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Decolonizing technoscience in northern Scandinavia: the role of scholarship in Sámi emancipation and the indigenization of Western science

Urban Wråkberg [a,*] and Karin Granqvist [b]

[a] Dep. of Tourism Research and Northern Studies, UiT The Arctic University of Norway Campus Kirkenes, N-9915 Kirkenes, Norway
[b] Independent Scholar, Sweden

Abstract

The historical geography of the sub-arctic homeland of the Sámi indigenous people is characterized by its division among four nations across Scandinavia and the Kola Peninsula of north-western Russia. The aim of this article is to improve the understanding of Sámi contributions to Western scholarship and science by discussing their history and epistemological complexity. The Sámi provided many types of knowledge as abused, peaceful subjects of colonial study. However, with time they became learned agents able to appropriate, develop and modify Western scholarship and science. The Sámi experience of destructive national school policies motivated political action by articulate Sámi leaders at the beginning of the 20th century. Given the growing acknowledgment of Sámi socioeconomic interests in Scandinavia since the 1980s, disputes and consensus-building are a continuing part of the Sámi's co-existence with the majority society and academia. A specific Sámi research agenda and stable Sámi academic institutions are crucial for continued Sámi contributions to the indigenization of Western scholarship. Nevertheless, given its history and the instrumental character of Western science, it is argued that using science as the norm in any interaction with traditional knowledge is highly problematic. For joint research to benefit from both types of knowledge, the rigid methodology and reductionist worldview of Western science must first be recognized and analyzed in terms of Western science's epistemological dogmas, hegemonic practices and funding peculiarities. Improved insights in the history of science facilitate a critical development of indigenous knowledge combining actively chosen adaptations of science and technoscience with traditional knowledge.

Keywords: Subarctic; Sámi; History of science; Decolonization; Indigenization; Epistemology of science; Traditional knowledge; Indigenous emancipation

The application of Western science in different geographical settings reveals its alliances with, dependence on, and clashes with other knowledge systems. Field research does much more than provide science with various collections, inventories and datasets and offer testing grounds for full-scale empirical verification of scientific theories. Given the extramural setting of field research and its necessary invocation of a range of spatial techniques it requires an intricate combination of logistical methods, observational norms, and knowledge enactments that together constitute what is called technoscience.

The concept of technoscience was developed to emphasize the interrelations among laboratory science, society, the material world and history.[1] In this essay, the social sciences and the humanities are seen as integral to technoscience because they have both contributed to the collection of information during field expeditions and been drawn upon for information by scientific travelers. The fieldwork of academic professionals in the Polar Regions has been and is dependent on their training, experience, special assistance and funding, but technoscience in the field is an evolving intellectual and material culture comprising spatial and bodily practices that become modified by the physical and human challenges posed Westerners by the non-scientific and often non-Western residents of the high north.

The goals and methods of field science have transformed over time.[2] Beginning with the Western exoticism of the 18th century

* Corresponding author.
E-mail addresses: urban.wrakberg@uit.no, karin.granqvist@online.no.

[1] S. Sismondo, *An Introduction to Science and Technology Studies*, Malden, 2008; D. Ihde, E. Selinger (Eds), *Chasing Technoscience: Matrix for Materiality*, Bloomington (IN), 2003.

[2] The development and socio-political uses of field science have been analyzed contextually in the history of science in recent decades; among these studies can be mentioned the special volume of *Osiris* in 1996: H. Kuklick, R.E. Kohler (Eds), *Science in the Field*, *Osiris* 2nd series 11 (1996); M. Bravo, S. Sörlin (Eds), *Narrating the Arctic: A Cultural History of Nordic Scientific Practices*, Canton (MA), 2002; D.N. Livingstone, *Putting Science in its Place: Geographies of Scientific Knowledge*, Chicago, 2003. For a historiographical overview, see D.A. Finnegan, The spatial turn: geographical approaches in the history of science, *Journal of the History of Biology* 41 (2008) 369–388.

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and continuing with the wilderness romanticism of the early 19th century, field research was inspired by Humboldt's commitment to inventory and quantification and developed into an instrument of central importance to colonialism.[3] This essay focuses on a set of issues raised by the specific processes through which technoscience in northern Fennoscandia exploited but over time was partly altered by the indigenous population of the area, the Sámi people. For the sake of allegorical illustration, one may consider a bandwagon of colonial technoscience and behold its use against the aboriginals of the arctic regions.[4] In some places such as northern Scandinavia, it was redeployed by native scholars. Where this occurred, colonial technoscience contributed to research that affirmed Sami practices and underpinned emancipatory agitation. Moreover, the opening to indigenous scholars of higher education and careers in research raised several important questions about the epistemology of science and scholarship.

This article considers how technoscience was first used against the Sámi indigenous people and the long process by which they appropriated scholarship to revive their culture, analyze their present conditions and attain certain self-governing rights within Norway, Sweden, Finland and Russia. The role of scholarship and science in the various policies directed against the Sámi will be exemplified mainly from those portions of the Sámi homelands that are today part of northern Norway and Sweden. We also discuss some problems associated with the de-colonization and indigenization of Western knowledge based on the sociology of science and post-colonial studies of technoscience.[5] The second half of the paper considers some of the challenges involved in decolonizing technoscience and discusses its relation to traditional knowledge, and to today's composite indigenous knowledge. Efforts to indigenize Western science and scholarship respond to its insensitive application to so-called peripheral regions of the world but they also have paradigmatic implications as they expose the acute epistemological difficulties of merging indigenous knowledge with reductionist science (Fig. 1).

Fig. 1. A Sámi becoming an object of Western research. The Swedish medical doctor and racial anthropologist Gustaf Retzius (1842–1919) about to perform skull-size measurements on a South Sámi man, known here by his surname Fjellstedt. This studio photo was arranged in the late 19th century on Retzius' initiative to further his status as an expert in racial science. Source: Wikimedia Sweden.

The wider issue at stake

The history of technoscience raises several questions about the flexibility and neutrality of Western science and scholarship. Does use of the 'instruments' of Western research require that practitioners be acculturated into the 'Way of the West'? If so, conducting field science would be part and parcel of an unmistakably Western suite of ideas and priorities. Since the inception of modern science, it has been both argued and shown that science includes a set of norms and a certain worldview that has been characteristic of Western culture since the Enlightenment. Among the fundamental concepts of Western science are the Cartesian split between mind and body. The methodological goals of Western science include reductionism, objectivity, scepticism, empiricism, replication, quantification, mathematical abstraction and calculus, precision, standardization, and the accumulation of de-individualized knowledge. Its norms comprise, among others, secularization, idealism, evolutionism, individualism and the commoditization of nature but also freedom of speech, equality among scientific peers, transparency, meritocracy and democracy.[6] The point is not whether real scientific work meets these norms but that these norms define what is attempted and identified as technoscience by delineating it from other knowledge systems with socio-economic and material ambitions. Because technoscience is dependent upon this ideology, practitioners of non-Western background risk losing their native worldview as they embrace its principles.

If technoscience were a tool-box containing flexible, neutral and somehow superior instruments, people could use what they needed from it for their 'own' purposes, and the full decolonization of technoscience might be possible. But this possibility raises two questions: what competence is needed to use those instruments successfully, and why would anyone who is not Western want to use Western science? Beyond this there lies the sense that many outside the Western world, desire to master technoscience in order

[3] S. Zeller, Classical codes: biogeographical assessments of environment in Victorian Canada, *Journal of Historical Geography* 24, 1 (1998) 20–35.

[4] This allegorical expression is invoked by the present authors, but for a discussion of the clash between Western science and traditional knowledge in Arctic North America, see D.J. Gamble, Crushing of cultures: Western applied science in northern societies, *Arctic* 39 (1986) 20–23.

[5] Sismondo, *An Introduction to STS* (note 1); W. Anderson, Introduction: postcolonial technoscience, *Social Studies of Science* 32, 5–6 (2002) 643–658; S. Fuller and J.H. Collier, *Philosophy, Rhetoric, and the End of Knowledge: A New Beginning for Science and Technology Studies*, Mahwah & London, 2004.

[6] Recent studies in the sociology and history of modern science have demonstrated its Western cultural ladenness. This is not to say that the roots of science are all European — quite the opposite is true — or that it has been developed ever since its beginnings only in the West. S. Harding, Is science multicultural? Challenges, resources, opportunities, uncertainties, *Configurations* 2 (1994) 301–330; S. Gaukroger, *The Emergence of a Scientific Culture: Science and the Shaping of Modernity 1210–1685*, Oxford, 2006; A. Bala, *The Dialogue of Civilizations in the Birth of Modern Science*, New York, 2006; T.E. Huff, Some historical roots of the ethos of science, *Journal of Classical Sociology* 7 (2007) 193–210; J. Golinski, *Making Natural Knowledge: Constructivism and the History of Science*, Cambridge, 1998.

