Scientia Canadensis
Canadian Journal of the History of Science, Technology and Medicine
Revue canadienne d'histoire des sciences, des techniques et de la médecine

Introduction: The History of Circumpolar Science and Technology

Liza Piper

Volume 33, numéro 2, 2010

Comparative Issues in the History of Circumpolar Science and Technology

URI : https://id.erudit.org/iderudit/1006148ar
DOI : https://doi.org/10.7202/1006148ar

Aller au sommaire du numéro

Éditeur(s)

CSTHA/AHSTC

ISSN

0829-2507 (imprimé)
1918-7750 (numérique)

Découvrir la revue

Citer ce document

Piper, L. (2010). Introduction: The History of Circumpolar Science and Technology. *Scientia Canadensis*, *33*(2), 1–9. https://doi.org/10.7202/1006148ar

Introduction: The History of Circumpolar Science and Technology

Liza Piper
University of Alberta

From 1963 to 1966, American scientists in Greenland drilled ice cores from their Camp Century base. The longest of these cores was 9.1 centimetres in diameter and 1,390 metres in length—the depth of the ice sheet itself. The core's makeup of layers provided the scientists with a paleoenvironmental record dating back 100,000 years. The U.S. military gave Willi Dansgaard, a Danish paleoclimatologist, access to the core. Working alongside scientists with the U.S. Army Cold Regions Research and Engineering Laboratory, Dansgaard was interested in the presence of oxygen isotopes, specifically oxygen-18, in the core layers. The presence of this seasonally-varying isotope provided the opportunity to investigate past climates and specifically to identify climatic oscillations with periods of 120, 940, and 13,000 years.[1] This episode, which figures in Heymann et al's paper "Exploring Greenland: Science and Technology in Cold War Settings," exemplifies the significance of the circumpolar region to the history of science. Dansgaard's research with the Greenland cores led to seminal findings in climate science. Along with Hans Oeschger, Dansgaard would eventually discern from the Greenland cores that not only were there repeated abrupt warming events during the last glacial period, but that they were followed by periods of gradual cooling. These Dansgaard-Oeschger events, as they came to be known, demonstrated the instability of climate during the last glacial period, as well as revealing the significance of Greenland ice to understanding global climates past and present.[2] The 1960s drilling was followed in the 1970s and 1980s by even more ambitious and comprehensive projects (notably, the Greenland Ice Sheet Project [GISP] and the Greenland Ice Core Project [GRIP]). The Arctic environment had suddenly become a site for the creation of global knowledge.

1. W. Dansgaard, S.J. Johnsen, J. Møller and C.C. Langway, Jr., "One Thousand Centuries of Climatic Record from Camp Century on the Greenland Ice Sheet," *Science* 166, 3903 (1969): 377-80.
2. W. Dansgaard et al., "Evidence for General Instability of Past Climate from a 250-kyr Ice-Core Record," *Nature* 364, 6434 (1993): 218-20.

The context in which the research occurred is also significant. The role of the U.S. military and the close relationship of different national research bodies (Danish, American, and Swiss) are each indicative of critical themes in the history of circumpolar science: namely, the militarization of the Circumpolar Arctic and of scientific research in the twentieth century, as well as the role of international relations implicit in the exploration of polar regions over an even longer period. And the ice cores themselves? In their frozen, ancient materiality, they evoke the prevailing imagery of the North in the Western imagination: cold and lifeless, and perpetually bound to an ancient past.

