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SEEKING THE ARCTIC: SCIENCE AND PERCEPTIONS OF NORTHERN CANADA

THE ARCTIC HAS RECAPTURED our interest. Scientists watching from survey ships, and interpreting satellite photos, track the melting of multiyear ice and project ice-free summers within two decades. They also warn of the consequences for polar bears and other species that depend on sea ice, while noting the appearance of exotic “southern” species in the north. But for other scientists, a warming Arctic and open water spells opportunity, especially for shipping and access to oil and gas deposits.

These circumstances are unprecedented. And yet, not entirely—at least when we consider how we understand, and talk about, changes in the Arctic environment. Today, our knowledge of these changes—how and why they occur, and their consequences—has been gained primarily through science. Scientists track ice expansion and contraction, and predict future trends; they also assess the state of the polar bear and other species, as well as northern resource prospects. In doing so, scientists continue a role they have played throughout much of Arctic history, and particularly in the sixty years since the Second World War: shaping our understanding and interpretations of the Arctic environment.

The contribution of science to how the Arctic has been viewed, debated, and transformed epitomizes the importance of scientific expertise in environmental affairs, and, more generally, to how we understand and relate to the natural world. Canadians find meaning in their environment in many ways: through experience, political debate, or artistic and literary representations. But scientific knowledge is often central, serving as an authoritative, yet contested, source of insights into nature and our impacts on it. This is particularly the case for the Arctic—an environment that few Canadians have experienced directly.

One way of understanding the contribution of science to our understanding of the Arctic—how, in effect, it has served to “groundtruth”

our perceptions of this region—is through a review of the recent history of Canadians' encounters with the Arctic. This will demonstrate how northern social and political changes have been closely tied to changes in the Arctic environment itself, as well as to how that environment has been perceived, particularly by scientists. Further, scientists have shaped not just our understanding of the Arctic environment and our impacts upon it, but our views of the identity of the Arctic itself.

SCIENCE AND ARCTIC HISTORY

As the Second World War ended and the region began to experience Cold War tensions, scientists' contributions to Arctic affairs became immediately evident. During the late 1940s and early 1950s the Canadian government, wary of Soviet incursions, but also mindful of American interest in the region, attempted to manage the resulting tension between continental security and national authority. The north became highly militarized, dotted with airfields and other facilities, of which the Distant Early Warning (DEW) Line (built between 1954 and 1957 as the last of three continent-wide lines of surveillance) was the most ambitious. In this military landscape the Canadian government asserted its sovereign authority, insisting on approval of and participation in Arctic military initiatives, and also supporting civilian initiatives, including comprehensive aerial photography and mapping projects, resource surveys, and expansion of transportation and other facilities.¹

Scientific research was essential to these efforts. For example, the Defence Research Board—among the most active federal agencies supporting science during this era—saw its mandate as including a special focus on northern science. The Board accordingly established a close relation between science and military imperatives. This was driven, in part, by practical issues: among other concerns, the Board wanted to understand and overcome the challenges involved in mapping the north. A similar imperative drove the Geological Survey of Canada to launch surveys of northern resources, sending small fleets of helicopters across the tundra. But Arctic science also fulfilled a political role: through its presence it asserted national authority, demonstrating that the region was occupied. Work during the 1950s by McGill University geographers led by Ken Hare exemplified this. They used

¹ K. Coates et al., *Arctic Front: Defending Canada in the Far North* (Thomas Allen, 2008); M. Farish, "Frontier Engineering: From the Globe to the Body in the Cold War Arctic," *The Canadian Geographer* 50 (2006): 177–96.

aerial photography to map vegetation types—forest, muskeg, tundra, burnt areas—in relation to physical geography and climate in northern Quebec. They did so in part to demonstrate a new approach to geographic survey: rigorously scientific, but suited to northern Canada, able to provide a “scale of observation not open to him with the naked eye,” with aerial photography giving the scientist “winged feet.”² This work also contributed to the larger political agenda of northern surveillance and assertion of national authority. Through such efforts, McGill, and Montreal, became the most active Canadian centre for Arctic research, with close ties between Montreal scientists and Ottawa bureaucrats epitomizing how science had become enlisted in Cold War security imperatives.³