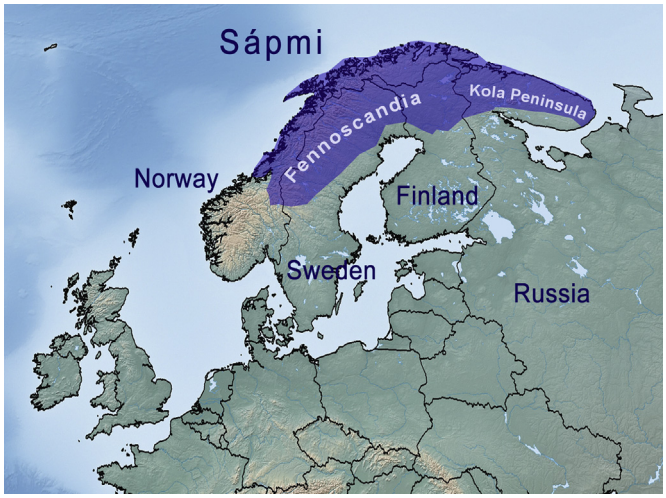

Fig. 2. The historically recorded area of all the nomadic villages (*siidas*) of the Sámi indigenous people is today often called Sápmi and is shaded in the European subarctic in this map. Sápmi is divided between four nations. Map by the authors.

to defy the economic and military predominance of the Euro-American industrial nations.[7]

Colonial discourses in research on Sápmi

The Fennoscandia and Kola peninsulas in northernmost Europe are aligned with each other and were populated some 10 000 years ago as the inland-ice of the last glacial age withdrew toward higher ground and melted (Fig. 2). Modern glaciology and climatology have indicated that this process first opened land along the Atlantic coast of Scandinavia, making possible the in-migration of people from the south west and north, wherever the coast became available, and the local climate and supply of game and fish allowed for subsistence. The archaeological excavations, mappings and narratives of this area conducted and produced in the 19th and early 20th centuries were based on a colonial paradigm that interpreted most remains of ancient settlements as representative of occupation by the southern majority population of Fennoscandia.[8] Later comparative studies have recognized a typical Sámi way of burial and configuration of living quarters that has persisted since the last century B.C. This has stirred animated debates in Norwegian and Swedish newspapers and other popular media about whether archaeological excavations are proof of an ancient Norse/Viking/Gothic or Sámi settlement.[9]

The various Sámi groups speak a number of slightly different languages or dialects. They did not form a nation in ancient times but could be considered to do so today given that Sápmi, the land of the Sámi in the north of the Scandinavian Peninsula and on the Kola Peninsula, is divided between four nations: Norway, Sweden, Finland and Russia. The Sámi people were, and some still are, traditionally organized in *siidas*, nomadic villages. Originally, the villagers made their living only from hunting and fishing, but the old way of life was made unsustainable by increases in the burden of taxation on the Sámi, forcing them to intensify the hunting of wild reindeer. In the 16th and 17th centuries, the Sámi developed an innovative livelihood of pastoralism based on semi-domesticated herds of reindeer. By combining this lifestyle with continued hunting and fishing, the Sámi were able to both transform and maintain their culture.[10]

The earliest encounters between Sámi people and missionaries and tax collectors from southern and eastern states took place in medieval and early modern times.[11] Some of these interactions resembled later colonial practices, but in the earliest preserved Swedish State documents on the Sámi villages in 1543 and 1551 A.D., the Sámi were treated as regular owners of land with hunting and fishing rights. In 1751 at the time when many Sámi villages had developed a livelihood based on herding semi-domesticated reindeer a legal document specifying Sámi entitlements (to cross national borders and to graze reindeer) called the Lapp Codicil was issued as an amendment to the border treaty between Norway and Sweden. It is one of the oldest documents specifying indigenous rights. In fact, it is still part of Scandinavian legislation and is called upon in contemporary land-use conflicts. In the 19th century, this law was challenged by increasing domestic migration from the south, but the long earlier history of engagement with the state makes the Sámi land ownership issue and Sami confrontations with colonialism different from those of aboriginal peoples subjugated later during the height of global imperialism.[12] During the industrialization of northern Sweden and Finland in the late 19th century, the 'opening' of the coast of the Baltic Sea and its hinterlands, rich with timber, mineral and hydropower resources, was clearly colonial in character.[13]

New policies conceived in the national capitals during the 19th century encouraged settlement by southerners along the coast and in the forested regions of middle and northern Fennoscandia. The Sami right to graze reindeer on traditional land was weakened. In Sweden, the Sámi were never granted rights beyond those defensible in courts of law that required Sámi herders to prove traditional Sámi use of the land under dispute since time immemorial.

During the 18th and 19th centuries Norwegian fishermen and merchants gradually came to dominate fishing along the Atlantic coast of northern Scandinavia, and overpowered the traditional livelihood of coastal Sámi people by introducing trade over longer distances, new fishing techniques, and vessels that could venture

[7] For a discussion of the hegemonic aspects of colonial and metropolitan scholarship, see J. Robinson, Postcolonialising geography: tactics and pitfalls, *Singapore Journal of Tropical Geography* 24 (2003) 273–289. A large number of conflict-focused interpretations have been made of the state of affairs and likely future development of the post-Cold War world order. Among the most debated of those reasonings in terms of confrontations between "civilizations" and ethnic cultures are those of S.P. Huntington, *The Clash of Civilizations and the Remaking of World Order*, New York, 1996.

[8] A. Hesjedal, Vinterlandet Norge: om hvordan samisk forhistorie har blitt usynliggjort i norsk arkeologi, in: M. Krogh, K. Schanche (Eds), *Samisk forhistorie: Rapport fra konferanse i Lakselv 5.-6. September 2002*, Varangerbotn, 2004, 7–19; A. Opedal, A.W. Brøgger and the norwegianization of the prehistory of north Norway, *Acta Borealia* 13, 1 (1996) 35–46.

[9] One recent example is a piece of writing in a daily newspaper of Kirkenes in northern Norway. In the article, a local politician complains about the bias he considers to be typical of archaeologists today from the University of Tromsø, which makes them redefine ancient remains in northern Norway from sites of Norse heritage to those of Sami origin. O.M. Rønning, Kirkegårdsbukt i Forsøl, *Sør-Varanger Avis* (29 June 2013), 8. For a study of this kind of conflict in Sweden and their wider legal and economic consequences, see C.-G. Ojala, *Sámi Prehistories: The Politics of Archaeology and Identity in Northernmost Europe*, Uppsala, 2009.

[10] L.I. Hansen and B. Olsen, *Samenes historie frem til 1750*, Vol. I of *Samenes historie* 2 vols., Oslo, 2004, 153, 211; L. Lundmark, Uppbörd, utarmning, utveckling: Det samiska fångstsamhällets övergång till rennomadism i Lule lappmark, Lund, 1982, 171–173.

[11] Hansen and Olsen, *Samenes historie* (note 10), 53–56.

[12] T. Cramér, *Sveriges nya regeringsform med samerna som erkänt urfolk: respekt för civilrättsliga domar utan diskriminering av samerna*, Samernas vita bok Vol. 33, Stockholm, 2010; G. Fur, *Colonialism on the Margins: Cultural Encounters in New Sweden and Lapland*, Leiden, 2006.

[13] S. Sörlin, *Framtidslandet: debatten om Norrland och naturresurserna under det industriella genombrottet*, Stockholm, 1988.

Fig. 3. The Swedish eighteenth century botanist and explorer of Lapland (the traditional Sámi area of northern Sweden) Carl Linnaeus, dressed in a Sámi outfit with items of traditional Sámi handicraft, holding his own emblematic flower, the *Linnaea borealis*. This stunt of posing 'inside the other' was part of Linnaeus's successful self-branding as a northern authority of the Western scientific community. Replica of original 18th century painting made by Hendrik Hollander in 1853.

farther out to sea. Because this process was slow compared to late-19th-century colonialism and was not initially marked by racism, Sami intermarried with Finnish then Norwegian and Russian migrants, especially in the border lands of the far north. Although this mixing undeniably led to some degree of assimilation and defused local conflicts, it created new ones when, for example, southern national policies were directed toward the north in the early 20th century to stop the use of the Sámi and Finnish languages in Norwegian territory.[14]

Scientific travelers to northern Scandinavia in the 18th and early 19th centuries brought with them ideas about wilderness and the noble savages who inhabited it. The botanist Carl Linnaeus (1707-1778) identified the Sámi as the exotic 'other' during his expeditions in northern Sweden in the early 18th century (Fig. 3). The native – savage or noble – was conceived of as natural and so different in habits and traits as to be fundamentally alien to the European. The aboriginal was construed as a mirror by which the scholar could reflect on his own culture. Despite Western curiosity about the indigenous foreigner, the attraction to the exotic remains a solipsistic interest. This fascination has formed a driving idea of ethnography and anthropology since their conception and inevitably objectifies the native person as the 'primitive' and unpredictable 'other.' It also follows a basic norm of Western science upholding the social and material demarcation between inside and outside to safeguard its integrity in controlling the external.[15]

