

over a period of time. The collection is strange because it includes apparently primitive measurements of melt and accumulation against stakes set in the glacier, thoughtful study and measurement in snow pits, careful and sophisticated interpretation of those measurements, and even more careful calculations based on them. The nature of the measurements and interpretation of them varies considerably from glacier to glacier and between climatic situations.

While properties such as glacier shape are nowadays monitored for thousands of glaciers, mass balance is regularly measured on less than 200 glaciers worldwide. This is a remarkable fact in this era of acute consciousness of climate change since changes in mass balance are a glacier's key response to changes of climate.

This publication of the International Association of Cryospheric Sciences (IACS) is the first attempt at redefining glacier mass balance terminology since the International Hydrological Decade (IHD) of the 1960s and 1970s. The years since the IHD have been ones of staggering change in glacier science and remote sensing of the earth's surface. Despite revisions of terminology and definitions over the years, it required great courage to undertake the comprehensive revision and update of a standard work on glacier mass balance that has stood up well since 1969.

The new glossary goes beyond measurement (there are standard works on glacier measurement) to include mass-balance terminology, formulations of mass balance, reporting of mass-balance data, and other topics, all relevant to modern mass-balance work. The book consists of a short, highly readable introduction dealing with these matters, followed by almost a hundred pages of equally readable (believe it or not) definitions. This is not a manual or a recipe for glacier mass-balance work; rather, it provides a modern frame of reference for people engaged in glacier mass balance research.

Many of the terms defined are what you would expect, for example "annual" (from a glacier's point of view), "ablation," "accumulation," "slush," "surge," and the like. These all deserve precise definition. But they also require careful thought within the context of the mass balance of a particular glacier. For example, I normally think of ablation as the equivalent in water of the melt of ice that I observe from stake measurements at the lower end of the glacier. In this glossary, the general definition of "ablation" is: "All processes that reduce the mass of the glacier" (p. 21). This makes anyone setting out on a glacier measuring program think. So does the more comprehensive definition of ablation (p. 21):

The main processes of ablation are *melting* and *calving* (or, when the glacier nourishes an *ice shelf*, *ice discharge* across the *grounding line*). On some glaciers *sublimation*, loss of *windborne snow* and *avalanching* are significant processes of ablation.

"Ablation", unqualified, is sometimes used as if it were a synonym of *surface ablation*, although *internal*

*ablation*, *basal ablation*, and *frontal ablation*, especially *calving*, can all be significant in some contexts.

The terms in italics are defined in the glossary.

Another example. Having drilled holes for thousands of them, I thought I had a good idea of what a stake is. The glossary devotes a page of text and a good diagram to the term "stake" in the mass balance context (p. 86). The pole that you drill into a glacier is a simple enough tool, but its use for measuring changes at the glacier surface requires careful thought about what changes at the glacier surface, in that particular situation, actually mean.

This sort of thing is not nit-picking. In a pleasant, readable way, it forces field and desk researchers to think carefully about their part of the glacier mass balance puzzle. This glossary goes beyond good definitions to the intellectual context of the term concerned.

I confess that I have never before read a glossary from cover to cover. I suspect that others with an interest in glaciers might find themselves reading, as well as consulting, this one.

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ACTS OF OCCUPATION: CANADA AND ARCTIC SOVEREIGNTY, 1918–25. By JANICE CAVELL and JEFF NOAKES. Vancouver, British Columbia: UBC Press. ISBN 978-0-7748-1868-1. xii + 333 p., maps, b&w illus., notes, bib., index. Hardbound, Cdn\$90.00; Softbound, Cdn\$34.95.

In *Acts of Occupation*, Janice Cavell and Jeff Noakes explore one of the most formative periods in the history of Canada's Arctic policy. In the first decades of the 20th century, explorers and government officials alike dreamed of discovering unknown islands in the Arctic Archipelago above North America—or even an entire continent somewhere near the North Pole. This wave of exploration and the attention to the Canadian Arctic Archipelago it sparked in countries like the United States and Denmark inspired grave sovereignty concerns in Ottawa. Between 1918 and 1925, the authors argue, the government finally took a sustained interest in the Arctic and developed a coherent policy with which to secure Canada's sovereignty over the region.