Taken together, the articles presented in this special issue, while confined to the Circumpolar North or Arctic, are nevertheless indicative of a dynamic historiography of circumpolar science and technology. The essays by Alan MacEachern, Marionne Cronin, and John McCannon each consider the early twentieth century North from the vantage point of people in North America and Stalinist Russia. Cronin and McCannon offer invaluable contrasting perspectives on the significance of Arctic aviation in the American Arctic and Siberia respectively. MacEachern looks at the role of J.E. Bernier's polar explorations in advancing the "sector principle." Mathias Heymann, and his co-authors, considers the character of science underway in Cold War Greenland. Each of these works, in their own way, takes on the role of science and technology in mediating outsider encounters with perpetually unfamiliar environments. This organizing analysis is indicative of a dominant theme in the wider historiography. While there are works that consider the experiences of indigenous northerners as outsiders in other northern and southern environments (by Michael Harbsmeier, for instance, or Karen Routledge), the articles here instead focus upon the experiences of non-Indigenous men in northern environments ranging from Siberia, to Greenland, and to the Canadian North.[3]

Indigenous technologies, world views, understandings of their home environment, as well as *their* contributions to the creation of Western science in the Arctic are all important avenues of investigation by historians of science. This latter theme is of particular importance given that, in the late twentieth century, Indigenous or local knowledge (often referred to as traditional ecological knowledge, or TEK became a much-

3. Michael Harbsmeier, "Bodies and Voices from Ultima Thule: Inuit Explorations of the Kablunat from Christian IV to Knud Rasmussen," in *Narrating the Arctic: A Cultural History of Nordic Scientific Practices*, eds. Michael Bravo and Sverker Sörlin (Canton: Watson Publishing International, 2002): 33-71. See also Karen Routledge, "In These Latitudes: American and Inuit Stories of Survival, 1850-1922," (PhD Dissertation, Rutgers University, 2011).

sought-after source of information about circumpolar environments.[4] This most recent desire for indigenous knowledge in the Arctic reflects two different developments. One was the changed politics of northern science, particularly in those parts of the circumpolar world (Canada and Greenland especially) where indigenous populations comprised the majority. The assertiveness of Aboriginal peoples as caretakers of *their* northern environments in the latter part of the twentieth century pushed non-Aboriginal scientists—who were so often from elsewhere—towards closer working relationships with their northern hosts, which, in turn, fostered a growing understanding and respect for indigenous ways of knowing circumpolar lands, waters, plants, and animals.[5] The second shift came from the sense that indigenous knowledge, specifically oral traditions, had the potential to offer "new" insights into scientific research. By acknowledging the value of local expertise, as well as the physical evidence accessible from story-telling traditions, researchers hoped to advance Western science.[6] Of course, relying on indigenous knowledge in this fashion is not a recent phenomenon, but it has only been recently that this reliance has systematically been given its due recognition across scientific registers. Aside from frequent dependence upon Aboriginal hunters and guides to sustain scientific expeditions—to help them move over land and, to a lesser degree, water; to help southerners survive in environments that were foreign and seemingly hostile—nineteenth-century scientists and explorers in the Canadian Arctic regularly depended upon indigenous knowledge in their research.[7] This is a subject that demands greater attention in the historiography. Likewise, as Sverker Sörlin has demonstrated in northern Scandinavia, Indigenous peoples were employed as scientific researchers themselves at different times in northern history.[8]

4. Stephen Bocking, "Indigenous Knowledge and the History of Science, Race, and Colonial Authority in Northern Canada," forthcoming in *Rethinking the Great White North: Race, Nature and the Historical Geographies of Whiteness*, eds. Andrew Baldwin, Laura Cameron and Audrey Kobayashi (Vancouver: UBC Press, 2011).

5. In Canada, this was very much a product of the Berger Inquiry, see Thomas R. Berger, *Northern Frontier, Northern Homeland: the Report of the Mackenzie Valley Pipeline Inquiry*, rev. ed. (Vancouver: Douglas & McIntyre, 1998) and Paul Sabin, "Voices from the Hydrocarbon Frontier: Canada's Mackenzie Valley Pipeline Inquiry (1974-1977)," *Environmental History Review* 19, 1 (1995): 17-48.

6. See for instance D. Wayne Moodie, A.J.W. Catchpole and Kerry Abel, "Northern Athapaskan Oral Traditions and the White River Volcano," *Ethnohistory* 39, 2 (1992): 148-71.