Non-Western cultural objects were collected as curiosities in Europe in earlier times. This practice developed into scholarship at the beginning of the 19th century with the rise of Romanticism and Western linguistic and humanistic studies. European academics of the early 19th century were obsessed with theories of wandering peoples and a search for the origins of Western civilization. In this way of thinking, there was little incentive to modernize so-called primitive people, once they had been subject to authority and taxation. Aboriginal individuals were made the objects of technoscience but there was no mission to engage them in its service. Instead, if possible, they were to be kept from modernization, leaving the white man with the burden to protect and preserve them as incapable beings. The exoticism projected on indigenous people is also the root of the European image of the Sámi as closer to, and in tune with, nature, inherently better positioned to relate spiritually to nature. As has been noted in contemporary research, this view may be respectful and positive in some ways, but it must still be acknowledged as another hegemonic representation that in practice denies indigenous people the freedom to develop their culture and way of life.[16]

Several missionaries learned to use Sámi languages, and at the beginning of the 18th century, some Sámi boys, found skillful by the 'wilderness priests' who served the protestant state church, were selected for further training in Norwegian and scripture at the Seminarium Scholasticum in Trondheim. This school was a college for instructing educators, clergymen, and missionaries, mainly from the majority population, in Sámi languages to facilitate their work in northern Norway.[17] There is some irony in the fact that those Sámi individuals brought into this centre of religious learning in hope that they would lead their people to serve the state church of a southern nation were provided with the language skills and training in reading, logic, writing and rhetoric, gained access to libraries and books, the principles of moral and political philosophy and a battery of flexible Western ideas that proved to be the tools of self-articulation.

The rise of Lars Levi Læstadius (1800–1861) to religious leadership demonstrates something of this. Læstadius was a Sámi from Arjeplog in Sweden, a state priest fluent in several languages apart from Swedish and Pite Sámi and also a full-fledged natural scientist. He was trained at Sweden's foremost university in Uppsala. Returning north to be parish priest in Lapland, Læstadius started a revival movement within the Swedish State Lutheran Church, with pietistic and Moravian influences. This was later named Læstadianism. Among other endeavors, Læstadius taught absolute abstinence from alcohol, which had devastated many Sámi families, and the value of an ascetic and honest lifestyle, which was said to make locks on doors and storage containers utterly redundant in Læstadian villages. Læstadianism became the most important revivalist movement in the Nordic countries. It has remained a strong component in many societies of northern Scandinavia ever since and has congregations today in North America and Russia as well.[18]

[14] K.E. Eriksen and E. Niemi, *Den finske fare*, Oslo, 1981.

[15] K. Granqvist, Between the arctic 'other' and subject: two researcher's images of Sámi in the 19th century, in: C. Folke Ax (Ed), *Encountering Foreign Worlds: Experiences at Home and Abroad*, Reykjavik, 2007, 69–86; K. Klitgaard Povlsen (Ed), *Northbound: Travels, Encounters and Constructions 1700–1830,* Aarhus, 2007.

[16] S.R. Mathisen, Hegemonic representations of Sámi culture: from narratives of noble savages to discourses on ecological Sámi, in: A.-L. Siikala, B. Klein, S.R. Mathisen (Eds), *Creating Diversities: Folklore, Religion and the Politics of Heritage*, Helsinki, 2004, 17–30; G. Broberg, Lappkaravaner på villovägar: antropologin och synen på samerna fram mot sekelskiftet 1900, *Lychnos* (1981/1982) 27–86.

[17] V. Stordahl, Nation building through knowledge building: the discourse of Sámi higher education and research in Norway, in: H. Minde, et al. (Eds), *Indigenous Peoples: Self-determination, Knowledge, Indigeneity,* Delft, 2008, 249–265; E. Bråstad Jensen, *Fra fornorskningspolitikk mot kulturelt mangfold*, Stonglandseidet, 1991, 14.

[18] B. Larsson, *Lars Levi Læstadius: Hans liv, verksamhet och den laestadianska väckelsen,* 2nd ed., Skellefteå, 2004; L. Sjöberg, Læstadius som dialogskapare, in: B. Claesson (Ed), *Samer och ursprungsbefolkningars rättigheter*, Gothenburg, 2003, 251–265; Ø. Norderval, S. Nesset (Eds), *Vekkelse og vitenskap: Lars Levi Læstadius 200 år,* Tromsø, 2000.

In the 20th century, the Sámi politician and teacher in Ofoten in north-western Norway Henrik Kvandahl (1865–1951) wrote and published a pioneering three-volume history of the Sámi people. The fact that Kvandahl's affirmative Sámi work is seldom mentioned other than as a curiosity today is mainly due to his application of the racial theories of his times.[19] Posterity's criticism is certainly legitimate but it is also ironic in that Kvandahl's use of then accepted research methodology is proof of his scholarship. Some scientific theories not only become obsolete but may also prove to be contrary to basic ethics when applied in real life. Kvandahl's outmoded work illustrates the fact that colonial ethnography was bound to reproduce the hegemonic and racist worldview of colonialism.

The positive view of the Sámi as an exotic but primitive people worth some protection turned into complete negativity with the rise of nationalism, industrialization and the establishment of the colonial world order. Technology and science were welded together into the modern form of technoscience, in which Social Darwinism and racial science legitimized and assisted the colonial enterprise. Indigenous minorities were ranked low on scales of civilizations, with Western majority populations on top. It was believed that aboriginal peoples would all perish in the struggle for survival. General education was considered of no use or provided with the intent of facilitating assimilation.[20]

The Sámi situation deteriorated in different ways in the various countries that had divided Sápmi. The struggle of the Norwegian majority population to gain national independence, first from Denmark and finally with success from Sweden in 1905, provided the impetus to 'Norwegianize,' (i.e., homogenize the language and culture of) the entire country, with the southern majority population providing the norms. This effort had strong impacts upon many regional minorities. In Sweden, a different path was followed. Social Darwinism influenced the rulings on Sámi land-use conflicts in Swedish courts from the second half of the 19th century onward and Sweden came close to introducing a system of Sámi reservations in its northern counties in the 20th century.[21]

In, 1848, the Norwegian state declared most of northern Norway as land under its ownership and control. The Sámi use of land and water was no longer viewed as originating from immemorial rights; instead, a legal innovation swapped the basis of indigenous land use to a contingent 'acceptance by courtesy of the State', allowing Sámi use of any land to be challenged by new industrial entrepreneurs.[22] However, the mountains and forests of northern Scandinavia and the Kola Peninsula and its coastal seas were already managed sustainably, as commons, by the various Sámi *siidas*. Later, in the 20th century, the argument that commons will always be degraded and must be either privatized or enclosed under state scientific management gained influence in policy-making based on Garret Hardin's influential scenario of the 'tragedy of the commons'. Until very recent times, this line of reasoning has been used to set aside Sámi regimes of natural resource management; among other effects, this distrust of indigenous governance facilitated the opening of the northern coast of Scandinavia for capital-intensive fish-farming enterprises.[23]

Fig. 4. Sámi rights pioneer activist Elsa Laula Renberg (1877–1931). Photographer unknown. Source: Tromsø Museum, Tromsø. Used with permission.

Mandatory teaching of young Sámi at special boarding schools was introduced in both Scandinavia and north-western Russia. The schools only taught in the national languages of the majority, denying the use of Sámi languages and dialects even among the students themselves. Interning Sámi youth away from their nomadic home *siidas* during semesters also deprived them of normal socialization and obstructed the transfer of generations of traditional knowledge. For all that, the boarding schools produced many educated and articulate pioneers in the early Sámi movement of the 1920s. Some of these were women, including the South Sámi agitator and organizer Elsa Laula Renberg (1877–1931), who wrote a pioneering political pamphlet 'Facing Life or Death? Words of Truth on the Conditions of the Sámi' in 1904 (Fig. 4). The pamphlet discussed the situation of the Sami and their prospects for survival as a culture under assimilationist policies. Soon after, she called together the first Sámi women's association and was instrumental in launching the first Nordic general Sámi meetings.[24]

[19] B. Evjen, Fra eksotiske forskningsobjekter til aktive forskere, *Bårjås: Populærvitenskapelig tidsskrift fra Árran – lulesamisk museum* (1999) 12–23, 19; H. Minde, 'Dagen er kommet' Henrik Kvandahl og hans verk – Samenes historie I–III, *Hammarn* (1995:4), 40–44.

[20] P. Brantlinger, *Dark Vanishings: Discourse on the Extinction of Primitive Races, 1800–1930,* Ithaca and London, 2003.