The catalyst for increased government activity in the Arctic was the Fifth Thule Expedition (1921–24) of Danish explorer Knud Rasmussen. In one of their most important contributions, Cavell and Noakes maintain that Rasmussen and the Danes actually posed no threat to Canadian sovereignty in the Arctic. Never did Rasmussen, or his supporters, deny Canadian sovereignty (even over Ellesmere

Island, perhaps the area that most concerned Ottawa). Rather, it was famed Arctic explorer Vilhjalmur Stefansson who convinced Ottawa that Rasmussen and the Danes were a threat in the hope that the government might respond with more investment in the region, namely in expeditions led by him. Largely in response to this perceived danger, the government did invest more resources in the Arctic in the early 1920s to bolster Canada's sovereignty. In short order the government launched the Eastern Arctic patrol, made it necessary for all explorers and scientists wishing to do work in Canada's North to apply for a permit, and sprinkled police posts, customs houses, and post offices throughout the region.

Like most historians who have written on Stefansson, the authors do not deny that he was an arrogant narcissist strongly disliked in Ottawa. They do, however, depart from the historiography in arguing that without him, Canada would have been far less prepared to cope with the Byrd-MacMillan expedition of 1925, an American endeavour that had intentions of claiming territory in the North. For all his faults, Stefansson pushed the agenda in the early 1920s and forced the government to come to grips with Canada's Arctic. He created the threat that led to a sustained period of Canadian interest in the North.

The authors' discussion of threats and their importance to Canada's Arctic policy is quite interesting. According to the authors, in the 1920s threats were "created or exaggerated by advocates of a more active northern policy," a pattern that has been repeated several times since (p. 258). The voyages of the *Manhattan* and *Polar Sea* were made into imminent threats to Canadian sovereignty, as were the visits of the Danes to Hans Island a few years ago. Alarmist rhetoric about the threats that will come with climate change has filled the media over the last few years, leading to calls for more government action in the North. *Acts of Occupation* explores the roots of this pattern of threat creation so prevalent in the formation of Canada's Arctic policy.

In sharp contrast to the traditional narrative of attempts by the government to secure sovereignty in the Arctic, which is quite critical, *Acts of Occupation* is refreshingly positive about the efforts of Canada's civil servants and politicians. In the 1920s, many officials held a genuine interest in the Far North. Throughout those years, "these men were groping towards their own, more pragmatic, vision of the Canadian Arctic and its future. Their concerns link together what formerly seemed to be a jumble of only loosely related events" (p. 10). In so doing, they created a strong foundation for Canadian state sovereignty in the Far North.

The authors convincingly show that the Arctic became a testing ground for Canada's fledgling Department of External Affairs and other government departments involved in the region. In 1921, the government required the assistance and advice of Britain's Foreign Office to deal with the Danish "threat," but it handled the Byrd-MacMillan Expedition independently only a few years later. The officials at External Affairs distanced themselves from the Foreign Office as they explored complex ideas about effective occupation, the

sector theory, and international law as they pertained to the Arctic Archipelago. The authors adeptly show the progression of the government's strategic thinking on the North. Given this focus, however, it does seem that a more logical end point for the book would have been the purchase of the Sverdrup Islands from Norway in the 1930s. This diplomatic coup was a culmination of all that the government had learned in the years covered in *Acts of Occupation* and would have encapsulated the authors' argument nicely.

This is a history in which personalities matter a great deal. The authors go to great lengths to provide intricate profiles of explorers like Vilhjalmur Stefansson, Knud Rasmussen, Ernest Shackleton, Richard Byrd, and Donald MacMillan and government officials like J.B. Harkin, W.W. Cory, James White, O.D. Skelton, and Loring Christie. They believe that these personalities all had a profound impact on the creation of Canadian Arctic policy and explain the somewhat erratic course of that policy. Indeed, all the characters mentioned in the book are described in rich detail, which is both a strength and weakness. Each character, however minor, gets a full biography: often interesting, sometimes unnecessary. Is it essential, for instance, for readers to be told (p. 86) that John Davidson Craig, a member of the Department of the Interior, and his wife Gertrude were a devoted couple with a fondness for young people? As a narrative device, the excessive and tangential personal details quickly lose their effectiveness.

Despite these minor shortcomings, this well-written and readable work deserves a place on the bookshelves of historians, students, and popular readers interested in the Canadian Arctic. High-quality photographs and maps add to the story of adventure, exploration, and intrigue that the authors set out to tell. Moreover, this history is both timely and important. The recent flurry of books on the Canadian North has included several broad and sweeping studies of Canada's Arctic policy, notably *Polar Imperative* by Shelagh Grant (2010) and *Arctic Front* by Ken Coates et al. (2010); however, more detailed works that fully explore the contours of Canada's Arctic policy are required. Other historians should follow the lead of Cavell and Noakes to describe the progression of Canada's policy since the country received its Arctic Archipelago in 1880 because many historical policy issues are still germane to debates about the Arctic today. The authors insist that "without an accurate history of this period, it is impossible to grasp the basis on which Canada's northern sovereignty rests" (p. 261). It is important for current decision makers to understand how past governments learned to carry out the necessary "acts of occupation" to consolidate Canada's Arctic sovereignty.

