



# Indigenous Knowledge and Perspectives

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## Abstract

Indigenous knowledge, once dismissed as mere folklore, is now widely recognized as an essential dimension of global environmental knowledge. Indigenous people, once excluded, now participate across a range of environmental affairs. Understanding how and why this has occurred requires attention to a complex history of scientists and others constructing ideas about Indigenous knowledge. A variety of scholars, including historians of science, environmental historians, and political ecologists have examined this history, identifying the factors that have influenced expert, public, and institutional perceptions of Indigenous knowledge. These include various colonial and postcolonial contexts, ideas about development, changes in the natural environment, disciplinary perspectives (such as those of anthropology), and shifting views of human-environment relations. Indigenous peoples – as knowledge producers, brokers, and intermediaries – have been crucial to these evolving perceptions, by asserting that their knowledge can be a means of achieving change in both knowledge and politics. The Arctic provides a

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distinctive setting in which the historical construction of Indigenous knowledge can be examined in more detail.

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**Keywords**

Anthropology · Arctic · Colonial sciences · Ecology · Identity · Indigenous knowledge · Indigenous people · Inuit · Local knowledge · Political ecology · Postcolonial studies · Racial sciences

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**1 Introduction**

Indigenous knowledge has become an important dimension of environmental affairs. Inuit insights on Arctic sea ice in a warming climate and the roles of Indigenous peoples as stewards of biodiversity are among the many ways in which the knowledge of people with deep ties to place has emerged as essential to understanding and conserving the environment. Indigenous knowledge has also become a major theme in scientific work, contributing insights into ecosystems and human-nature relations, while challenging scientists' epistemological, ontological, and political assumptions. And it has gained a presence in studies of the history of science, as evident in, for example, histories of colonial and postcolonial science (see chapter ► [“Postcolonial Perspectives in the Historiography of Earth and Environmental Sciences”](#) by Jarrod Hore, this volume) and of studies of global environmental change.

The significance of Indigenous knowledge raises many questions relevant to the historiography of the earth and environmental sciences. Why is this knowledge, once widely dismissed as mere stories or folklore, now invoked in scientific and environmental affairs, including by authoritative institutions such as the Intergovernmental Panel on Climate Change and the Convention on Biodiversity? How does its status relate to the evolving political contexts of environmental affairs? What does this status tell us about the intersections of knowledge and identity?

These and other aspects of Indigenous knowledge are relevant to a range of disciplines. Its historiography therefore encompasses not just the work of historians but anthropologists, political ecologists, and scholars in other fields. Insights from imperial and postcolonial studies, science and technology studies, the study of racial and cultural identities, and community-based knowledge systems are also relevant. Work across these fields presents opportunities to enhance our understanding of the historical geography of race, nature, and knowledge.

One challenge that Indigenous knowledge presents to historians is that of terminology. A variety of terms are used when discussing this topic, such as “vernacular knowledge,” “local knowledge,” and “traditional ecological knowledge.” These terms must be used with care, as they reflect diverse and often contested theoretical, practical, and political commitments. So does “Indigenous epistemology” – a term that some Indigenous scholars reject, since it implies that the nature of knowledge can be considered in isolation from its political and social contexts. The signifier “Indigenous” itself is marked by its colonial origins. Geographic distinctions are also

important: in settler societies such as North America, “Indigenous knowledge” refers to First Peoples’ knowledge and associated ethical relations both today and in the past; in South Asia, it refers to precolonial forms of knowledge; historians of Latin America view it as one among many forms of knowledge that form a landscape of “creole science”; and in Europe, the term can refer to historical knowledge of local nature, distinct from knowledge of more exotic places (Cooper 2007; McCook 2013; Menon 2022).

Indigenous knowledge presents other challenges to the historiography of the earth and environmental sciences. Indigenous peoples themselves have challenged how scientists use evidence to adjudicate knowledge claims; they have critiqued the assumption that knowledge can exist in an objective space unsullied by politics; and they have insisted that researchers acknowledge the epistemic violence that has so often accompanied knowledge production in Indigenous contexts, and hence the ethical responsibilities that accompany knowledge production today. Historians working in Indigenous contexts must therefore acknowledge these challenges and revise their practices and purposes accordingly.

Focusing primarily on debates in the twentieth and early twenty-first centuries, this chapter examines the attitudes and interpretations of Indigenous knowledge formed by observers, usually situated outside Indigenous communities, including scholars of environmental knowledge in a variety of institutional and political contexts. The chapter begins with overviews of the erasure, reconsideration, and resurgence of Indigenous knowledge in colonial and postcolonial contexts. It then acknowledges the necessity of geographic specificity through a focus on the historiography of Arctic Indigenous knowledge.

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## 2 Erasure

Ignorance of Indigenous knowledge was once widespread across empires and states. This ignorance was not just an absence of knowledge but a condition actively produced (Proctor and Schiebinger 2008). Science – as a source of both empirical information and authority – has been a consistent presence in the histories of imperialism and state formation: contributing to the imposition of order and rationality, the pursuit of efficiency and “improvement,” and the formation of modern societies, while justifying erasure of other forms of knowledge, including that held by Indigenous people (Drayton 2000). Science has been coproduced with political authority: guiding and justifying both physical transformations (for example, building dams, designating game parks, and relocating people to reserves and reservations), and the discursive construction of landscapes as either managed systems of production or pristine wilderness – displacing thereby both people and their knowledge (Neumann 1998; Nixon 2011, 150–174). While this unfolded across diverse geographic and historical contexts, a common element has been the production of difference: distinguishing standardized, universal science from “local” ways of knowing. These distinctions have been inherently intersectional, produced

amidst the assertion of differences based on gender, ethnicity, class, and location (Radcliffe 2017).