[21] Cramér, *Sveriges nya regeringsform* (note 12), 344; Bråstad Jensen, *Fra fornorskningspolitikk* (note 17), 21; R. Kvist, Swedish saami policy 1550–1990, in: R. Kvist (Ed), *Readings in Saami History, Culture and Language III*, Umeå, 1992, 69–71; K. Granqvist-Nutti, *Samerna i svenska läroböcker 1865–1971*, Umeå, 1993.

[22] T. Strøm Bull, Om rettsanvendelse og etikk, in: NESH: Den nasjonale forskningsetiske komité for samfunnsvitenskap og humaniora (Ed), *Samisk forskning og forskningsetikk,* Oslo, 2002, 88–98.

[23] For a discussion of Hardin's theory and an overview of recent research on traditional and Western management of common resources, see the thematic issue of the *Journal of Natural Resources Policy Research* 1, 3 (2009) 241–286. For a study on the problems of harmonizing science-based state regulation with Sámi ways of keeping commons in a sustainable state, see J.Å. Riseth and A. Vatn, Modernization and pasture degradation: a comparative study of two Sámi reindeer pasture regions in Norway, *Land Economics* 85, 1 (2009) 87–106.

[24] Swedish original's title 'Inför Lif eller Död? Sanningsord i de Lappska förhållandena.' V. Hirvonen, *Voices from Sápmi: Sámi Women's Path to Authorship,* Kautokeino, 2008.

The Swedish and Norwegian State administrations encouraged systematic infiltration of the new Sámi associations by various state officials, typically so-called 'reindeer trade inspectors'. Using patronizing scientific and economic arguments against traditional Sámi interests, these officials contributed to social divisions within and the sidetracking of the political agendas of the organizations, while journalists from the majority population regularly published condescending reports on their meetings.[25] The early Soviet 'decree on the equality and freedom of smaller peoples' was, in practice, an agenda for the immediate Sovietization of the indigenous peoples of the Russian Arctic. In the Kola Peninsula, the Eastern Sami people were centralized into collectives of reindeer-herding brigades, and relocated away from all sites of interest to the Soviet mining and metallurgical industry.[26]

The role of scholarship in establishing a Sámi nation as part of Scandinavia and Russia

In, 1924 a 'Sámi Program' was issued as an official northern addendum to the Norwegian Social Democratic party program for the up-coming parliamentary elections. Among its proposals were that the language of instruction in Sámi primary and secondary schools should be Sámi in all subjects except Norwegian, and that a professorship should be established in 'Sámi culture and folk tradition' at one of Norway's universities.[27] This goal was not to be fully achieved for another half a century but the Program reflects the emphasis early Sámi activists placed on defending their native language and the crucial role they envisioned for academic research in their political struggle against discrimination (Fig. 5).

In his speech at the First All Nordic Sámi Conference held in Jokkmokk in Swedish Sápmi in 1953, the Sámi PhD of Uppsala University and Swedish State School Inspector of Lapland (*Nomadskoleinspektör*) Israel Ruong (1903–1986) reviewed post-war changes in the social and economic realities of the Sámi. He proposed moderate measures to modernize the conditions of the Sámi and protect their indigenous lifestyle. He also suggested placing special taxes on forestry, hydropower production and the mining industry in northern Norway, Sweden and Finland to build a set of Sámi cultural funds. The funds were to be managed by a joint Nordic Institute of Sámi Culture to provide stipends for Sámi youth, to support traditional Sámi culture and to run a research institute with branches in the humanities, jurisprudence, economic geography, and natural science focusing on reindeer husbandry. The rationale for the study of jurisprudence was to examine the relations between indigenous Sámi arbitrations on land use and contemporary Scandinavian law.[28] The full scope of this remarkable proposal remains unfulfilled today; yet it is strikingly relevant, even in its details, to contemporary discussions on how best to fund and organize research in the high north.

The development of indigenous studies and higher education envisioned by the First Nordic Sámi Conference commenced in Norway with the establishment of the Sámi section at the

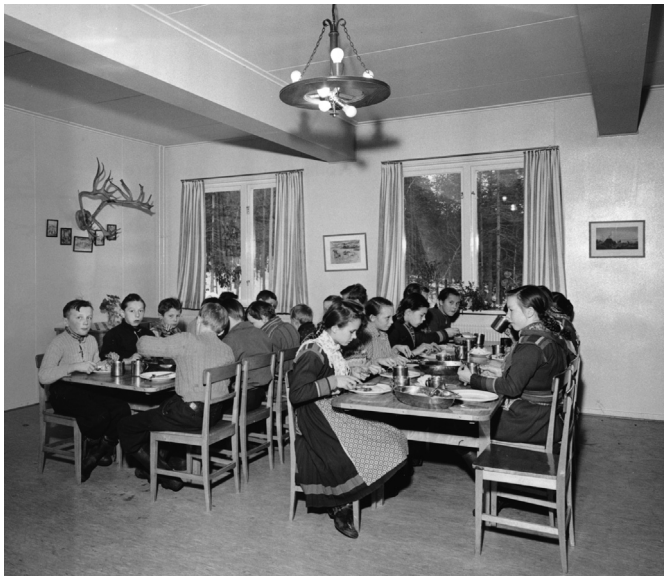

Fig. 5. The cantina of the Gällivare boarding school for Sámi youth, about 1950. The system of mandatory residential schools for Sámi youth remained in force until the 1960s. It was motivated by the difficulties of providing instruction to children of nomadic families, but also by hostility toward the Sámi languages, as all teaching was conducted in the dominant language of the nation where the school was situated. Photo by Karl Heinz Hernried. Permission: Nordic Museum, Stockholm.

University of Tromsø in 1972 and the opening of the Nordic Sámi Institute in 1973. There were three major causes of political change in the development of Sámi rights in Scandinavia after 1945, including improved Sámi access to higher education and the launching of indigenous research inside new and old universities. First, there was an international turn, in politics and scholarship, toward acknowledging the legitimacy of ethnic minorities and the responsibility of any nation to contribute resources to the survival of its aboriginal cultures.[29] This state responsibility was increasingly conceived in a dynamic manner to accept the modernization of indigenous life based on the initiative and self-rule of the minority peoples themselves. New policies on minorities and native peoples were developed and expounded in important UN declarations. Here the role of decolonized scholarship was profound. Relevant skills in rhetoric and jurisprudence went into drafting and negotiating new international civil rights documents. Visionary Sámi scholars, activists and officials such as Ole Henrik Magga, Lars Anders Baer and John Henriksen were central in developing UN declarations on indigenous rights, and Sámi representatives continue this commitment to circum-arctic collaboration in the Arctic Council and in teamwork with indigenous groups such as the Inuit Circumpolar Conference (ICC) and the Russian Association of Indigenous Peoples of the North (RAIPON).[30]

Second, improvements of Sámi rights rose to the top of the political agenda in the 1950s because of the poor state of social services and the

[25] E.-A. Drivenes and R. Jernsletten, Det gjenstridige Nord-Norge: religiøs, politisk og etnisk mobilisering 1850–1990: Ill etnisk bevisstgjøring 1900–1990, in: E.-A. Drivenes, M.A. Hauan, H.A. Wold (Eds), *Nordnorsk kulturhistorie*, Vol. 1, Oslo, 1994, 248–257.

[26] Y. Konstantinov, Memory of Lenin Ltd: reindeer-herding brigades on the Kola Peninsula, *Anthropology Today* 13, 3 (1997), 14–19; A. Afanasyeva, *Forced Relocations of the Kola Sámi People: Background and Consequences*, master thesis, Tromsø, 2013.

[27] Drivenes and Jernsletten, Det gjenstridige Nord-Norge (note 25), 252.

[28] I. Ruong, Om sambandet mellan kultur- och näringsfrågor i Lappmarken, in: K. Nickul, A. Nesheim, I. Ruong (Eds), *Sámiid dilit: Föredrag vid den nordiska samekonferensen Jokkmokk 1953*, Oslo, 1957, 222–230.

[29] O.H. Magga, Samisk forskning i et selvbestemmelsesperspektiv, in: N. Oskal (Ed), *Samisk selvbestemmelse,* Kautokeino, 2002, 130–138.

