBN 0-300-08967-8. xxii + 383 p., b&w illus., maps, appendixes, glossary, bib., index. Hardbound. US\$29.95/£19.95.

An expert's first reaction to seeing another book title on the expeditions of Captain Robert Falcon Scott is to expect another review of the failed expedition to the South Pole in 1911–12, its heartbreaks, hardships, effects of scurvy, frost-bite, accusations about the poor planning and preparation

by its leader, and the grim ending of three men slowly dying in a tent on the Ross Ice Shelf, only to be found months later by a search party. Those aspects are all here, and most people who know the story might put the book aside without another glance. However, there is a twist to the story, a denouement, done expertly by a renowned scientist and author. The ending doesn't change, of course, but the author has assembled new information that in many ways vindicates Scott, who for years has carried the reputation of an inept leader and bumbler. Susan Solomon is perhaps better known for her insights in explaining ozone depletion, first discovered and announced by the British Antarctic Survey in 1985, and followed up by her and others in the U.S. Antarctic Research Program. Her research in this area led to her recent award of the U.S. National Medal of Science. How, after all these years, had the research detailed in this book gone unnoticed, to show that Amundsen, by an earlier start and perhaps experiencing different weather systems, survived when Scott did not? The key to her discovery of the unusually harsh weather that Scott experienced is the information gained from Automated Weather Stations (AWS). These were placed in various parts of Antarctica beginning in the 1980s by a program funded by the U.S. National Science Foundation and carried out by the University of Wisconsin. Wind speed, wind direction, and air temperature sensors are mounted at the top of the tower.

Some of those AWS were placed along the route that Scott took on his route to and from the South Pole. By comparing trends and averages during the period that Scott was on the trail, Solomon shows that Scott indeed had been plagued by unusually low temperatures, as well as by accompanying snow conditions that produced greater friction on sled runners. Amundsen, who operated on an earlier schedule to achieve the Pole and thus escaped weather difficulties, had an easy time of it by comparison.

Scott's expedition meteorologist, George C. Simpson, calibrated the instruments and analyzed the temperature and other data vital to the author's comparison with AWS records. Aside from AWS information, the bulk of weather data in Antarctica has been collected daily since the International Geophysical Year (1957–58). Such data continue to be collected today, but that information is primarily from occupied stations and a few seasonal camps. Scattered older records are available, the oldest beginning in 1904 from Orcadas Station (Argentina) on Laurie Island in the South Orkney Islands, east of the Antarctic Peninsula, but this area is a long way from the Ross Ice Shelf for purposes of comparison. The lowest temperature at the surface of the Earth was recorded at Vostok Station (Russia) in July 1983:  $-129^{\circ}\text{F}$  ( $-89^{\circ}\text{C}$ ). The author contends that AWS records show that abnormal weather was experienced during Scott's 'march' to and from the South Pole. Periods of blizzards kept the men confined to a tent when they could have been gaining crucial distance on the trail. The coldest 'march' thus became a coldest March, with temperatures  $10^{\circ}$  to  $20^{\circ}\text{F}$  lower than normal. These unusually low temperatures, along with blizzards, produced conditions that led to

frostbite and the depletion of the party's meager food supplies (which would have been supplemented by a cache only 11 miles north of where the men were found in November 1912). Diaries and other information found at the death tent proved that Scott's party of five had reached the South Pole on 17 January 1912, only to find that Amundsen's group had already been there, arriving on 14 December 1911. Weather data kept by Bowers on the polar trip indicated that extremes of weather on the return northward no doubt contributed to the failure of Scott's party to return to the base at Cape Evans on Ross Island. Scott's last diary entry was made near the end of March 1912. The author also provides information that Scott, Wilson, and Bowers were not pinned down by a blizzard at their final camp, but instead opted not to continue, perhaps because of Scott's frostbitten foot.

Scott's struggles with weather and climatic conditions can easily be compared with the expedition led by Sir John Franklin in search of the Northwest Passage in 1845–47. Franklin's voyage couldn't have been carried out in a worse year. Analyses of an ice core drilled in the 1970s at Devon Island indicate that the expedition occurred at the close of a 30–50 year frigid period. Sea-ice conditions were therefore more severe and most likely played a major role in the failure of the expedition. One can speculate that if only Franklin had waited a few years for conditions to improve, he might have made it. But the same could be said of Scott—if only he had gotten an earlier start that summer. Retrospection often resolves issues of life and death, and the 'ifs' of time cannot be changed later.

The book is arranged into 14 chapters to tell the story of the expedition, and is supplemented by 71 figures. These include historical photos by Ponting, Scott's photographer, modern-day photos, and figures and graphs to illustrate the temperature and weather comparisons between the 1911–12 data and the AWS data. A page or two of narration by someone visiting McMurdo Station (U.S.A.) and Antarctica today introduces each chapter. These personal views and opinions about what life is like today form an interesting contrast with the rest of the chapter, which contains historical information about Scott's expedition. Appendix 1 lists the shore parties of Scott's *Terra Nova* expedition of 1910–12, and Appendix 2 presents "A timeline of interconnected lives," a short review of the relationship between explorers like Franklin, Nansen, Amundsen, Cook, Shackleton, and others. It is apparent that considerable background material and archival records were researched to put together an interesting, if different, approach to one of the more famous polar expeditions. Archival notes related to numbered entries in chapters are listed at the end of the text, and a short glossary of polar terms and an index complete the book. I recommend the book for those interested in the subject, experts and non-experts alike, and also for those who enjoy 'forensic meteorology,' if that is a reasonable term to propose for this compelling treatise for polar historians.

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