These physical and discursive transformations imply opportunities to link the history of science and environmental history. In diverse ways, perceptions of Indigenous knowledge have been linked to changing natural and social landscapes. In the late nineteenth and early twentieth centuries, environmental and social transformation – such as drought, disease, and war in East Africa, or the near-elimination of bison and displacement by settlers in the North American Plains – disrupted Indigenous societies, including their relations with local environments, encouraging the assumption that “traditional” precolonial knowledge and ways of life had been rendered irrelevant. Assumptions regarding Indigenous knowledge have also been embedded in interpretations of the history of local landscapes. From Madagascar to Southeast Asia to Australia, and across diverse ways of life, of pastoralism, shifting cultivation, or managing fire, narratives of environmental crisis were justified by the uncritical transfer of theories of a balanced, primeval nature. These narratives then justified intervention to “save” local people from their own “irrational” behavior (Fairhead and Leach 1996; Kull 2000; Munro 2020; Oba 2020; O’Brien 2002). Changing environmental conditions reinforced these perceptions. Drought in the 1930s encouraged the view that local people were overgrazing arid land, encouraging desertification: a diagnosis rooted in the belief that their knowledge was unable to adjust to changing conditions (Davis 2016). In the postcolonial era, these rationales for intervention were readily translated into the imperatives of international development: the formation of modern economies and societies through science and technology imparted urgency to the erasure of Indigenous knowledge (Scott 1998).

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### 3 Recovery

In recent decades, historians have reconsidered this history of erasure, describing relations between Indigenous and scientific knowledge that include not just displacement but exchange, the agency of local knowledge holders, and the formation of hybrid forms of knowledge. One theme has been the roles of Indigenous peoples in exploration: dismantling narratives of heroic travelers by describing their reliance on local people for guidance, means of travel, and often survival. Colonial maps were the product of efforts to make places knowable by drawing on local knowledge, enabling, alongside collecting and other field practices, the colonial appropriation of Indigenous cultures into global systems of territorial and taxonomic classification (Bryan 2009). Attention to Indigenous peoples’ roles as knowledge brokers and intermediaries has also provided the basis for recovering their agency in the history of field and museum sciences (Goss 2021). Historical studies of fieldwork have emphasized the roles of lay participants (including Indigenous peoples) as field assistants or local informants, forming distinctions between cosmopolitan and residential ways of knowing (Kohler 2011; Vetter 2011). “Working” landscapes such as agriculture formed particular contexts for these interactions, with the production of

knowledge involving a variety of local actors (McCook 2011). While scientists often included little information about the Indigenous sources of their samples and observations, close examination of the knowledge they produced can illuminate their interactions with and reliance on local informants. The emerging image, therefore, is of a “middle ground” (as Richard White once described it), or “contact zones” of exchange and accommodation, where knowledge was transacted, with scientists paying close attention to local conditions and knowledge, and local people instructing and challenging imperial ideologies and scientific agendas (Anderson 2009; Hodge 2007; White 1991).

These knowledge relations were commonly the products of local negotiation. There was no consistent “colonial mind” but instead a complex interplay between local places and wider networks of knowledge (Chambers and Gillespie 2001). Less-developed colonial scientific capacities tended to encourage more interest in Indigenous knowledge, with their uneven distribution influencing debates about what counted as science, and hence where its boundaries would be drawn (Tilley 2010). Cultural attitudes also mattered: as Londa Schiebinger has explained, knowledge of the use of the peacock flower as an abortifacient failed to travel from the Caribbean to Europe for a variety of reasons, including attitudes regarding gender and female bodies, economic interests, and the shifting professional identity of medical practice (Schiebinger 2008). The relations that scientists formed with Indigenous knowledge were shaped not just by their imperial roles and by universalizing discourses of modernity and reason, but by their own institutions, disciplines, and environmental circumstances (Radcliffe 2017). Diverse scientific perspectives on Indigenous knowledge imply that the colonial and postcolonial state should not be viewed as a monolith, pursuing a coordinated agenda of domination guided by experts. Instead, scientific expertise might not only support but also critique colonial power structures.

Postcolonial studies of science have been complemented by work in science and technology studies. Both present a view of science, including assertions of its universal authority, as a situated practice: an amalgam of practical skills, technical devices, theory, and social strategies, tied to political, social, and institutional contexts. This implies study of the sites in which knowledge is produced and applied, how it travels between these sites, and how different forms of knowledge interact. According to this perspective, knowledge does not compel acceptance merely because it corresponds to the “truth”; rather, acceptance must be understood in terms of the interpretation of knowledge claims within particular cognitive or institutional frameworks (Anderson and Adams 2008). Close examination of controversies has also been important, by demonstrating how knowledge is the product of negotiation between scientists, their patrons, and other interests (Martin Rudwick’s *The Great Devonian Controversy* is considered an early classic among “controversy studies”; Rudwick 1985).

Boundary work – how scientists assert distinctions between their work and other ways of knowing – has been essential to these relations between science and Indigenous knowledge (Gieryn 1999). Those seeking to dismiss Indigenous knowledge have done so by excluding it from science, often by describing it as anecdotal,

inaccurate, or mere spirituality. In contrast, scientists seeking to draw on Indigenous knowledge have often emphasized those aspects, such as taxonomic classifications, that can be most readily removed from its context and understood in scientific terms. In effect, they redraw the boundary of science to include those aspects of Indigenous knowledge that have meaning within it, while excluding those that would not contribute to their scientific purposes, such as its social, cultural, and racial dimensions.

The historical authority of Indigenous knowledge is therefore tied to both the history of efforts to assert that science is distinctive, and the many practical links between these forms of knowledge. Historians must therefore pay close attention to the interactions and negotiations across the shifting and porous boundaries between science and other forms of knowledge. The image is of “Indigenous” and “scientific” as fractured and indistinct categories, with varying degrees of similarity, difference, and overlap, often combined in processes of knowledge formation, and often distinguished not on the basis of epistemological content but their political implications (Agrawal 1995).