[30] C.J.B. Hicks, 'Historical Synopsis of the Sámi/United Nations Relationship,' The ArcticIs… A Web Resource on Human–Environmental Relationships in the Arctic, Akureyri, 2002. Available online at http://www.thearctic.is/articles/topics/samisynopsis/kafli_0100.htm. Last accessed 10 July 2013; H. Eidheim, On the organisation of knowledge in Sámi ethno-politics, in: T. Brantenberg, J. Hansen, H. Minde (Eds), *Becoming Visible – Indigenous Politics and Self-Government*, Tromsø, 1995. Available online at http://www.sami.uit.no/girji/n02/en/106eidhh.html. Last accessed 10 July 2013.

dismal quality of life in general in the Sámi core areas; in Norway, these areas were the interior of the sub-arctic counties of Troms and Finnmark. In 1956, the Nordic Sámi Council was formed. Its members articulated a cross-border Sámi identity and a positive awareness of the value of Sámi culture and language. General living standards were gradually raised for the Sámi population in the following decades. Teaching in Sámi was finally accepted alongside teaching in Scandinavian languages in primary schools. Sámi professionals became more numerous and by the 1970s formed a state-employed, rather well-off group in the central north. In Norway and Sweden, reindeer herding was reserved by law for people of Sámi descent, thus granting social and economic sustainability to this way of Sámi life. However, the deterioration of the fishing-based Sámi coastal culture has continued into the present.[31]

Third, the protracted conflict over the construction of the Alta-Kautokeino River dam and hydropower plant in the Sámi areas of northernmost Norway in the late 1970s and early 80s gained international media coverage and political importance. The original plan of the Norwegian Water Resources and Energy Directorate in charge of the project was to set an entire Sámi village under water and transform parts of the actual rivers into lakes, disrupting local reindeer migration and salmon fishing. After initial protests, the plan was reduced considerably by the Norwegian Parliament. In 1978, a Popular Movement against the Development of the Alta-Kautokeino Waterway was formed; petitions to courts were filed but ruled against. Sámi alliances and the Scandinavian environmental movement joined forces and turned to methods of civil disobedience. Local construction sites were occupied, and in Oslo, hunger strikes were undertaken by Sámi activists in front of the Norwegian Parliament.[32]

The scale of this movement was remarkable by Scandinavian standards; not since the Second World War had people been arrested for rioting in Norway. Approximately one thousand protestors, joined by several like-minded international participants, sat down on roads and chained themselves together and to objects at the construction site during the peak of the protests in January 1981, when the postponed works were scheduled to recommence. Ten percent of the entire Norwegian police force was on hand, and the military was on alert to enter the scene but they were ordered back in the nick of time by the prime minister. Demonstrators were removed by force. The threat of escalating violence was real, but reconciliation prevailed as a reduced version of the hydropower project was constructed. The result was in effect a political victory. The Sámi cause had been made visible internationally and gained general support from the majority of people in Norway and abroad.[33]

These events promoted a further shift in governmental policies on indigenous issues. Norway signed the ILO Convention on Indigenous and Tribal Peoples when it was adopted by the International Labour Conference in 1989, and a Norwegian Sámi Parliament was established in Karasjok in northernmost Norway the same year. This was followed by the creation of a Sámi Parliament in Sweden in 1993 and in Finland in 1996 (Fig. 6). In 2008, a Russian Committee for a Sámi Parliament started working toward a similar goal. A new system of regional governance over the large state commons of northernmost Norway was instigated democratically and resulted in the Finnmark Land Reform implemented in 2006.[34]

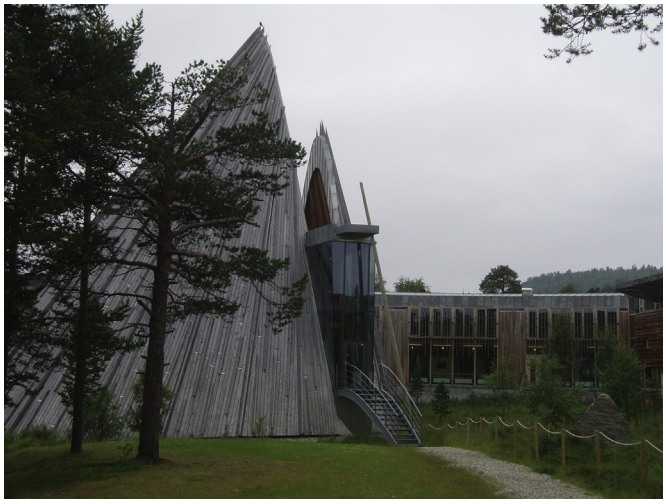

Fig. 6. Buildings of the Norwegian Sámi Parliament in Karasjok, completed in 2005. Architects Stein Halvorsen and Christian Sundby were commissioned to express traits of the Sámi civilization in their design of these lavish facilities. Thus the plenary assembly hall on the left is shaped in semblance with the tipis of the traditional nomadic Sámi culture. Photo in 2007 by Roald Ivar. Used under Creative Commons license BY-ND 3.0.

Throughout this process many Sámi and non-Sámi scholars either contributed to policy making as activists or were called as experts to advise and provide data for various political decisions. The partisan role of the researcher was discussed, but arguments were also made for the value of continuing the development of a special Sámi university campus around the previously mentioned Nordic Sámi Institute established in 1973 in the center of Sápmi at Kautokeino.[35] A Sámi University College was inaugurated at Kautokeino in 1989, but a few years later the program in Sámi research at the University of Tromsø was criticized for drifting away from Sámi concerns into mainstream social anthropology.[36]

[31] H. Eidheim, Ethno-political development among the sami after World War II, in: H. Gaski (Ed), *Sami Culture in a New Era*, Kárášjohka, 1997, 29–61; E. Eythorsson, Intervju med Harald Eidheim, 13. desember 2004 på Etnografisk museum, *Norsk antropologisk tidsskrift* 16 (2005) 248–256.

[32] T. Brantenberg, The Alta–Kautokeino conflict, Sámi reindeer herding and ethnopolitics, in: J. Brøsted, et al. (Eds), *Native Power: The Quest for Autonomy and Nationhood of Indigenous Peoples*, Oslo, 1985, 23–48; R. Paine, *Dam a River, Damn a People? Saami (Lapp) Livelihood and the Alta/Kautokeino Hydro-Electric Project and the Norwegian Parliament,* Copenhagen, 1982.

[33] L.M. Hjorthol, *Alta – Kraftkampen som utfordret statens makt*, Oslo, 2006; J. Gustavsen, Forsvarlig å benytte dynamitt i naturvernets tjeneste, sier Alta-aksjonist Ellen Anne Hætta, *Ringen – vår verden* 33 (1984), 25–28. Several later disagreements over land-use in Scandinavia between Sámi reindeer herders and mining, logging and hydropower corporations, have been inspired by and compared to the Alta conflict. One such prominent dispute, where mining law, reindeer herder's rights and environmental issues are again at stake, is over the exploitation of the large iron deposit of Kallak, in the northern Swedish municipality of Jokkmokk. Brita Thomasson, *Minerallagen vs. Rennäringslagen: En studie av rennäringens skydd när mineralutvinning planeras på renskötselområde*, master thesis, Luleå, 2012.

[34] R. Kuokkanen, Indigenous peoples on two continents: self-determination processes in Sámi and first nation societies, *European Review of Native American Studies* 20, 2 (2006) 1–6; H. Minde, The Alta Case: from the local to the global and back again, in: G. Cant, A. Goodall, J. Inns (Eds), *Discourses and Silences: Indigenous Rights, Risks and Resistance,* Christchurch, 2005, 13–34. On the Sámi parliaments see E. Josefsen, *The Sami and the National Parliaments: Channels of Political Influence,* Kautokeino, 2003.

[35] T. Thuen, Samiske studier: En oversikt og noen problemstillinger, in: M. Rugkåsa, K. Trædal Thorsen (Eds), *Nære steder, nye rom: Utfodringer i antropologiske studier i Norge,* Oslo, 2003, 107–162; A.N. Sara, Perspektiver for forskningen ved Nordisk Samisk institutt, *Acta borealia* 2, 1–2 (1985) 81–85.

[36] There has been a prolonged debate on this issue; see V. Stordahl, Harald Eidheims betydning for studiet av samiske forhold sett fra et samisk ståsted, *Norsk antropologisk tidsskrift* 16 (2005) 229–238; Thuen, Samiske studier (note 35); A. Hoëm, Research activities concerning saami education in Norway: a survey, in: V. Hirvonen (Ed), *Davviriikkalaš sámi skuvladutkiid konferánsa 2001: Kautokeino*, Kautokeino, 2003, 16–24; S. Joks, Samisk forskning svekkes, *Cultura Polaris* 2, 2 (1998) 5; A. Hoëm, Sámi Instituhtta i forskningssamfunnet, *Acta borealia* 2, 1–2 (1985) 87–91; H. Minde, Forskersamfunnet og det samiske samfunn som referanseramme i studiet av samiske rettigheter, *Forskningsnytt* 30, 6–7 (1985), 31–34.