This was to be only the first of a series of circumstances in which Arctic political imperatives and scientific affairs would be intertwined. In 1957 John Diefenbaker was elected prime minister; the following year, he was reelected with a strong majority. He had campaigned, in part, on the basis of a renewed commitment to a “Canada of the North”—that is, to developing the north and its resources. Accelerated surveys, new transportation routes, and an extension of administrative control over the region testified to his drive to integrate the northern “frontier” into the Canadian nation. It also encompassed the attempted assimilation of northern Aboriginal peoples into Canadian society, and the reorientation of the northern economy towards southern markets.⁴

Scientific research proved to be essential to this agenda. During the 1950s and 1960s federal resource and research agencies—notably the Geological Survey, the Fisheries Research Board, and, especially, the Canadian Wildlife Service—were among the most active participants in Arctic research. The Geological Survey continued its ambitious airborne surveys. Fisheries scientists measured fish populations and the potential for northern lakes and the Arctic Ocean to provide the basis for a commercial fishery. But the ties between northern administration and science were perhaps most evident in wildlife science. Research by the Canadian Wildlife Service was considered essential to a firmly interventionist program of wildlife management. Through research on caribou and other species the Service sought to

² F.K. Hare, “Foreword,” in J.A. Howard, *Aerial Photo-Ecology* (London, 1970), xv.

³ S. Bocking, “A Disciplined Geography: Aviation, Science, and the Cold War in Northern Canada, 1945–1960,” *Technology and Culture* 50 (2009): 320–45.

⁴ M. Zaslow, *The Northward Expansion of Canada, 1914–1967* (Toronto: McClelland and Stewart, 1988).

establish its authority over northern wildlife and those who would use this resource. This encompassed a managerial view of northern wildlife, founded on the necessity to avoid wasting a resource that, it was believed, could be managed to provide a stable yield.

This view of wildlife and of science was especially manifested in relations between government and Aboriginal peoples. By the 1950s federal officials had concluded that the traditional northern hunting and trapping economy was no longer viable. Fox fur prices had collapsed, fur trade posts had closed, and hunting crises had led to famine; these events led them to believe that Aboriginal relationships with their land and food, and, indeed, Aboriginal identities themselves, had been ruptured. This view had several consequences. Assimilation of northern peoples was seen as necessary, including movement from camps to settled communities, integration into the new northern resource economy, and extensive interventions in northern cultures, including community relocation and controls on hunting. Wildlife conservation became a chief tool of colonialism, with the relations between Aboriginal peoples and wildlife seen as requiring expert supervision—which included everything from encouraging hunters to change their target species, to comic books warning of the dangers of depleting game.⁵ Wildlife science could thus contribute to scientific administration of the north. Knowledge was also tied to racial identity: indigenous people were viewed as having attitudes towards wildlife that tended towards wastefulness and ignorance—the relics of a fading relationship with the land. Photos said to depict indiscriminate killing of caribou were used to hammer the point home. In contrast, science was viewed as having a non-racial identity, disengaged from cultural or racial identities, and distinct from the knowledge of Aboriginal people.

Yet these policies did not go unchallenged. As will be discussed below, they were resisted, not least by Aboriginal peoples, with these conflicts implicating both the immediate consequences of regulatory regimes and the broader colonial mission of state authorities. But these debates also took place among scientists working in the Arctic—a fact that reflected the increasing diversity of views among scientists regarding such issues as the relations between Aboriginal peoples and wildlife, the appropriateness of a “managerial” perspective on wildlife, and the appropriate relations between the Arctic and southern Canada. Even in the 1930s the naturalist J. Dewey

⁵ J. Sandlos, *Hunters at the Margin: Native People and Wildlife Conservation in the Northwest Territories* (Vancouver: UBC Press, 2007).

Soper felt obliged to criticize federal plans to intensively manage the bison of Wood Buffalo National Park; by the 1990s other scientists were making wide-ranging critiques of federal wildlife policy.⁶ This diversity of views was encouraged by the evolving array of institutions for Arctic science. During the 1960s the federal government's once dominant role in Arctic science was eroded. Ironically, this happened, in part, as a result of federal initiatives. A wider range of federal departments, including the Department of Indian and Northern Affairs, began to support Arctic research by academic scientists. In response, numerous universities established centres and programs for northern research, such as the Boreal Institute at the University of Alberta (now the Canadian Circumpolar Institute), and the Centre d'études nordiques at Laval University. The Polar Continental Shelf Project began operations in 1959, providing transport and facilities for Arctic scientists at locations once considered too remote for sustained research. The Inuvik Research Centre opened in 1964, accommodating visiting scientists. Five years later the International Biological Program began providing northern research opportunities for ecologists. Overall, by 1970 there were many scientists working in the Arctic, located outside the federal agencies that had traditionally fostered northern science. This broader diversity of northern scientists would prove to be essential to emerging critiques of federal resource and Aboriginal policies.