Political ecologists have provided important perspectives on this nexus of situated history of science and Indigenous knowledge (Goldman et al. 2011). Motivated by a concern for the relations between knowledge and the exercise of power, they have examined, among other topics, the formation of environmental subjects in relation to the state and other forms of power, and the relations between discourses of environmental crisis, Indigenous knowledge, and critical perspectives on assumptions of equilibrium. Influential works such as Donna Haraway’s *Staying with the Trouble* (2016) and Anna Tsing’s, *The Mushroom at the End of the World* (2015) have challenged the notion of a dichotomy between nature and culture, asserting views compatible with Indigenous perspectives on relations between humans, other species, and physical and ethical worlds.

The disciplinary structure of science has been essential to historical perceptions of Indigenous knowledge: shaping how scientists think, and what practices, evidence, and ideas are included or excluded from science. Since the 1930s, a few colonial scientists in Africa, particularly in health, ecological, and agricultural disciplines, began to look at how people actually used and understood their environments. Although paternalistic and grounded in faith in superiority of science, they challenged assumptions of Indigenous ignorance and irrationality, instead describing knowledge of medicinal plants and ecological conditions, and the adaptation of farming activities to local soils and climates (Adams 2003; Tilley 2011). Each of these disciplines guided scientists’ evaluations of the relevance and credibility of local knowledge.

Since its formation as a distinct discipline, anthropology has had a distinctive role in shaping perceptions of Indigenous knowledge. As European empires expanded, researchers followed, studying the ways of knowing of colonized peoples. Consistent with their focus on cultures that were thought to be closer to nature, anthropologists had a particular interest in how they related to their environment, including, as Bronislaw Malinowski described in the case of the Trobriand islanders, the “primitive

knowledge” relevant to immediate concerns such as agriculture, healing, and navigation (Orr et al. 2015; Tilley 2010). By the 1950s, anthropologists were developing a variety of perspectives on Indigenous environmental relations. In forming cultural ecology as a new research field, Julian Steward and his colleagues emphasized the adaptive links between culture and environment. Ethnoscience (the study of conceptions of the world held by a people or culture), ethnoecology, and human ecology also became active research fields. As articulated by Harold Conklin in 1954, the “ethnoecological approach” compelled attention to how people understand their local environment. “Cognitive anthropology” suggested that instead of fitting cultures within an ethnocentric narrative of primitive to modern, anthropologists could understand them on their own terms, with Indigenous knowledge part of comprehensive, holistic perspectives, embedded in systems of resource use, choice, and decision-making. These trends led many anthropologists to view Indigenous knowledge as part of the defining subject matter of their discipline (Orr et al. 2015; Sillitoe 1998).

Anthropological perspectives on Indigenous knowledge have often been contentious, raising questions regarding, for example, the relative roles of material, social, and symbolic explanations of human-environment relations; the ontological status of social relations between humans and other species; and the extent to which anthropologists have reframed, simplified, or misrepresented Indigenous knowledge to fit within their discipline (Orr et al. 2015; Pualani Louis 2007). Anthropologists have also assumed a novel and often contested political status, through their role as mediators between Indigenous people and more powerful actors. This shift has implied a move from the apolitical study of local human-environment relations to consideration of politics and power, influenced by the work of critical scholars such as Arturo Escobar (1995). There are, therefore, a variety of ways in which historians might consider the relations between anthropology and Indigenous knowledge: in terms of the conceptual development of the discipline, the formation of research methods and practices (such as participant observation), or the evolving political implications of anthropology.

Study of these relations between science and Indigenous knowledge has been accompanied by reconsideration of the global diffusion of science, displaced by ideas of mobility, circulation, and transformation that challenge distinctions between center and periphery (Anderson 2018). The situated nature of science also challenges the distinction between local and global: what might be considered “global” (such as scientific perspectives) reflects the influence of local circumstances, while the “local” (such as Indigenous knowledge) gains its meaning at least in part in relation to global factors. Related issues include the implications of “decolonizing” knowledge; allocation of access and control over resources; intellectual property rights; and the challenges of communicating between science and oral knowledge (Hayden 2004). Various works have reframed the “globalization” of science as a contingent and heterogeneous assemblage, effectively “indigenizing” science in the contact zones shared by different forms of knowledge (Anderson 2020; Delbourgo 2019; Sim 2021). However, these contact zones must include not just the specific places where newcomers and Indigenous people



interact, but all the sites where these relations are negotiated, such as the museums where field specimens are classified, and the scientific societies that serve as gatekeepers for disciplinary knowledge (Schiebinger 2011).

Anthropologists and historical ecologists have demonstrated that “pristine” habitats such as the Amazon Basin and North America before European settlement in fact exhibit long histories of manipulation by Indigenous peoples. In doing so, they have made visible not only the physical traces of these activities but also the knowledge that guided these activities (Denevan 2011; Raffles and WinklerPrins 2003). These conclusions continue to challenge biodiversity conservation and its concern for a nature defined in terms of the absence of humans.

Throughout this history of encounters between different forms of knowledge, ideas about race have been a continuing presence. Shifting imperial geographies – as seen, for example, in the British Empire – encouraged novel ideas about the relations between race and environments, with the capacity to develop technologies in response to local diseases interpreted in terms of racial differences, thereby linking knowledge, adaptation, and racial identity (Benson 2020, 48–77). Elements of critical race theory, such as the concept of “whiteness,” provide one way of thinking about these histories of knowledge and racial thought, including racialized distinctions between science and Indigenous knowledge. Whiteness was not just about skin color but about how colonial officials, scientists, and doctors evaluated a range of characteristics and associated identities in terms of racial theories. As an identity defined as racially “unmarked” and thus the normal against which other identities are evaluated, whiteness became both an interpretative framework and a set of power relations (Garner 2007; Kobayashi 2003). It also maintained an analogical relationship with science: both asserted their status as unmarked and objective – and thus, as defined in terms of absence, whether of racial identity or of bias. Both also exercised through social relationships the power that accompanies this status, in ways that are time- and place-specific. Today, science, by asserting an absence of racial identity, continues to tacitly affirm its whiteness, while Indigenous knowledge is accorded an identity defined in terms of both race and place.