Indigenous research and the hurdles of decolonization

Some results of colonial research, such as ethnographic documentation and linguistic records, provide unique sources of information of enduring value. The postcolonial utilization of these records may be unproblematic – provided that the contemporary user is aware of the original principles of inclusion and omission of items in the material.[37] Other collections such as the skeletal remains of aboriginal peoples, kept in metropolitan museums and anatomical institutions, have brought to light ethical issues and claims on repatriation and re-burial, which some have found easy to arbitrate. However, the best interests of anyone made the object of technoscience are not necessarily easy to establish, even less to forecast. The problem is most obvious when the process of repatriating materials is conceived in ways that terminate their role as sources for Western science and scholarship. Remaining in the repository, human biological samples may play a crucial role in research regarding, for example, genetic conditions that could be of positive concern to the members and future descendants of the ethnical group under consideration, from medical but also legal and political points of view. This dilemma carries a wider ethical component of general human interest in terms of, for instance, the gains that research based on such collections may generate in medical therapy.[38]

The battle with metropolitan museums for the return of all cultural objects taken from their original owners during and after the age of colonialism has been carried forward in recent years on a wave of enthusiastic scholarship and journalism.[39] However, some champions of the decolonization of museum curatorship have begun to recognize the challenges in this. Some have argued – offensively to many – that free trade in objects of any commercial value is standard neo-liberal practice today and is globally celebrated as the only realistic way to balance all interests in the distribution of everything. Even more provocative, but more interesting with respect to the issue of decolonizing research, is the cosmopolitan argument that cultural objects from a particular region and period of time are (also) part of a global human heritage. An ethnically identifiable object of art, for example, can be experienced and have sufficient significance to any person or group of people to out-balance (in utilitarian terms) the value it has to those who claim rights to it based on their ethnic or national identity.[40] A more practically oriented argument against complete repatriation of collections held abroad is the risk that political turmoil in the country of origin may lead to major destruction of its cultural objects, as for example in the systematic eradication of Buddhist cultural heritage in Afghanistan during the Taliban rule in the early 2000s decade.[41]

Ethnology and anthropology were the core colonial competencies guiding the Western administration of the 'other.' As discussed above, the shifting priorities of these branches of scholarship were among the early signs of reform.[42] Today, of course, the majority of the research labeled ethnology and social anthropology ponders issues other than indigenous matters. According to some, ethnology in contemporary Norway is preoccupied with cultural studies and the history of mentalities and neglectful of its original curatorship of ethnography and folklore. This might suggest that one consequence of decolonization could be a diminishing interest in indigenous issues in the research community at large.[43]

Growing numbers of students with an indigenous identity and command of their native languages have entered higher education. The professional with a native background and fluency in the local language is more likely to become a positive representative of the public bodies of the majority society and to establish good communication with its indigenous citizens. However, this double competence of the Western-trained native professional seems to come at the price of certain distrust by other indigenous people.[44] We suggested previously that this situation may result from the hegemonic element ingrained in technoscience and from the identity hybridization of the native professional, and this is an issue considered further in the final section of this article.

Contemporary indigenous research has been criticized for continuing to exploit its objects of study because it serves to open career opportunities for its academic practitioners, and this despite – or perhaps because of – many explicit statements of partisan commitment made before, during and after the research in question has been conducted.[45] Researchers paying lip service to the interests of indigenous peoples are undeniably another hurdle on the road to decolonization. On the other hand, this problem is not unique to indigenous studies. Despite declarations that its goal is the best interests of humanity, or that of the human object of its study, any research project may further an individual's career. However, partisan research has mainly been criticized on the normative claim associated with the ethos of science that researchers should be neutral with regard to competing human interests. Further criticism is delivered by those who hold to the universalist idea that scholarship, science, and technoscience are either right or wrong, and for whom undertakings such as 'Sámi research' or 'research executed to strengthen and develop the Sámi society/nation' are inconsistent with the fundamental process of establishing facts by replication and international consensus

[37] See for example H. Eidheim, I. Bjørklund, T. Brantenberg, Museene, publikum og antropologien: et formidlingsprosjekt ved Tromsø Museum, *Norsk antropologisk tidsskrift* 13 (2002) 124–136; Norges forskningsråd, *Samisk forskning: forskningsrådets utredning: november 1998*, Oslo, 1998, 32.

[38] L. Nilsson Stutz, Archaeology, identity, and the right to culture – anthropological perspectives on repatriation, *Current Swedish Archaeology* 15 (2007) 1–16; A. Schanche, Knoklenes verdi: Om forskning på og forvaltning av skjelettmateriale fra samiske graver, in: NESH: Den nasjonale forskningsetiske komité for samfunnsvitenskap og humaniora (Ed), *Samisk forskning og forskningsetikk* (note 22), 99–133. For information on the ethical compromise between repatriation and related scientific research in the US, see A.M. Kakaliouras, Leaving few bones unturned: recent work on repatriation by osteologists, *American Anthropologist* 110 (2008) 44–52; S.D. Ousley, W.T. Billeck and R.E. Hollinger, Federal repatriation legislation and the role of physical anthropology in repatriation, *American Journal of Physical Anthropology* 128, S41 (2005) 2–32.

[39] L. Tuhiwai Smith, *Decolonizing Methodologies: Research and Indigenous Peoples*, London, 1999, 61; I.-M. Mulk, Conflicts over the repatriation of Sámi cultural heritage in Sweden, *Acta Borealia* 26 (2009) 194–215.

[40] K.A. Appiah, Whose culture is it? *New York Review of Books* 53, 2 (2006) 38–41; D.A. Hollinger, From identity to solidarity, *Dædalus* Fall (2006) 23–31; K.A. Appiah, *Cosmopolitanism: Ethics in a World of Strangers*, London, 2007.

[41] D. Gillman, *The Idea of Cultural Heritage*, 2nd rev. ed., Cambridge, 2010.

[42] T. Hylland Eriksen, Antropologien er død – leve antropologien, *Norsk antropologisk tidsskrift* 12 (2001) 137–145; Tuhiwai Smith, *Decolonizing Methodologies* (note 39), Ch. 3.

[43] For information on the contemporary state of ethnology and the humanities in Norway, see S. Lindstrand, Etter festen: Det har blitt magre tider for mange universitetsfag, studenterne sviker, hva nå? *Forskerforum* (2010:9) 12–17.

[44] S. Kvernmo and V. Stordahl, Fra same til akademiker = fra deltaker til observatør: erfaringer fra utviklingen av en samisk helsetjeneste" *Sami medica* (1990:1) 4–10; Thuen, Samiske studier (note 35), 148.

[45] W.S. Shaw, R.D.K. Herman and G.R. Dobbs, Encountering indigeneity: re-imagining and decolonizing geography, *Geografiska Annaler: Series B, Human Geography* 88 (2006) 267–276; I.-L. Moen, [Interview with] Jeremy Beckett: in defence of fieldwork, *Cultura Polaris* 2, 2 (1998) 16–17.

among the acknowledged peers of the relevant research community.[46]

Scholars have also debated whether post-colonialism is served by efforts to decolonize recorded knowledge about traditional societies to serve the cause of ethnic revival because the rift between life in the past and the contemporary integrated global community is so great. According to this conception, indigenous movements cannot claim continuity with pre-colonial native culture because such claims must not include any Western knowledge.[47] If there is a real continuity that legitimizes speaking about contemporary ethnic identity with past societies it cannot be pieced together reflexively from Western records. In similar vein, what might be called the school of cosmopolitan anthropology denies claims of continuity with traditional societies of the past as a way to build a sense of indigeneity anywhere within the reach of globalization. This controversial claim has been regarded as an attack on ethnic nation building and bicultural politics in economically (but not necessarily socially) integrated societies.[48] It has been argued that if decolonizing research affirms native and ethnic identity building in the contexts of latent or overt conflict, it risks providing ammunition for nationalism, separatism and xenophobic movements.[49]

Finally, there are also schools of indigenous study such as the radical kaupapa Maori that get around the problems of decolonization, as well as the project of indigenizing the (Western) academia, by arguing that kaupapa Maori research is and will remain non-Western. This circumvention solves most of the dilemmas of decolonization discussed above and has received the attention of Sámi scholars.[50] It is in line with the mild relativism of knowledge and the denial of the neutrality and universality of science, suggested since the 1970s in the sociology of science, and by many studies in science, technology and society (STS).[51]

Despite an expressed willingness to decolonize research among both its sponsors and practitioners, decolonization has proved difficult to achieve.[52] Post-colonialism is not a reformed state attained at a certain moment in history but rather the establishment of consensus to strive toward less hegemonic distributions of responsibilities between so-called centers and peripheries of research, the insides and outsides of the natural and social fields of normal science. It signals a critical engagement with the present effects – intellectual and social – of centuries of European expansion on Western former colonies and beyond, across its ever expanding spheres of interest.[53] This consensus should be vigorously pursued. The chronicles of local colonial events as well as its general interpretations need to be rewritten from the field and presented at metropolitan centers of learning.[54]

Technoscience at the nexus of Western and indigenous knowledge

Quite often, questions about the compatibility of technoscience and traditional or modernized indigenous knowledge are confused with questions about whether these systems of knowledge are equally interesting or useful or whether they need to be ranked somehow in relation to each other.[55] Some have simply tried to deny the problem by dismissing the idea of a divide between these systems as sterile, whether that divide is drawn to improve the standing of indigenous knowledge or to somehow safeguard the interests of those who are disadvantaged.[56] This may be well-intentioned but the causes it seeks to forward will not be furthered by conflating science and traditional knowledge; rather, the opposite seems likely. The argument stems from the philosophical side of this problem rather than from the practical reality of the confrontations between Western science and traditional or folk wisdom. These arrays of knowledge, enactments and practices have different histories and different but also overlapping areas of application, and they are intertwined in a colonial past and a multilayered contemporary reality of cultures and subcultures within the Western sphere.