Much of the scientific debate fostered by this institutional diversity concerned the environmental impacts of northern resource development. Increased oil and gas development, particularly after the 1968 discovery of oil at Prudhoe Bay in Alaska, collided with emerging environmental concerns in Canadian society. Much of these concerns focused on the Arctic, and scientists became prominent advocates for northern environmental protection. The sensitivity of tundra to disturbance (demonstrated by tire tracks that in just a few years eroded into deep gashes), the vulnerability of slow-growing northern fish populations to exploitation, and, especially, the simplicity of northern ecological communities, were among evidence that persuaded many ecologists, such as Max Dunbar of McGill University and Bill Pruitt of the University of Manitoba, that the Arctic was peculiarly fragile.⁷

⁶ J. Sandlos, "Where the Scientists Roam: Ecology, Management and Bison in Northern Canada," *Journal of Canadian Studies* 37 (2002): 93–129.

⁷ S. Bocking, "Science and Spaces in the Northern Environment," *Environmental History* 12 (2007): 868–95.

In part as a result of their advocacy, by 1970 Arctic industrial development had become a focus of national controversy. One response, in the north as elsewhere in Canada, was formation of an apparatus of environmental management and regulation, including Environment Canada and other administrative agencies. Another consequence was large environmental research programs, conducted by industry, government, and consulting firms, employing large numbers of scientists. The immediate objective of this research was to understand, and ultimately reduce, the impacts of industrial development on the northern environment. These programs also epitomized the use of science by government and the oil and gas industry to demonstrate that they were taking environmental concerns seriously. In addition, they exemplified a new kind of relationship between Canadians and their environment, particularly in northern Canada: one mediated by the new managerial roles of expertise. These roles were founded on confidence that the environmental impacts of northern development could be managed, that the northern environment was not distinctively fragile, and that scientific knowledge could be relied upon as the basis for managing the relations between industrial activity and the environment. In effect, the relationship between humans and the environment could be reduced to an administrative task, managed through close working relationships between government and industry that often excluded other parties.

But these ties between government and industry—intended to remove Arctic development from the realm of controversy—became themselves controversial. Ultimately, the transformation of northern politics rendered them untenable. The 1970s witnessed the emerging prominence of Aboriginal priorities in governance, evident in assertion of treaty rights, negotiation of land claims, devolution of political authority to territorial governments, and formation of new agencies to manage northern lands and waters. These developments were accompanied by evolving perspectives on the northern environment, including renewed interest in living resources as an economic and social foundation for northern communities, and, more generally, recognition that lands and waters remain crucially important for Aboriginal communities, serving as a basis for both material well-being and cultural and social integrity.

Several aspects of this transformation became evident in the course of the Mackenzie Valley Pipeline Inquiry, chaired by Thomas Berger, and established to consider a proposal to build a gas pipeline linking natural gas deposits in the Beaufort Sea and Mackenzie Delta to southern markets.

Between 1974 and 1977 the inquiry focused national attention on land claims and the implications of northern development. Its outcome included a recommendation that the pipeline be deferred for a decade, to allow time for land claims to be settled. But especially central to the inquiry was Berger's insistence on open discussion, founded on the principle that all points of view needed to be heard, as every individual and community had a right to contribute to decisions that could affect them.⁸ Crucially, this political perspective was tied to particular views of knowledge, its place in society, and its role in our relationship with the environment. As a result, the inquiry presented both scientific and indigenous knowledge in new ways, which emphasized their public examination. This process exhibited the uncertainties commonly encountered in scientific knowledge of the northern environment and the potential impacts of development; it also, by emphasizing the experience and insights of Aboriginal peoples, demonstrated how indigenous knowledge could serve as an essential source of insights into that environment.

These insights, flowing from both the inquiry and from other events taking place during this time, including documentation of land use and occupancy as part of land claims negotiations, encouraged attention to the nature and status of indigenous knowledge in the Arctic. One of the first such efforts was the Inuit Land Use and Occupancy Study, begun in 1973 and directed by Milton Freeman, an anthropologist at the University of Alberta. This study and others helped demonstrate, using maps, how much of the north was the well-traveled territory of Aboriginal peoples. These projects also exemplified how knowledge continued to be central to northern political and environmental developments, and how the status of science itself was being contested, with increasing critiques of its reliability, authority and legitimacy, and with greater attention paid to the social dimensions of this research. A variety of factors were also encouraging scientists and others to change their perceptions of indigenous knowledge. These included empirical observations, of caribou, for example, that demonstrated that Aboriginal people often had more accurate knowledge than did scientists. As Fred Roots, among the most experienced Arctic experts, once noted, "Southerners who have worked or studied in the Arctic for many years and know it well are those most conscious of the soundness and depth of traditional knowledge."⁹

⁸ T. Berger, *Northern Frontier, Northern Homeland: The Report of the Mackenzie Valley Pipeline Inquiry* (Ottawa: Minister of Supply and Services Canada, 1977).