Historical perceptions of Indigenous knowledge can therefore be understood in terms of the situated construction of the authority of knowledge: the roles of places, practices, and tools, of professional and disciplinary communities and institutions, and of power in the making of what becomes defined as truth. The concept of Indigenous knowledge itself – including the tendency to collect and examine it in forms detached from its social and cultural contexts – reflects the limits implied by how scientists recognize evidence, authority, and objects of knowledge (Cameron et al. 2014). Reframing the history of science as the history of knowledge is one response: acknowledging that science is only one among many ways of knowing the world (Beattie and Morgan 2021). However, this reframing must also acknowledge the continuing influence of the assumptions and political commitments that underpin the distinctive authority of science.



## 4 Reconsidering Contemporary Indigenous Knowledge

Historical analyses of Indigenous knowledge exist in dialogue with studies by scientists, scholars, and activists of the contemporary status of Indigenous knowledge. The latter have often been framed in empirical terms: evaluating the accuracy of Indigenous knowledge in relation to reality as defined by science. A related strategy has been to assert its practical benefits – as seen, for example, in the conservation of traditional crop varieties, or the species and habitats of Indigenous-managed territories. This perspective received prominent notice at the 1992 Earth Summit, when the contribution of Indigenous knowledge to biodiversity conservation was highlighted. These analyses frame Indigenous knowledge in terms of a pragmatic realism: its benefits confirm its correspondence with empirical reality. Analyses of intellectual property issues raised by the application of Indigenous knowledge to bioprospecting are grounded in a similar perspective: useful species and knowledge of them are both viewed as distinctively valuable resources (Hayden 2004; Osseo-Asare 2013).

Realist perspectives on Indigenous knowledge have also drawn on ideas from ecological science. Ecologists have reconsidered assumptions of equilibrium; instead, change and disturbance have been recognized as intrinsic to ecological systems even in the absence of human interventions. A related development has been the formation by C. S. Holling and colleagues of the concepts of adaptive management and ecological resilience. These concepts imply that scientific knowledge is necessarily incomplete; that “surprises” are always possible; that resilience not control should be the goal; and that management must allow for continuous learning. Some scientists see in these concepts a ratification of Indigenous knowledge, particularly in how it exhibits adaptation to nonequilibrium conditions – more so than resource management regimes founded on control. In effect, Indigenous knowledge has been conceived as a way of working with, rather than against, nature. Numerous scholars have described how systems of local resource management are often highly adapted to more variable environments. For example, in sub-Saharan Africa, mobile pastoralism is more suited to rangelands exhibiting variations in rainfall and other conditions than are resource management systems grounded in assumptions (often imported from temperate regions) of equilibrium (Davis 2016). A similar argument has been made regarding Indigenous use of fire to manage ecosystems (Kull 2000). Overall, Indigenous knowledge has gained authority by according with, and even anticipating, innovations in ecological theory, as well as with doubts regarding the capacity of science to impose control over nature.

While persuasive in public, political, and scientific contexts, these pragmatic perspectives are only a starting point for understanding the contemporary status of Indigenous knowledge. In the postcolonial era, development agencies became of central significance to Indigenous knowledge: evaluating, extracting, and applying it in practical and regulatory contexts across a variety of scales, from local institutions to multilateral organizations such as the World Bank (Brokensha et al. 1980). This reflected several factors: the influence of anthropological research; recognition of the

practical value of this knowledge in the context of agriculture, conservation, and forestry (encouraging the formation of, for example, agroforestry to codify longstanding practices of mixed agriculture); advocacy on behalf of Indigenous peoples; and alternative framings of the relations between states and peoples, including communities and the subaltern. By the late 1970s, critiques of development itself were emerging, including the assumption of a single path through science to modernity. Nevertheless, in development practice, Indigenous knowledge remained framed in terms of science: evaluated for accuracy in relation to scientific knowledge, defined as specifically local knowledge to distinguish it from “universal” science, translated into scientific terms (as in agroforestry, for example) to be viable in the modern world, and adhering to a firm distinction between nature and culture (Agrawal 2002). This framing gained prominence through the concept of sustainable development: while the World Commission of Environment and Development’s report, *Our Common Future* (1987), expressed sympathy for Indigenous peoples, it also continued a decades-long tradition of presenting their knowledge as an endangered historical relic that had only survived through isolation from the modern world (O’Brien 2002). The critique of this perspective that O’Brien references parallels Kim TallBear’s analysis of efforts to present Indigenous peoples’ identities and knowledge as historical relics that can be validated (and therefore circumscribed) through genetic science (TallBear 2013).

This reconstruction of Indigenous knowledge in terms of science and science-based development became evident in its codification as traditional ecological knowledge (TEK). The concept of TEK epitomized the extraction of Indigenous knowledge from its cultural context, to be commodified into a form compatible with environmental administration and resource management (Nelson 2005). TEK exemplifies how these categories must be interpreted not as self-evidently distinct forms of knowledge but in terms of specific institutional, political, and social contexts.

There is also a parallel history of public discourse regarding Indigenous knowledge. In America, notions of native “wisdom” and the “ecological Indian” as an authentic alternative to industrial society were invoked by Ernest Thompson Seton, Henry David Thoreau, John Muir, and other writers, becoming fixtures of popular culture – eventually invoked in the era of environmentalism through the image of the “crying Indian”: an icon conducive to mass persuasion but disengaged from Indigenous realities (Dunaway 2015). In defense of the forests and rights of Indigenous peoples such as the Penan, environmentalists reframed their knowledge in terms compatible with a Western romantic tradition (Brosius 1997). Critiques of science (including the notion of the history of science as a story of progress) and modern society became projected onto Indigenous knowledge, now designated as a source of new environmental attitudes (Krech 1999; Smithers 2015). Viewed as timeless and outside modernity, Indigenous knowledge became defined in oppositional terms that eschewed any attempt to engage with Indigenous people and their histories on their own terms (Nadasdy 2005).