In this section, the status of traditional versus scientific knowledge is considered because it impinges on their epistemological relationship and on, the possibility of transferring insight and findings between them in ways beneficial to both. Field sciences and colonial science are parts of technoscience, and it is a standard trope used by proponents of science to seek interpretational hegemony over other knowledge systems to refer to the practical superiority of the achievements of technoscience rather than scientific knowledge.

There are instances in contemporary Sámi experience in which a balance seems to have been struck between exposure to global forces and the indigenous community's ability to exercise autonomous choice in appropriating from technoscience (Fig. 7). Some indigenous applications of technoscience have depended mainly on the economic capacity to acquire pieces of technoscience, and sufficient scientific insight on the part of indigenous people to produce new indigenous technoscientific practices. The so-called RenGIS community environmental mapping system in Sweden seems to be a successful contemporary example of this. Combining rugged GPS-equipped handheld computers with touch-screen software to collect field data, members of the reindeer herding community control a system that monitors the movement and thus land-use of the reindeer. This makes it possible to compile indigenous information about the impact of mining on reindeer grazing areas for example that is robust enough to assist in Western legal proceedings.[57]

[46] Cf. T. Bull, Kunnskapspolitikk, forskningsetikk og det samiske samfunnet, in: NESH: Den nasjonale forskningsetiske komité for samfunnsvitenskap og humaniora (Ed), *Samisk forskning og forskningsetikk* (note 22), 6–21.

[47] A. Kuper, The return of the native, *Current Anthropology* 44 (2003) 389–402; K. Pohl, 'Es lebe alles, was saamisch ist' Saamische Ethnopolitik zwischen Primordialismus und Instrumentalismus, *NORDEUROPAforum* (2007:2) 7–27.

[48] E. Rata, Rethinking biculturalism, *Anthropological Theory* 5 (2005) 267–284; J. Friedman, Indigeneity: anthropological notes on a historical variable, in: H. Minde, et al. (Eds), *Indigenous Peoples: Self-determination, Knowledge, Indigeneity*, Delft, 2008, 29–48.

[49] A. Babadzan, Anthropology, nationalism and the 'invention of tradition', *Anthropological Forum* 10 (2000) 131–155.

[50] S. Walker, A. Eketone and A. Gibbs, An exploration of kaupapa Maori research, its principles, processes and applications, *International Journal of Social Research Methodology* 9 (2006) 331–344; J. Porsanger, An essay about indigenous methodology, *Nordlit* 15 (2004) 105–120.

[51] J. Law, On sociology and STS, *The Sociological Review* 56 (2008) 623–649.

[52] W. Anderson, From subjugated knowledge to conjugated subjects: science and globalisation, or postcolonial studies of science? *Postcolonial Studies* 12 (2009) 389–400; A.L. Stoler, Imperial debris: reflections on ruins and ruination, *Cultural Anthropology* 23, 2 (2008) 191–219.

[53] Anderson, Introduction: postcolonial technoscience, 644 (note 5).

[54] V.-P. Lehtola, The Sámi: a history of our own, and O.H. Magga, Sámi past and present, and the Sámi picture of the world, both in: E. Helander (Ed), *Awakened Voice: The Return of Sámi Knowledge,* Kautokeino, 1996, 64–73, 74–80.

[55] M. Bravo, Cultural geographies in practice: the rhetoric of scientific practice in Nunavut, *Ecumene* 7 (2000) 468–474; A. Agrawal, Indigenous knowledge and the politics of classification, *International Social Science Journal* 173 (2002) 287–297.

[56] A. Agrawal, Dismantling the divide between indigenous and scientific knowledge, *Development and Change* 26 (1995) 413–439, 433.

[57] T.M. Herrmann, K. Granqvist, P. Sandström, H Asselin, J. Mameamskum, G. Guanish, J.–B. Coons, R. Cuciurean and N. Saganesh, Effects of mining on reindeer/caribou populations and indigenous livelihoods: community-based monitoring by Sámi reindeer herders in Northern Sweden and First Nations in Northern Quebec, *Polar Journal* [forthcoming].

Fig. 7. Sámi people appropriating technoscience: aircraft assisting Sámi fishing on Lake Sitojaure in northern Sweden in the 1950s. Photo by Ernst Manker. Permission: the Nordic Museum, Stockholm.

The Western-styled school, with its tuition facilitated by technoscience, can also maintain and develop native traditions in circumstances where the passing of knowledge between generations immersed in the old nomadic lifestyle has begun to break down. Traditional indigenous techniques, called handicrafts by the majority society, have been incorporated into the northern school system of practical teaching, and this has helped uphold and develop *duodji*, the traditional method of making of Sámi clothes, tools and utensils. Wider interaction among Sámi groups and between Sami and other indigenous communities has produced cross-fertilization and hybridization in artwork. Introduced to the international art and fashion scenes traditional and the hybridized handicraft and artwork have acquired commercial value from which indigenous artisans can gain.[58]

Less modifiable elements of technology – e.g., snowmobiles, radio communication, helicopters, GPS transmitters on reindeer etc. – have been appropriated into traditional reindeer husbandry and effected voluntary changes in Sámi ways of life. Thus the reindeer herding *siida*, or nomadic village, became more stationary after the transfer of the technologies just mentioned. This has helped to keep families together with their children and undercut the rationale behind the detrimental system of mandatory residential schools for Sámi youth of the 1950s and 1960s.

There is a circum-Arctic trend in policy-making that strives to integrate science and traditional knowledge in joint sustainable land management regimes.[59] Despite much enthusiasm, expressed not least by various research funders and communities, serious doubts remain about whether the different ways in which traditional and scientific knowledge are generated, stored and presented allow for meaningful communication. To suggest that traditional ecological knowledge should be given serious attention in respectful collaborations around land-management issues is good policy making,[60] but to call this joint scientific research without major re-consideration of the normal practice and traditions of Western science will neither serve the preservation of traditional knowledge nor native interests. Science's claim to superior universal knowledge is one obstacle; another is its practitioners' normal reluctance to acknowledge that what anyone holds to be true, and his or her ability to develop that knowledge into a dominant narrative is conditioned by historical path dependence and political and economic resources.[61] Scientific management has set goals for national parks and nature reserves, including securing subarctic bio-diversity, protecting 'wilderness' and safe-guarding the sustainability of many resources, without realizing that several of these concepts have different meanings and to some extent no counterpart in traditional land use.[62] The insistence that this problem cannot be fixed in the old colonial way by dismissing native land management (the very concept is an oxymoron) whenever there is a conflict in outlooks between science and traditional knowledge has caused controversy.[63]

There is some doubt, then, that recent much-acclaimed multidisciplinary research collaborations between Sámi scholars and natural scientists on the use, richness and preservation of traditional knowledge of reindeer herding and other matters will strengthen modern indigenous knowledge as an alternative way of knowing. The main philosophical objection is the incommensurability of scientific reductionism with holistic traditional wisdom based on for example tacit knowledge.[64] Because nothing indicates that the epistemology of science is up for revision, one must doubt the prospects of integrating, using or benefitting traditional knowledge in multidisciplinary collaboration with ecology. In contrast to the success in preserving and developing Sámi *duodji* based organizationally and pedagogically on the Western style of school teaching, attempts to keep traditional knowledge on nature based on integration in Western science have not been convincing and risk producing a set of scientifically reduced, interpreted and stored records extracted from indigenous cultures, once again turning them into packages of dead artifacts torn out of context. Attempts to introduce indigenous knowledge in science school curricula to achieve multicultural and interdisciplinary teaching have also been well-intended but lacking in rigor.[65]

[58] These are the conclusions reached by the present authors after discussing with students, teachers and the school leader during study visits to the Sámi Education Institute (SEI) Inari campus in northern Finland in 2006 and 2009. The SEI is a secondary degree school that provides vocational training in both Finnish and Sámi, along with promoting Sámi culture in all of Sápmi.

[59] B.J. McCay and S. Jentoft, Market or community failure? Critical perspectives on common property research, *Human Organization* 57 (1998) 21–29; A.I. Keskitalo, Sedentary and nomadic Sámi in a research program context, in: E. Helander (Ed), *Awakened Voice: The Return of Sámi Knowledge,* Kautokeino, 1996, 44–53.

[60] H.P. Huntington, Using traditional ecological knowledge in science: methods and applications, *Ecological Applications* 10 (2000) 1270–1274.

[61] M. Bravo, Voices from the sea ice: the reception of climate impact narratives, *Journal of Historical Geography* 35 (2009) 256–278.