⁹ Quoted in M. Freeman, "Ethnoscience, Prevailing Science, and Arctic Co-operation," *Canadian Papers in Peace Studies* 3 (1992): 90.

Most recently, the place of the Canadian Arctic in its circumpolar and global contexts has become an essential feature of northern political and social conversations. The Arctic has emerged as a foreign policy priority, and northern Aboriginal communities and organizations have formed ties with circumpolar institutions. Once again, scientific knowledge and research practices have contributed to an evolving view of the Arctic. The movement of contaminants from the south into the north, with consequences for both the northern environment and for the health of northerners; the impacts of global changes such as ozone layer depletion and climate change on this environment; these and other changes in the Arctic environment, as described through science, have compelled changes in northern politics and in perceptions of the northern environment. Since the 1980s global and circumpolar institutions have also become major supporters of northern research, reflecting the increased importance of issues on those scales.

ARCTIC IMAGES

Canadians have often turned to literary and artistic works when seeking to define the place of the north in the Canadian imagination.¹⁰ In contrast, our expectations of Arctic science have tended towards the factual. Scientists, it is believed, simply provide details about the environment and how it is changing: the rise and fall of wildlife populations, the local impacts of resource developments, the implications of a warming climate. Through scientific knowledge, and increasingly through indigenous knowledge, we try to make sense of these changes.

Yet, as we have seen, the recent history of the Arctic tells a different story: of how science provides not just information (which has often, as we have seen, had political consequences) but has also, like art and literature, affected how we see this region. This has occurred even as science has itself been influenced by political and other priorities. Society's responses to the natural world have helped shape scientific thinking.

One way that we can understand this reciprocal relation between science and social context is in terms of the many and diverse roles that science plays in political affairs, in the Arctic, and elsewhere. These include reinforcing or challenging managerial imperatives, contesting the impacts

¹⁰ S. Grace, *Canada and the Idea of North* (Montreal & Kingston: McGill-Queen's U Press, 2001); R. Hulan, *Northern Experience and the Myths of Canadian Culture* (Montreal & Kingston: McGill-Queen's U Press, 2002).

of development, anticipating emerging problems, or describing ways of solving them. These roles, in turn, are influenced by the diverse factors that complicate the interface between knowledge and society: the conditions that determine whether knowledge will be accepted as reliable; the formation and undermining of trust and authority; the interaction of diverse forms of knowledge; and doubts regarding the legitimacy of expertise that is tied to economic or political interests. One must also consider the nature of science itself: a complex amalgam of practical skills, technical devices, theory and social strategies.

These dimensions of science also encompass the relations between science, the state, and space. The history of science in Canada is, in part, a history of its role as an instrument in the extension of authority over the landscape. This is often a question of power, particularly in the displacement of local knowledge by the universal view of modern state administration. The relations between knowledge, power and space also raise questions regarding science in its natural context: how knowledge is shaped by the sites of research, how scientists assert the capacity of knowledge to be “mobile,” and how knowledge is constructed as “global” or “local.”

These relations between science, politics, and place have been evident in northern Canada. This is illustrated by the integration of science with other aspects of northern history, including political, military and social developments, as well as by the events, such as resource developments and land claims negotiations, that have punctuated transformation of the Arctic since the 1940s. Science has historically played a disproportionate role in shaping attitudes and decisions regarding the north, and hence has been essential to this transformation. It has been especially important to the extension of administrative and military authority over the north: surveying and managing resources, asserting sovereignty, and fulfilling other political and strategic goals. Science and scientists have acted as the sharp edge of southern intervention, essential to imposing legibility and asserting control; but also as a wedge by which this intervention has been challenged.