7. See for instance John Richardson's correspondence with his wife regarding information and reports from "Indians" in the 1820s, Scott Polar Research Institute, MS 1503/2/1-10, #8 Letter to Mary, Fort Providence, July 29, 1820 - Slave Lake; and MS 1503/6/1-10, #10 Letter to Mary, Fort Franklin, June 12, 1826.

8. Sverker Sörlin, "Lapland Laboratories: Science, Conservation and the Sami in the Scandinavian North," Canadian Historical Association, 2 June 2008. Podcast archived at http://niche-canada.org/node/411.

Recent efforts go beyond simply incorporating indigenous knowledge as data into Western modes of understanding. One example is the scholarship by anthropologist Julie Cruikshank on glaciers and oral traditions in the St. Elias Range (located in the southwest corner of Canada's Yukon Territory and in north-western British Columbia), another comes from the collaboration between the renowned Inuit director and filmmaker Zacharias Kunuk and scholar Ian Mauro in their film *'Qapirangajuq* (Inuit Knowledge and Climate Change).[9] Work that adopts northern Indigenous epistemologies, while still relatively marginalized, is of great importance given the role that polar environments serve in global climate change and its ecological impacts.[10] The stark reality of such trends gives new impetus to learn not only about polar environments, but also from the people with deep familiarity and connections to these environments. The absence of these themes from the articles presented here is not intended to suggest their insignificance, but rather should emphasize the need for further research in these areas as key to further advancing our understanding of the history of circumpolar science and technology.

Pervasive throughout circumpolar history is the identification of residents as "insiders" versus those from away as "outsiders." The dichotomy, in part, reflects the importance of indigenous identity in Northern places and the concordant importance of belonging to a particular place.[11] This distinction in the circumpolar world, however, goes beyond that accorded to those of a particular ethnicity or "race" or those born in the North. It typically includes those who have maintained long-residence, those who have transitioned from outsiders to insiders with time and commitment to the northern communities and environment. It is, as such, an important corollary to the significance of sojourners in circumpolar history.[12] What we see from the articles presented here is

9. Julie Cruikshank, *Do Glaciers Listen? Local Knowledge, Colonial Encounters, and Social Imagination* (Vancouver: UBC Press, 2005); Julie Cruikshank, "Glaciers and Climate Change: Perspectives from Oral Tradition," *Arctic* 54, 4 (2001): 377-93; Zacharias Kunuk and Ian Mauro, *Inuit Knowledge and Climate Change*, 2010, available at http://www.isuma.tv/hi/en/inuit-knowledge-and-climate-change, accessed June 20, 2011.

10. Arctic Climate Impact Assessment, *Impacts of a Warming Arctic* (Cambridge: Cambridge University Press, 2004).

11. For an examination of these dynamics see the ESF BOREAS project, "Moved by the State: Perspectives on Relocation and Resettlement in the Circumpolar North (MOVE)," http://www.alaska.edu/move/geka/, accessed June 20, 2011. See also Renée Fossett, *In Order to Live Untroubled: Inuit of the Central Arctic, 1550-1940* (Winnipeg: University of Manitoba Press, 2001), 87.

12. This is intimately linked to the presence of sojourners in northern history. See, for instance, L. Piper, *The Industrial Transformation of Subarctic Canada* (Vancouver: UBC Press, 2009); Alla Bolotova, "Colonization of Nature in the Soviet Union: State Ideology, Public Discourse, and the Experience of Geologists," *Historical Social Research* 29, 3 (2004), 104-23; Joan Sangster, "'The Beaver' as Ideology: Constructing Images of Inuit and Native Life in Post-World War II Canada," *Anthropologica* 49, 2 (2007): 191-209.