## REFERENCES

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COMMUNITY ADAPTATION AND VULNERABILITY IN ARCTIC REGIONS. Edited by GRETE K. HOVELSRUD and BARRY SMIT. Heidelberg, Germany: Springer-Verlag, 2010. ISBN 978-90-481-9173-4. xvi + 353 p., maps, b&w illus., colour plates, 24 contributors, index. Hardbound. €25.99.

This book aims to present a human approach to understanding the vulnerabilities and adaptive capacities of communities, particularly those in the Arctic, that are experiencing rapid socio-economic and environmental changes. Instead of looking at changes through a physical science lens, which has often been the norm in the past, this approach, entitled “Community Adaptation and Vulnerability in Arctic Regions (CAVIAR),” starts with the interests and observations of local communities—a human perspective—to identify the conditions and risks that communities are already facing, and then to proceed to future risks, sensitivities, and adaptive strategies. In other words, the approach puts people’s observations at the forefront, rather than as anecdotal evidence, which, it is hoped, will allow a fuller integration of social research into the broader realm of polar science.

The CAVIAR group had its beginnings during the 2007–2008 International Polar Year (IPY), when partners from Arctic countries came together to respond to the need for systematic assessment of community vulnerabilities and adaptations across the Arctic. The book describes the rationale, framework, and methodology for CAVIAR. It then provides 11 case studies in 16 Arctic communities across the Arctic (Russia, Norway, Sweden, Finland, Greenland, Canada, and Alaska). These communities have used the CAVIAR framework and its multidisciplinary methodology to describe the social and environmental conditions that have created exposure sensitivities and require adaptation measures. The final chapter summarizes the findings from the case studies and future adaptive capacity issues and challenges.

The authors succinctly summarize CAVIAR on page 4:

CAVIAR research is more than data collection or monitoring of change; it involves interdisciplinary integration and collaboration with Arctic community partners, in order to characterize vulnerabilities

or risks, to document the processes and forces that facilitate adaptation or management of risks, and to identify and evaluate means to improve the capacity of communities to adapt to changing conditions. By undertaking studies in communities in all of the Arctic countries using a common research framework and consistent methodologies, CAVIAR is able to compare results and synthesize findings across the circumpolar north.

A number of the case studies illustrate important stresses or vulnerabilities from diverse cultures and locations. For example, three municipalities in Norway, in discussing issues related to management of fisheries, note that although the municipalities are central actors in maintaining sustainable and functional communities, there is “a lack of adequate human capacity and finances to plan and prepare for new and different conditions despite their efforts to seek expertise and funding” (p. 49). Similar stresses are noted in Nunavut’s Arctic Bay case study (p. 107): “a number of barriers to adaptation are likely to constrain future adaptability including financial constraints on strengthening and protecting infrastructure, lack of knowledge of climate change projections and likely impacts on the community, and erosion of traditional knowledge...” In the case study of forestry practices and reindeer husbandry in Sweden (p. 293–299), multiple land uses and well-meaning regulations are putting stress on reindeer and their herders. Reindeer migrate between summer and winter pastures. With increased forestry practices and fertilization, however, the lichens on which reindeer depend for winter food are being outcompeted. Driving winds in the winter are creating hard pack, so the reindeer must spend more energy digging to get to the lichens. Also, because of habitat fragmentation from roads, railways, mining operations, and hydroelectric development, herders are often trucking the reindeer from winter to summer pastures, rather than herding them, to reduce losses. This trucking results in additional costs. The reindeer also have to be trucked farther away for slaughtering because European Union requirements are forcing local slaughterhouses to close. This case study is an example of a number of individual regulations and factors that accumulate to cause significant stress. As noted in one of the Russian case studies, “response strategies that do not reflect the values, priorities and needs of society will fail, either because they are not acted on or because they destroy the very thing they were supposed to help protect” (p. 135).

The concluding chapter (p. 346–347) notes that in all the case studies institutions act either as barriers or as facilitators for adaptation; however, when local decision makers have a greater understanding of the changing conditions, they are in a better position to engage in short- and long-term planning for impacts on resources, infrastructure, and culture. The authors also note that future adaptive capacity is contingent upon the connections between the local level and the broader socio-political institutional context of the northern regions.