Each of these episodes in northern history have also been marked by particular ways of seeing the north—that is, particular images of the region. In doing so, scientific practice and knowledge have shaped the range of possibilities for policy and action. Amidst Cold War tensions in the 1950s the north was seen as an undifferentiated continental space, most noteworthy for its scale and capacity to buffer the impacts of atomic warfare; and also as a contested frontier, in which scientific activities such as aerial surveys and

field work—and the presence of scientists themselves—could assert national authority.¹¹ Once, on the other hand, interest was developing in northern resources, scientific surveys of geology, fish, wildlife and water, as well as studies aimed at building a knowledge base for engineering in this environment, underpinned a view of the Arctic as a storehouse, or resource frontier, that could be “harnessed” to meet economic needs defined elsewhere.

Other images of the north have also been prevalent: of a domesticated landscape, evident in, for example, wildlife science and the experiments in reindeer management that took place near Inuvik between the 1930s and the 1970s. Another ambitious effort to domesticate the north were experiments in large-scale eradication of biting insects by the Defence Research Board during the 1950s. But even huge quantities of DDT sprayed over large areas, it turned out, couldn’t dent northern mosquito populations.

This vision of a domesticated, controlled north obviously contrasts sharply with the opposing vision, founded on ecology, of a fragile wilderness, vulnerable to industrial impacts. More recently, these images have been joined by others. Aboriginal ways of thinking about the land for long fit poorly into dominant perspectives, and hence were dismissed. More recently, however, indigenous knowledge, and scientific work that incorporates Aboriginal perspectives—for example, in anthropological and land use studies—have presented a view of the north as a homeland. And finally, the image of the Arctic as a global environment has become prevalent, reinforced by research that views the north as a global laboratory, susceptible to impacts, such as contaminants and climate change, that originate elsewhere.

These images—often co-existing, but frequently at odds, sometimes reinforcing, but also undercutting views of the region inspired by other forms of discourse—exemplify the central role played by scientific knowledge and practice in interpreting the Arctic to outsiders. As these diverse images demonstrate, the Arctic is not merely a place to which one can go, but the outcome of imaginative effort, disciplined by physical reality. Scientists have been active participants in exercising this disciplined imagination. Science has provided ideological justification for northern policies, legitimating colonial interventions, guiding state and private initiatives, or critiquing these initiatives and the assumptions upon which they rest. Of special note is how these images have often converged: visions of a domesticated north

¹¹ S. Grant, *Sovereignty or Security? Government Policy in the Canadian North 1936–1950* (Vancouver: UBC Press, 1988); Farish, “Frontier Engineering.”

have co-existed with that of a resource frontier; so too has that of a fragile landscape and of one exposed to global environmental change.

Science has been integrated with Arctic affairs not just through political and ideological ties, but by the practice of research itself. One way of examining this is in terms of how scientists used aircraft to move around, and do research, in the Arctic. It was inevitable, given the distances involved in the Arctic and the challenges involved in ground-based travel, that scientists would use airplanes. Beginning in the late 1940s they traveled by air to research sites; they also developed new research techniques, particularly for aerial survey of natural phenomena ranging from caribou populations to vegetation and physical geography. But aviation affected not only where scientists studied, and what, but the questions they asked (by enabling collection and transformation of data on larger scales), and also how scientists asserted the reliability and authority of their results. Aviation technology also underpinned the assertion of science as an objective view of nature. For example, biologists of the Canadian Wildlife Service, like Frank Banfield and John Kelsall, argued that an aerial view of caribou populations was superior to the partial view of these populations that could be obtained by ground-based observers. Aviation technology was essential to biologists' claims to be applying the most advanced techniques of wildlife research. Airplanes and related instruments, such as aerial photos, provided a way of asserting scientific knowledge as the objective perspective of the disembodied, disinterested observer high above the earth.

The use of aviation in Arctic science also affected the relations between scientists, institutions for northern research, and the political imperatives that have guided northern administration. Scientists in the Arctic did not work alone: when they used airplanes they had to cooperate with pilots, surveyors, administrators and everyone else who contributed to maintaining the complex systems needed for Arctic aviation. These included not just the aircraft themselves, but maps, airfields, supplies and navigational systems. Scientists thus became tied to institutions such as the Defence Research Board and the Royal Canadian Air Force through the routine tasks involved in coordinating use of this technology. In effect, aviation served as a site of exchange between science and its institutional and political contexts. These ties were reinforced by the role of aviation and related technologies, including aerial photography, in asserting a specific view of the Arctic: as a landscape shorn of mystery, that could be surveyed and therefore understood, extinguishing the notion that the region was too vast or harsh to be administered.