that the science and technologies discussed, including aviation, mapping, and geophysical research, serve to perpetuate this distinction, and to keep those who practice science—those engaged in aviation, in this case, at least in this early period—on the outside. The notion of the outsider is thus co-constructed with the perpetually unfamiliar environment. Indeed, the relationship, fraught with complex power relations, is arguably tautological given that familiarity with place arises once one is brought inside, and so to remain on the outside keeps one in the dark. However, scientists and those engaged in bringing new technologies north are not by popular definition outsiders. As the previous discussion of the indigenous role in circumpolar science indicates, science could be practiced by northerners, and, historically, scientific knowledge was created only because of the participation and incorporation of indigenous and local knowledge. Likewise, while beyond the scope of the essays in this collection, new technologies were consistently adopted by northerners and assimilated into the circumpolar world. In Canada, bush flying would, in the later twentieth century, become typically identified as a northern practice rather than a southern activity practiced in the north. It was adapted to the environment.[13] What is apparent from these articles, then, is that, in the contexts discussed, a considerable range of historical subjects—including J.E. Bernier, Roald Amundsen, and other aviators in America and Stalinist Russia, as well as American and European scientists—remain positioned outside of Arctic environments, which continued to be constructed as unfamiliar places.

There were a series of key ways in which science and technology served to distance people from Arctic environments. Each of the articles here demonstrate the importance of geography and, more precisely, ways of geographical imagining and the abstractions that are a part of Western scientific geography to the abstraction of circumpolar space. This is perhaps most evident in MacEachern's article, both in the initial impetus that sent J.E. Bernier north in search of the North Pole and, in his claim to fame, the sector principle. The analyses presented by both MacEachern and Cronin must be situated in the context of the "race to the pole," a contest which was the main preoccupation for Anglo-American explorers from the mid-nineteenth century forward.[14] Yet, the North Pole itself had no economic value; it was but an imagined point on a map, which organized the space around it. In that sense, it was the ultimate abstraction. It is unsurprising, as MacEachern notes, that the Canadian

13. Marionne Cronin, "Flying the Northern Frontier, the Mackenzie River District and the Emergence of the Canadian Bush Plane, 1929-1937," (PhD Dissertation, University of Toronto, 2006).
14. Lyle Dick, *Muskox Land: Ellesmere Island in the Age of Contact* (Calgary: University of Calgary Press, 2001), 116.

Bernier—a wholly insignificant contender in the contest for the pole—should turn instead to a different abstraction: the sector principle, which gave him a place in the annals of Arctic exploration. The sector principle enabled a nation to assert its claims to Arctic sovereignty by means of the extension of its east and west boundaries northward. It did not require that explorers, scientific or otherwise, set foot on these lands or sail through these waters. That said, the irony present in MacEachern's piece is that it was precisely the "materiality of Bernier's claim" that gave the abstraction of the sector principle greater weight. The pole and the sector principle are not the only geographical abstractions that organize circumpolar space in this issue. McCannon describes the grid network, which, superimposed on the Siberian landmass, enabled navigation and the mapping of this space. Heymann et al note that Thule Air Base, the centre of U.S. scientific research activities, was selected not for its environmental significance (although most of the research conducted from here was preoccupied with the physical environment) but rather because it was equidistant from New York and Moscow. Thus, the organizing geographical abstraction was, in this instance, a product of the geopolitical realities of the Cold War North.

The research presented in this issue evokes a tension between gaining experience of the physical environment and keeping it at a distance either because of the social realities of circumpolar science or because of the objectives of its practice. The notion of the circumpolar North as "pristine" has served not only wilderness advocacy, but also the interpretation of Arctic environments as locales where nature can be studied independent of the human presence.[15] Investigation of the artificiality of these notions of "pristine" landscapes, and the ideologies that underpin and are reinforced by such notions, lie outside the scope of this special issue. Nevertheless, we can see such ideas at work where, for instance, Cronin emphasized the value of the Arctic as a laboratory for technological experimentation. Likewise, as the example of Dansgaard's research with the Camp Century ice cores suggests, the scientific research questions also made assumptions about the value of circumpolar environments to understanding broader phenomena. Heymann et al emphasize that the American and Danish research in Cold War Greenland focused upon the environmental sciences, in part because the insights