## 5 Resurgence

Indigenous people have been essential to the formation of Indigenous knowledge as a research area, negotiating its relationship with science and dominant institutions. They have done so in conventional research contexts, including universities, but also in communities and Indigenous territories, state and international agencies, and the wider public sphere. In many instances, these contexts have formed sites of struggle over both material environments and contrasting ways of knowing and living in places. Indigenous peoples' assertions and interpretations of their knowledge extend the historiographic agenda of understanding knowledge production in diverse environments, but they also challenge academic history by questioning the boundaries between knowledge and its political implications and between knowledge and other aspects of society, including the ethical responsibilities that link humans, other species, and the wider environment. (There are important parallels between this perspective and work that has identified the racial and colonial violence embedded in the sciences of the Anthropocene, including geology [Yusoff 2018].) The interest therefore is in moving beyond description and analysis, towards political action. This work can be framed in terms of regional environmental histories, including accounts of struggles over landscapes and environmental features and the consequences of dams, pipelines, and other energy facilities, resource developments, and military activities. However, environmental historians have been slow to incorporate these dimensions of Indigenous knowledge into their discipline: by one account, scholarship in American environmental history has tended to assume that Indigenous people have not been significant actors after 1900 (Rosier 2013).

One way in which Indigenous people have asserted these perspectives on knowledge and its boundaries has been by insisting that research adhere to ethical relations with communities: that it respect Indigenous points of view, incorporate ethical practices, and contribute to community well-being. Accordingly, Indigenous communities and agencies have formed protocols and structures of review and accountability to facilitate respectful and ethical relationships between researchers and communities, founded on collaboration rather than extraction of knowledge, and an acknowledgment of the political character of research (Kovach 2009; Latulippe and Klenk 2020; Liboiron 2021; Smith 2021).

However, ethical research principles – like the notion of knowledge itself as something distinct from daily life – also reflect an accommodation to science-based epistemological principles. Similarly, Indigenous peoples' efforts to assert claims to land and resources must still adhere to colonial requirements, including demonstration that their stewardship of land and animals meets the standards of science-based environmental management. Participatory mapping techniques that draw on local knowledge to assert territorial authority are similarly embedded in state-based frameworks of territorial authority. In practice, Indigenous knowledge has often only been recognized when it has been backed by access to or control over land – adhering to rather than challenging conventional standards of authority.

Beyond its assertions in specific contexts and communities, many Indigenous authors have presented more general perspectives on the meanings and politics of Indigenous knowledge. In the North American context, these have included, among others, Vine Deloria, Deborah McGregor, Winona LaDuke, and Leanne Simpson. They have stressed that Indigenous knowledge is about more than epistemology: it implies ethical commitments and forms of action, as well as alternative ontologies to those asserted by “Western” territorial authority and by science (such as social and ethical relations between humans and other species) (Liboiron 2021; Whyte 2017).

In the context of this chapter, the significance of these authors is that they challenge conventional assumptions about academic research (including the history of science): how evidence should be interpreted; that this research is, or even can be, politically neutral (instead, it expresses the values of the settler colonial state); narratives of the progressive formation and diffusion of scientific knowledge (rather, this knowledge has been founded on the epistemic violence inherent in the marginalization of Indigenous perspectives); and the colonial construction of the signifier “Indigenous” itself (Parrenas 2020). To decolonize both science and history, it is therefore necessary to affirm the autonomy of other knowledge traditions and resist their extraction and inclusion within dominant ways of knowing (Radcliffe 2017b). This implies a critical perspective on postcolonial historians’ analyses of exchanges between science and Indigenous knowledge and the formation of hybrid knowledge: this, it is argued, downplays the exploitation of Indigenous people and their knowledge throughout the history of science. Instead, they stress the incommensurability of Indigenous and scientific knowledge, including differences in what counts as evidence, explanation, and authorship, ways in which knowledge relates to communities, and perceptions of time and history (Tuck and Yang 2012). One expression of this has been efforts to “decolonize” or “indigenize” the university, to provide space for indigenous ways of knowing on their own terms (Latulippe and Klenk 2020).

The global extension of Indigeneity (the expression of distinctive Indigenous identities) – evident in, for example, the United Nations Statement on Indigenous Rights, and the increasing presence of Indigenous peoples in international conservation affairs – has its own implications for the historiography of environmental science. Like Indigenous knowledge, indigeneity is neither imposed nor an autonomous product but the outcome of interactions between how a people view themselves and their contexts. Although in part the product of globalization, Indigeneity is also geographically specific. Key aspects of the concept, including a tendency towards essentialism and an unambiguous demarcation between Indigenous and non-Indigenous identities, are rooted in settler societies, particularly North America. In contrast, Indigeneity carries different meanings in, for example, Southeast Asia or in Africa (Mavhunga 2018; Parrenas 2020; Sim 2021). Thus, the historiography of Indigenous knowledge as an expression of indigeneity must encompass how it has circulated across diverse geographical, political, and cultural contexts.

## 6 Histories of Arctic Indigenous Knowledge

Situated in specific places and communities, Indigenous knowledge should be studied accordingly. The Canadian Arctic presents distinctive opportunities to explore its situated nature, including its historical relations with scientific knowledge. These relations have exhibited in distinctive ways many of the issues discussed in this chapter; they therefore illustrate the value of studying the history of Indigenous knowledge in regions with unfamiliar, intemperate environments that embody a challenge to assumptions of scientific expansion and domination. Knowledge in the Canadian Arctic has been shaped by both local circumstances, including the distinctive environment and political, economic, and institutional conditions, and by factors that are not specific to the region, including transnational scientific disciplines, the global resource economy, and relations between nations. The history of Indigenous knowledge in the Canadian Arctic is also relevant to other issues, such as how climate change and the transition to the Anthropocene involve not just transformation of the physical environment but social, ethical, and human rights concerns.