Aviation also, along with scientific knowledge, reinforced perceptions of an “empty” Arctic—erasing the signs of its original inhabitants. Overall, therefore, aviation exhibited how Arctic science could be closely tied to political imperatives through the practice of research.¹²

LOCATING THE ARCTIC

Throughout the recent history of northern Canada, amidst diverse and conflicting ideas about this region: an ambiguity has persisted: just where is it? Of course, the compass points north: follow it far enough, and one eventually encounters tundra, polar bears, and the Arctic Ocean—all signs that one has arrived somewhere “north.” Yet this apparent clarity obscures the many ways in which Canadians know the north. Some define it in terms of jurisdiction, delineated by the provincial-territorial boundary. Others see the north in terms of presence: of permafrost, or the aurora borealis; or by absence: of agriculture, or trees. The most thorough effort to define the north is undoubtedly Louis-Edmond Hamelin’s concept of “nordicity.”¹³ Running throughout these efforts at definition is the assertion that there is something distinctive about the north, distinguishing it from the rest of the continent.

For scientists, the north has often been an overwhelming presence, demanding expensive equipment and travel arrangements. As a result, even more so than for science in southern Canada, research in the north has depended on institutions, primarily of government, but also of other agencies, such as industry and circumpolar institutions. This dependence has also extended to the knowledge claims of scientists: their reception has required institutions (including scientific disciplines) that were predisposed to accept them. This has been demonstrated, for example, in shifting views of the value of indigenous knowledge; or, in an earlier era, of the results of aerial surveys of wildlife populations.

Perhaps even more pervasive than institutions in shaping Arctic research has been the northern environment itself. The distinctive northern landscape has long been a central theme in scientific work—inspiring in scientists a sense of wonder and of the sublime. Its influence has also been evident in the choice of research topics particular to this region, such as the dynamics of sea ice, the movement of migratory species, the pathways by which contaminants reach this region, and the ecological implications of

¹² Bocking, “A Disciplined Geography.”

¹³ L.E. Hamelin, *Canadian Nordicity: It’s Your North, Too* (Montreal: Harvest House, 1978).

snow. Specific sites have been especially important as sites for research: such as the Mackenzie Delta and its distinctive wetlands habitat, and Lancaster Sound and its unusual abundance of marine life. In addition, the northern environment has also sometimes “resisted” scientific and political imperatives. For example, in the 1970s the limited timeframes of “crash” environmental research programs clashed with the variability and unpredictability of the northern environment: because there was no such thing as “typical” conditions, it proved impossible to get complete information in only one or two field seasons. Similarly, the social environment of the north, that has made contacts between scientists and northern communities both necessary and productive, has helped give northern science a distinctive openness to indigenous knowledge.

And yet, scientific work has also often challenged the distinctive identity of the northern environment. Even when scientists have seen the Arctic as scientifically interesting, when they have traveled north they have usually brought with them the theories and methods that defined their work in the south. Application of these tools to the north has eroded perceptions that this region was somehow distinctive or unique. How could it be, if the same ideas and methods could be applied there as elsewhere? This view was reinforced by the proliferation of networks enabling the flow of scientists, theories and data between the Arctic and the rest of the world. Increasingly, scientists working in the Arctic have no longer seen themselves primarily as northern scientists, but as members of southern research communities, asking questions of interest not only to northerners, but to other scientists or policymakers. Similarly, field research has shifted from gaining its authority by meeting requirements specific to that location, to emulating laboratory procedures—pursuing a “placeless” standard, able to accommodate universalizing discourses of progress, modernity and rationality.

CONCLUSIONS

Science has been essential to how the Arctic is discussed, how impacts are debated, and how its potential and future are defined. This exemplifies how science can impose its own meanings on places, knowledge, and politics, being shaped by its own institutions, networks, and disciplinary priorities. And in return, we can identify various ways in which the northern environment has actively shaped scientists’ agendas and research practices: defining the problems that can be understood through science, and the techniques by which scientists have sought to solve them.

Science has also been essential to understanding and debating the Arctic, defining what kind of place it is. Since the 1940s the space occupied by the Arctic has been itself a matter of negotiation, defined as much by its relation to elsewhere, as by its “essential” features. The Arctic illustrates how places do not have stable, essential identities, but are open and dynamic, with their identities constructed within wider networks of social relations and knowledge. Thus, this place has many identities: defined by the natural spaces of tundra and ocean; by the political spaces of territories, land claim regions, the federal government, and circumpolar regimes; and by our diverse ways of thinking about, and knowing, nature.