15. See Urban Wråkberg, "Nature Conservationism and the Arctic Commons of Spitsbergen 1900-1920," *Acta Borealia* 23, 1 (2006): 19; as well as the notion of "domestic exteriors" described in Sverker Sörlin, "Science, Empire, and Enlightenment: Geographies of Northern Field Science," *European Review of History* 13, 3 (2006): 455-72; James M. Glover, "Sweet Days of a Naturalist: Olaus Murie in Alaska, 1920-26," *Forest & Conservation History* 36, 3 (1992): 140; Shelagh D. Grant, "Arctic Wilderness – and Other Mythologies," *Journal of Canadian Studies* 33, 2 (1998): 27-42.

available in Greenland had the potential to inform global understandings: whether because of the uniqueness of the ionosphere in that part of the world or the opportunities for insights into meteorology and climate. Indeed, the investigation of climate change from Greenland, as early as the 1940s, ensured that circumpolar science would perpetuate an unfamiliar environment by demonstrating the instability of climate: often seen as the most definitive environmental characteristic of any given place. The interest in Greenland as a "hostile environment," a subject also explored by Farish and Lackenbauer elsewhere, and the significance of human survival in this setting, also spoke to the ways in which the Circumpolar North was different from the home environments of those setting the research questions.[16] In this fashion, it was the scientist rather than the environment which attracts our attention. Similarly, Bernier emphasized that as a navigator he was better poised to reach the North Pole than his competitor, Norweigian Fridtjof Nansen, who, as a scientist, lacked the necessary experience with wind, water, and ice. The distinction that Bernier is drawing here, between mariner and scientist, reinforces the ways in which early-twentieth-century Arctic scientists were seen to be remote from the environments they purported to explore and study. Heymann et al suggest that the ways in which such distance persisted in the Cold War era research in Greenland may have influenced scientific results, even when those results question whether "the fact that polar researchers travelled back and forth from home institutions to Arctic stations and explorations" may have influenced their research classification schemes. Thus, the sojourning scientist employed in the Arctic laboratory lived on through much of the twentieth century.

McCannon's analysis puts on display just how technology, in the form of aviation in Siberia in the 1920s and 1930s, began to bridge the distances separating the circumpolar North from elsewhere. Specifically, the choice of airplanes, which were better suited to transport and resource development, over the airships to facilitate scientific experimentation encouraged transportation development in Siberia, while privileging the economy over science. The machines and materials of science, including the military bases constructed in Cold War Greenland, appear to have otherwise primarily served to perpetuate the distance that characterized scientific and technological encounters with twentieth-century circumpolar environments. Aircraft, as Cronin describes, raised scientists and explorers "above the obstacles of the Arctic ice." Bernier's vessel, the *Arctic*, while in the water rather than in the air, was criticized for the

16. Matthew Farish, "Frontier Engineering: From the Globe to the Body in the Cold War Arctic," *The Canadian Geographer* 50, 2 (2006): 177-96; P. Whitney Lackenbauer and Matthew Farish, "The Cold War on Canadian Soil: Militarizing a Northern Environment," *Environmental History* 12, 4 (2007): 920-50.

ways in which it acted as a floating extension of southern society, laden with luxuries such as truffles and foie gras. The military bases on Greenland were not integrated with the rest of Greenlandic people or society, rather their construction displaced the Inughuit and they came to represent "a small but powerful and isolated state of its own."