For centuries, the Canadian Arctic has been understood in terms of the meanings and values of powers located elsewhere: as imperial territory, a place of economic opportunity, or a hoped-for passage to more profitable regions. The twentieth-century history of Arctic knowledge has been marked by the intersection of colonial and scientific authority: evident in the extension of administrative control, the assertion of military and strategic interests, the orientation of economic activity towards global markets, and the redefinition of the region as an environment vulnerable to industrial society. Since the 1970s, critiques of this intersection have been implicit in political developments: the devolution of authority to local governments, renewed interest in local resources to meet local needs, and views of the Arctic environment that incorporate Indigenous perspectives. Throughout, scientists have defined the Arctic in diverse ways: as distinctive (hence requiring special ideas and techniques) or as a place similar to more familiar places elsewhere (albeit colder or less productive) (Bocking and Martin 2017).

Throughout much of the history of the Arctic, Indigenous knowledge occupied a tacit position: essential, yet often unremarked upon. Explorers had commonly lived and traveled with Indigenous people, with some of the most celebrated, including Robert Peary and Vilhjalmur Stefansson, considering Indigenous knowledge a requirement for survival even as they also, for various reasons, including racial attitudes, a sense of cultural superiority, or the need to assert (white) credibility, obscured the roles of Indigenous people in exploration (Dick 2001; Martin 2020). In the early twentieth century, scientists' attitudes towards the Arctic might be grounded in science, yet also constitute, at times, a reaction against modernity and an openness to "indigenous wisdom" – evident in how Inuit ingenuity became a staple of Arctic travel accounts. But after the Second World War, and for the reasons detailed below, the history of Indigenous knowledge in the Canadian Arctic became a history of erasure. No government agency, and few scientists, accorded more than token acknowledgement to Indigenous knowledge. It was viewed as anecdotal and subjective, failing to meet scientific standards. Government policies commonly

incorporated a dismissal of Indigenous knowledge. They did so, in part, by extending a tradition of intervention in hunting cultures, justified in terms of conservation. Intervention also encompassed relocation of communities, which both denied a community's knowledge and rendered it irrelevant. Hunting crises, incidents of extreme hunger, and transformation of settlement encouraged the view that whatever knowledge Indigenous peoples once possessed could not have survived the transformation of postwar Arctic society. Instead, the culture of knowledge of the land was seen as a vestigial remnant awaiting assimilation into the dominant culture.

Wildlife science played a central role in postwar perceptions of Arctic Indigenous knowledge. The Canadian Wildlife Service became essential to an interventionist program of wildlife management, asserting expert supervision of Indigenous-wildlife relations, while denying the existence of Indigenous knowledge and practices. Wildlife science and management contradicted Indigenous perspectives through a focus on populations, physiology, and range ecology, and by assuming that each hunter acts as an individual in competition with others and so must be regulated by an expert authority. Scientific practices reinforced this view, emphasizing aerial survey of populations – an approach consistent with practices within the North American research community, but that reinforced the boundary between scientific and Indigenous knowledge. Indigenous hunters were also thought to be prone to waste: corrupted by exposure to modern society, they were likely to hunt to excess once no longer limited by primitive technology (Kulchyski and Tester 2007; Sandlos 2007).

Changing social relations of Arctic science influenced perceptions of Indigenous knowledge. New scientific facilities, including aircraft and research laboratories, meant that scientists no longer needed to live among Indigenous people, learn their techniques for travel and survival, or, indeed, have any contact with them. The “view from above” provided by aircraft enabled scientists to extend their perspective over larger areas, breaking with a previous reliance on ground study. In doing so, scientists asserted a new “white” identity: seemingly objective, disengaged from local social and cultural circumstances – and one from which Indigenous people were excluded. Just as whiteness could be constructed as a category lacking racial identity, science could be asserted as pure and objective knowledge, as the standard against which other forms of knowledge could be evaluated, and as excluding aspects of other forms of knowledge that had an explicit racial identity (Kobayashi 2003; Garner 2007). And so, as scientists took to the air and to laboratories, Indigenous knowledge itself was commonly dismissed as an historical relic: subjective and partial.

These views of hunting, social conditions, and Indigenous knowledge were bound up with ideas about race. Interventions in community life reflected a desire, informed by attitudes regarding race and space, to transform and modernize Arctic society (Usher 2004). Arctic racial identities were defined not only in terms of ancestry but also, particularly for Inuit, in terms of relationships with the land. The perception that these relationships had been ruptured by colonization and economic and technological transformation could thus justify their assimilation into the dominant society: a process encouraged by the close association between white identity and state objectives, and, more generally, between whiteness and progress itself. In contrast, wildlife scientists

argued that Indigenous hunters had little capacity for conservation. Wastefulness towards wildlife became, therefore, a racial characteristic. The argument that science was the only reliable source of knowledge was also framed, in part, in racial terms: it was a nonracial perspective, something that was exclusive to non-Indigenous (that is, white) people. This racialization of knowledge could then contribute to justifying authority over Indigenous livelihoods (Kobayashi 2003). Race was also implicated in contrasting views of whether Inuit adaptation to Arctic environmental conditions was inherent in their biology or the product of their ingenuity.

Arctic Indigenous peoples have long attracted the interest of anthropologists: unsullied by modernity, but able to adapt to a difficult environment – in Harvey Feit’s words, research subjects at the “absolute zero of human culture” (quoted in Anderson 2004, 1). In the 1880s, Franz Boas saw the Arctic and the geographical isolation of Inuit as an opportunity to test theories of environment-culture relations (Powell 2015). During the interwar period, Knud Rasmussen studied Inuit intellectual culture, tracing their shared identity across much of the circumpolar region (Bown 2015). Other anthropological interests specific to the region have included Inuit travel and mapmaking, the impacts of European contact on Indigenous cultures, and their transition to a modern economy. Arctic anthropology has also reflected wider currents in the discipline: an interest in adaptation, in Indigenous human-environment relations, and in research methods that require immersion in community life through listening and participating in activities. The region became a site for exploring and applying ideas developed within cultural ecology, ethno-science, and other fields of anthropology, and for developing new roles such as that of mediator between states and Indigenous populations (Balıkcı 1989; Wenzel 1999).

By the 1960s, some anthropologists in the Arctic had begun to examine Indigenous knowledge on its own terms. A significant early work was Richard Nelson’s *Hunters of the Northern Ice: a study of Inuit knowledge and adaptation* (Nelson 1969). Eleanor Leacock also drew attention to Indigenous knowledge, noting the “prodigious knowledge” of elders. Milton Freeman studied Inuit perceptions and knowledge of the environment, and their use of this knowledge in decisions regarding settlement and hunting. In other research, he demonstrated the value of Indigenous knowledge as a source of information about species that was often superior to that provided by science. Studies of Arctic Indigenous knowledge proliferated during the 1970s. Henry Lewis described the importance of fire to Indigenous strategies of adaptation to the boreal forest. Harvey Feit worked with the Quebec Cree, describing their knowledge of wildlife populations and other ecological phenomena, and situating this knowledge within their worldview, in which animals and other aspects of nature are seen as “like persons,” causality is personal, and hunting success is influenced by the hunter’s previous behavior. Julie Cruikshank’s studies of stories of Athapaskan women demonstrated the importance of landscape and species to their knowledge; she also found a remarkable persistence and conservatism in these accounts, and an incommensurability with science – as expressed by the question, “Do glaciers listen?” Fikret Berkes described how subarctic fishers rely on both knowledge and cooperation to adapt to unpredictable environmental changes. In the following decades, Berkes would study many aspects



of Indigenous knowledge and resource practices, in Canada and elsewhere. Finally, Hugh Brody described how Indigenous cultures and social systems drew on environmental knowledge to construct maps of meaning (Berkes 1999; Bocking 2011; Cruikshank 2005). These anthropologists therefore pursued a variety of strategies: emphasizing the scientific credibility or incommensurability of Indigenous knowledge, its adaptive significance or its assertion of ethical relations between humans and other species.

The political history of the region, including land claim negotiations, influenced studies of Indigenous knowledge. Because an effective negotiating position required establishing that certain lands had long been occupied, there arose a demand to document Indigenous land use and knowledge, drawing on information provided by hunters, trappers, and other land users. The Inuit Land Use and Occupancy Study, initiated in 1973 and directed by Freeman, used map biographies and other techniques to document land use. These techniques served not so much to represent the cultural dimensions of knowledge as to translate it into a format suited to negotiations with government. They therefore demonstrated the complexities of recognizing Indigenous knowledge: it combined the technical process of mapping, the empowerment of people to enable them to assert their regional authority, and their incorporation within a still-dominant system of territorial authority (Bryan 2011). Land claim negotiations also provided opportunities for anthropologists to construct their role as mediator between the state and Arctic peoples. This role was encouraged by changes in the institutional position of anthropology, including its increased study in universities (permitting greater independence from federal policies). But while anthropologists pursued this role, distrust rooted in the history of northern colonialism, as well as a desire to speak directly to society generated resistance among Arctic peoples (Asch 2001). More generally, the shifting political contexts of research have meant that anthropologists no longer have the power to decide themselves where and how they will do fieldwork; instead, research strategies must be negotiated locally and be based on collaboration. Overall, anthropological perspectives on Indigenous knowledge have continually evolved, in response to both wider disciplinary concerns and institutional and political conditions specific to the Arctic.

These factors shaping the work of anthropologists have also been important for environmental scientists. They too saw themselves not merely as Arctic scientists but as members of larger scientific disciplines. This cosmopolitan identity has had diverse implications for relations with Indigenous knowledge. Scientists seeking to develop ideas particular to the Arctic have generally been more receptive to Indigenous knowledge. In contrast, researchers within disciplinary frameworks defined outside the region have tended to be less receptive. Thus, while the colonial regime in the Arctic (as elsewhere) drew on universalizing discourses of progress, modernity, and rationality, it was also shaped by local factors and by scientific communities that had distinctive views on the relations between Indigenous people and science. In short, this regime, in terms of the evolving status of Indigenous knowledge, was not monolithic, but fractured, heterogeneous, and open to diverse influences from both within and outside the scientific community. Collaborations between science and Indigenous knowledge have exhibited how historical inequalities between

knowledge systems can be perpetuated. This has been evident in comanagement institutions: although intended to bring together these knowledge systems, they have also, in practice, embedded their unequal authority, with Indigenous knowledge obliged to frame its advice in scientific terms (Nadasdy 2003).

Empirical experience has been a significant local factor shaping Arctic scientists' perspectives on Indigenous knowledge. For example, in the 1970s, Indigenous observations of caribou began to be compared against scientific predictions. The result was often diminished confidence in science and more credibility for Indigenous knowledge. Once biologists began to learn from hunters that, for example, older males play an important role in protecting the herd against predators, they became more open to accepting the empirical validity of Indigenous knowledge. Overall, Indigenous knowledge provided for scientists an increasingly significant source of empirical information (Ferguson et al. 1998; Freeman 1992).

Other Arctic researchers also drew on aspects of Indigenous knowledge. One example was the ecologist William Pruitt. In his research, he used Inuit terms to designate different types of snow. Describing them as the "wisest instructors" on the nature of snow, he argued that their terms enabled far more precise description than was possible with English words (Pruitt 1978). Polar bear researchers used Indigenous knowledge to describe bear behavior, locate their dens, and generate insights into the behavior of seals (Smith and Stirling 1975). Thus, scientists often viewed Indigenous knowledge as a source of knowledge and observations not available through their own research. They did so by shifting the boundary of science so as to include Indigenous knowledge, even while excluding those aspects that would not contribute to their scientific goals, such as its social, cultural, and racial dimensions. Perspectives on race and whiteness were implicated in this shifting boundary between science and Indigenous knowledge. Thus, scientists' recognition of the value of Indigenous knowledge did not come merely through force of evidence. Acceptance of knowledge claims also required a supportive framework of institutions and disciplines, new research practices, including collaborative fieldwork involving scientists and Inuit, and a shift in perceptions regarding the relations between "white" science and knowledge that is tied to racial identity.