Thus far, the emphasis has been on how scientific practices and findings created distance and abstractions relative to the physical environment, particularly through the work of scientists and the materiality of science and technology in the Circumpolar North. The articles each also demonstrate how scientific research, exploration, and the introduction of new technologies were also, in the words of Cronin, "process[es] of producing and consuming narratives." These narratives tethered the circumpolar north to other places, by creating meanings in the Arctic that ultimately resonated elsewhere. This is a well-developed theme in the historiography of circumpolar science, particularly as Arctic territories offered opportunities for colonial expansion in a period (the nineteenth and twentieth centuries), when expansion elsewhere was relatively circumscribed. Thus, we see in the circumpolar north, science and technology participating in nationalist discourses and colonial projects that emerged in more recent contexts. Suzanne Zeller, for instance, has described the role of nineteenth-century science in transforming landscape into texts that could be used to support larger imperial projects.[17] Sverker Sörlin has emphasized the role of northern science, and northern discourses more broadly, in shaping the national identities of northern nations, such as the Scandinavian countries; Canadian historians have similarly demonstrated the central importance of the idea of North to Canadian national identity.[18]

Each of the articles in this issue draws attention to how the narratives that informed and grew out of the scientific work and technological development in the Arctic were intended for outside audiences. Bernier's search for the pole was motivated by national competition and his sector principle was significant for its contribution to contemporary geopolitical contests for control of Arctic lands and waters. His explorations were sponsored by corporate interests, had southern patrons, and, upon his return, he lectured to large audiences. Likewise, it was the *New York Times*, a metropolitan newspaper with an international readership, which served as the paper of record for polar exploration. Where northern scientists, explorers, and aviators sought fame, they did so not in the north, but in their home (typically more southern) environments. That said, as others have noted,

17. Suzanne Zeller, "The Colonial World as Geological Metaphor: Strata(gems) of Empire in Victorian Canada," *Osiris* 2nd series, 15 (2000): 85-107.

18. Sverker Sörlin, "Rituals and Resources of Natural History: The North and the Arctic in Swedish Scientific Nationalism," in *Narrating the Arctic*; Sherrill E. Grace, *Canada and the Idea of North* (Montreal/Kingston: McGill-Queen's University Press, 2002).

such fame was typically only made available to them because of the time they passed in the Arctic. Olaus Murie, the American naturalist, spent time in Alaska and the Yukon in the 1920s and it was this work that established him as a "superstar field biologist," signalling how Arctic field research was a key route to fame and success among early twentieth-century natural scientists, a process that Sörlin has indicated was strong in Sweden, as well.[19] McCannon notes that such Arctic fame was also available to aviators in Stalinist Russia, where the Arctic myth relied upon the toughness and fortitude required to work in the Arctic environment to create "positive heroes"—heroes who fit within socialist realism by demonstrating their heroism through hard work and collectivist framework, rather than the hyper-individualism celebrated in the West. Aviation and polar exploration in Stalinist Russia emphasised utility over drama and thus served as a foil against the Western narratives of polar aviation. The American scientific presence in Greenland several decades later was similarly in direct response to Soviet aspirations. Ultimately, the contexts in which Arctic science and technology achieved their greatest significance were in reference to imperialist and geopolitical contests.

The articles in this special issue clearly demonstrate the manifold ways that twentieth-century science and technology mediated outsider encounters with circumpolar environments. Through the emphasis upon geographical abstractions, the role of sojourning explorers, pilots, and scientists, all of whom kept their attention on audiences situated elsewhere and attuned to nationalist and colonial projects, the Circumpolar Arctic remained an unfamiliar terrain. In spite of the role of science and technology in perpetuating the remoteness of the Circumpolar North, it is prudent to close by looking to the consequences of new science and technology in bringing greater knowledge of Arctic environments and enabling "outsiders" better understandings of these places. Two examples from the articles in this issue suffice: first, there was the interest of the American military in studying ice for the purposes of construction: the goal was to facilitate residence in circumpolar environments. Similarly, the planes that traversed Siberia in the 1920s and 1930s would, through the work of surveying, mapping, and transportation, help to bring the rest of Russia closer to the North. It is significant that even though twentieth-century science and technology bridged gaps between the circumpolar north and the "outside" (in knowledge and material life), the emphasis in the historiography instead lies in the distance between these places signalling that academic historians continue to be compelled by the Other in the Arctic.

19. Glover, 139; Sörlin, "Rituals and Resources," 99-100.