The history of Arctic resource development also illustrates some factors influencing perceptions of Indigenous knowledge. Much of the documentation of Indigenous knowledge in the region has been tied to development, including land claims and regulatory activities, as well as efforts to deal with local hazards. It has therefore exhibited the problematic ways in which Indigenous knowledge has been assembled and translated into forms compatible with modern perspectives. Some accounts have acknowledged the disruptions implicit in removing knowledge from its social context, coding and reifying it as TEK and incorporating it within bureaucratic approaches to decision-making. This has been especially evident in environmental impact assessments, with divergent views of these assessments – as a scientific or a civic process – implying different roles for Indigenous knowledge (O'Faircheallaigh 2007). Thomas Berger's Mackenzie Valley Pipeline Inquiry of 1974–1977 emphasized the deep experience and insights of Indigenous peoples regarding their homeland, combined with critical perspectives on other aspects of knowledge, including

the roles of scientists in relation to public policy, and the relations between science and values (Berger 1977). It therefore provided an influential demonstration of how attitudes towards Indigenous knowledge can be interpreted in relation to other perspectives on science in its social contexts.

Political changes across the Arctic have encouraged communities to collect their own knowledge, and in doing so, to assert their rights to the land (McDonald et al. 1997). These studies have shown that northern land and waters remain crucially important to Indigenous communities, as a basis for both material well-being and cultural and social integrity. In doing so, they have challenged a strictly biological perspective on renewable resources and impacts of industrialization (and its accompanying denial, consistent with attitudes of whiteness, of the significance of racial and cultural identities). This has also implied shifting views of the Arctic itself: from an “empty” resource frontier or a “pristine” wilderness, to that of homeland, long occupied by humans, and populated with species that have their own intentions and social relations. These changes demonstrate the political significance of local control over documentation of Indigenous knowledge (Nuttall 2010). The politics of identity have thus in the Arctic often been negotiated in terms of knowledge.

Communities also began to insist that their knowledge be incorporated into research, with scientists required to demonstrate an awareness of Indigenous knowledge before receiving permission to do research. Concern for research ethics and community relations is also producing new models of research that contribute to local self-determination by transmitting knowledge to younger generations and challenging assumptions about who has the right to define the Arctic environment. Community histories are based on local memories and oral histories – forming an alternative model of historiography, and illustrating how changing social and power relations have many implications for how Indigenous knowledge is understood (QTC 2014).

Finally, the Arctic presents distinctive issues of scale that have become evident in the relations between Indigenous knowledge and the global earth and environmental sciences. Inuit gained in the late 1950s a presence in early Cold War understanding of the global environment with concerns regarding the local health effects of radioactive fallout (see chapter “► Cold War and Earth Sciences” by Ron Doel, this volume). By the 1980s, concerns about contaminants that had traveled long distances focused on persistent organic pollutants. Research on these hazards initially framed Inuit as objects of research. However, by the 1990s, amidst changing political circumstances and research practices, they were asserting an increasing role in these studies: setting priorities and drawing on their own knowledge of the environment. Although global models, satellite-based remote sensing, and ice core studies have framed knowledge of the Arctic climate in terms of large spatial and temporal scales, Inuit have also gained a role in climate research, providing insights into weather, sea ice, and other environmental features on scales more relevant to human activities (Huntington 2011). Inuit participation in circumpolar environmental and political affairs, through the Inuit Circumpolar Council, the Arctic Environmental Protection Strategy, and the Arctic Council, has complemented their presence in studies of environmental change. They have stressed in these fora not merely the relevance of Indigenous knowledge, but that climate change is not just a physical

transformation but a moral and ethical issue that can be understood in terms of Inuit concepts such as *Sila* (a worldview that encompasses weather, climate, the Arctic environment, and their relations to Inuit identity and ways of life), as well as concepts understood in universal terms, including human rights and environmental justice (Krupnik and Jolly 2002; Watt-Cloutier 2015).

However, scientific perspectives on Arctic and global environmental change can also marginalize Indigenous knowledge. This is seen, for example, in discussions of “opening up” the Arctic Ocean to resource development as it loses its permanent ice cover: a prospect that risks returning the region to its colonial image as an otherwise uninhabited place open to claims by outside interests. It is also seen in the continuing tendency to present Indigenous knowledge of the Arctic environment separately from the dominant scientific narrative of global environmental transformation. As in other arenas of global environmental science, this marginalizing of Indigenous knowledge through epistemic dominance can constitute its own form of slow violence (O’Lear 2016). The continuing challenge of including Indigenous knowledge in perspectives on the Arctic environment speaks to how different ideas about what counts as knowledge and history are at stake.

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## 7 Conclusion

The historiography of Indigenous knowledge parallels its evolving roles in contemporary environmental affairs, where it asserts intellectual and moral authority but still exhibits the consequences of a history of erasure. This ambiguous status has been reinforced by the deeply rooted idea of science as the foundation of modernity, setting the terms by which rationality itself is defined. This historiography also aligns with a significant theme in the history of science: the relations between forms of knowledge with contrasting methodological, epistemological, and political implications, evident in efforts to extract and combine knowledges, as well as assert boundaries, amidst evolving political conditions and contested racial identities. Throughout, Indigenous knowledge has not been “discovered,” but constructed, most often in forms compatible with scientific knowledge (including its reification as distinct from its social contexts), but also, in Indigenous contexts, in ways that challenge this knowledge.

The history of perceptions of Indigenous knowledge is relevant to study of other aspects of the history of knowledge of the earth and environment. Among these are the roles of disciplines and disciplinary boundaries in shaping scientific attitudes (evident in how there is no single “scientific” mind regarding Indigenous knowledge); of particular places and regions (as seen in the distinctive significance of Indigenous knowledge in the Arctic and in the diverse scales and geographies of nature, peoples and knowledge more generally); of racial identities and their consequences for knowledge; and of the relations between knowledge and power – evident in the contexts of empires, international development, and modernity. However, this history also challenges the agenda of the history of science. As a form of knowledge inseparable from issues of identity and of access to and control

over nature and peoples, it calls into question the study of the history of knowledge as distinct from its contexts, as well as assumptions about history itself: its evidence, exclusions, and purpose.

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