[62] A. Sande, *Villmark i grenseland: Samenes hjemland, nasjonalpark eller verdensarvområdet Laponia?*, Oslo, 2010; R. Howitt and S. Suchet-Pearson, Rethinking the building blocks: ontological pluralism and the idea of 'management', *Geografiska Annaler: Series B, Human Geography* 88 (2006) 323–335; J.Å. Riseth, An indigenous perspective on national parks and Sámi reindeer management in Norway, *Geographical Research* 45 (2007) 177–185.

[63] M. Dowie, *Conservation Refugees: The Hundred-Year Conflict between Global Conservation and Native People*, Cambridge (MA), 2009; J. Cruikshank, Uses and abuses of 'traditional knowledge': perspectives from the Yukon Territory, in: D.G. Anderson, M. Nuttall (Eds), *Cultivating Arctic Landscapes: Knowing and Managing Animals in the Circumpolar North*, New York 2004, 17–32; P. Nadasdy, Reevaluating the co-management success story, *Arctic* 56 (2003) 367–380; J. Cruikshank, Legend and landscape: convergence of oral and scientific traditions in the Yukon Territory, *Arctic Anthropology* 18 (1981) 67–93.

[64] S.-R. Nystø, Common concern for the Arctic – arctic research – science and traditional knowledge – recommendations for consideration, Address at the Nordic Council of Ministers' conference Common Concern for the Arctic, Panel discussions 'Arctic Research – Science and Traditional Knowledge', September 9th–10th 2008 in Ilulissat, Greenland; E. Eythorson, Sámi fjord fishermen and the State: traditional knowledge and resource management in northern Norway, in: J.T. Inglis (Ed), *Traditional Ecological Knowledge: Concepts and Cases*, Ottawa, 1993, 133–142.

[65] L.R. Simpson, Anticolonial strategies for the recovery and maintenance of indigenous knowledge, *American Indian Quarterly* 28 (2004) 373–384; E. McKinley and G. Stewart, Out of place: indigenous knowledge in the science curriculum, in: B.J. Fraser, K.G. Tobin, C.J. McRobbie (Eds), *Second International Handbook of Science Education*, Springer International Handbooks of Education Vol. 24, Dordrecht, 2012, 541–554.

Fig. 8. Skolt or East Sámi traditional Käpälä fishing technique for wild salmon in the Skoltefossen rapids of the Neiden river, not far from Kirkenes in arctic Norway. Photo in July 2005 by Risto Varhe. Used under Creative Commons license BY 3.0.

The status, preservation and development of indigenous knowledge — including techniques and resource management — now depend on whether it is acknowledged politically by the majority society and integrated in its economy more than on whether scientists respect such knowledge and would like to draw upon its tacit insights and collective memories. The majority society will continue using science as its tool to evaluate and monitor industrial resource exploitation in order to attain sustainability. If there is a political will traditional indigenous practices can be granted a special status to remain or develop within this scientific-legal framework. To take one example we may consider contemporary Skolt or East Sámi traditional Käpälä fishing of wild salmon at Neiden in arctic Norway. Before industrialization reached this part of Norway, bringing with it mechanized coastal fishing, the local Skolt Sámi *siidas* shared the rich salmon resources of the rivers in their regions. Seasonal harvesting techniques, like the highly efficient cast-net method (shown in Fig. 8) were sustainable then. The cast-net method was based on tacit knowledge, requiring a well-developed and choreographed bodily technique involving three men, who would throw a large set of stones in a coordinated movement to sink the net and spread it over the right area of water in the rapids—all without any of them falling into the frigid, fast-flowing water. Today the fishing regulation of the salmon rivers of Norway includes a special clause specifying a time-slot and a total quota for the catch by Käpälä fishing in the Neiden rapids. This regulation is based on the reporting of all catches and systematic scientific monitoring. On the Norwegian part of the Neiden River, for example, it grants the exclusive right to Käpälä fishing to the landowners along that part of the river who are mainly Skolt Sami. Fishing is important for the Skolt Sami in cultural and in commercial ways—and increasingly so also as a public tourist event. Today a growing minority of younger Skolt Sami, after fishing for and selling some of the catch (mindful of the public entertainment value of traditional fishing methods), release a substantial number of their quota of salmon back into the Neiden River to boost its reputation as a good place for anglers, thus drawing more income to their tourist establishments along the river.[66]

In discussing the relationship between traditional knowledge and Western science it is worth noting that mainstream scientists and their organizations typically challenge all types of folk wisdom. This has been a central and constitutive element of modern science since its formation in the 16th century. Considering the enthusiasm on behalf of some natural scientists to collaborate in funded programs with elders and carriers of indigenous knowledge, there seems to be a need to remind everyone about the proverbial cake that you sadly cannot have and eat as well. The guidelines issued in many countries over the past decades specifying the proper conduct of Arctic field research with respect to indigenous people are not settling this underlying issue.[67] Science throughout its modern history has been a sworn enemy of all superstition, including shamanism, holism, sacral phenomena, spirituality, occultism, etc. The aversion toward pseudo-science and the programmatic non-pluralistic nature of Western science have proved to be successful principles in many ways; it would take nothing less than an epistemological paradigm shift on the behalf of Western science to harmonize that practice with traditional knowledge.[68] This route seems neither realistic moving forward nor the best way to address the political issues that are really at stake here and that remain within the socio-economic sector of the majority society.

Conclusions

The tools, practices and enactments of Western knowledge are the core of technoscience. It may not be possible to decolonize it unless the project of technoscience is better understood and deconstructed in terms of its intrinsic reductionist aim of handling and colonizing the exterior. The general aim of technoscience is to control and produce desirable outcomes for its sponsors and practitioners in interpreting, predicting and managing the material other. It is not enough to simply make political declarations before unleashing technoscience. The instrumentality of technoscience is based on it being a reductionist tool used to handle the material world in the most economical way, which means, among other tasks, externalizing as many 'irrelevant' concerns as possible. In this interpretation, decolonizing technoscience will be a political matter relating to its governance rather than some type of reform possible to complete once and for all.

It is still worth trying to indigenize Western knowledge production to make it more interdisciplinary, versatile and truly universal. One difficulty is that this effort tends to make technoscience locally more relevant at the price of its cross-cultural applicability. Among the social arguments for indigenizing research – and for indigenizing the academy – are improving the inclusion of previously marginalized communities in the scientific discourse and opening Western scholarship to a wider sphere of experiences relating, for example, to tacit and intuitive knowledge and the fundamental bond between man and nature.[69] In redefining Eurocentric concepts, these acts may function as a response to

[66] H. Henriksen, Slipper ut laks fra Käpälä, *Sør-Varanger Avis* (4 July 2013) 4–5; A. Andresen, States demarcated – people divided: the Skolts and the 1826 border treaty, in: T.N. Jackson, J.P. Nielsen (Eds), *Russia–Norway: Physical and Symbolic Borders*, Moscow, 2005, 80–94.

[67] F. Korsmo and A. Graham, Research in the North American north: action and reaction, *Arctic* 55 (2002) 319–328.

[68] Harding, Is science multicultural? (note 6). The so-called 'Science Wars' in the 1990s between this line of research and the views of mainstream scientists was a controversy involving, among others, the issue of the cultural universality of science; see J.R. Brown, *Who Rules in Science? An Opinionated Guide to the Wars*, Cambridge (MA), 2001; W.W. Cobern and C.C. Loving, Defining 'science' in a multicultural world: implication for science education, in: E. Scanlon, et al. (Eds), *Reconsidering Science Learning*, London, 2004, 195–214.

[69] E. Helander-Renvall, Animism, personhood and the nature of reality: Sámi perspectives, *Polar Record* 46 (2010) 44–56.

Jacques Derrida's call to recreate the humanities to save them from economic rationalism by neoliberal reforms of higher education modeled on the idea of the pure instrumentality of technoscience.[70] By restoring the Sámi episteme, so-called alter-Native practices of conducting science can be developed.[71] Many surely find reflection on the incongruity of holism and reductionism a waste of time that could be better spent conducting normal science. Nevertheless the active appropriation of technoscience by indigenous individuals and communities has been highly productive in expanding indigenous knowledge and furthering indigenous self-articulation.

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[70] J. Derrida, [transl. C. Porter and E.P. Morris], The principle of reason: the university in the eyes of its pupils, *Diacritics* 13, 3 (1983) 2–20; S. Slaughter and G. Rhoades, *Academic Capitalism and the New Economy: Markets, State, and Higher Education*, Baltimore, 2004; G.E. Karlsen, *Utdanning, styring og marked: Norsk utdanningspolitikk i et internasjonalt perspektiv*, Oslo, 2006.

[71] R. Kuokkanen, Sámi higher education and research: toward building a vision for future, in: H. Minde, et al. (Eds), *Indigenous Peoples: Self-determination, Knowledge, Indigeneity*, Delft, 2008, 267–286; R. Kuokkanen, Láhi and attáldat: the philosophy of the gift and Sámi education, *Australian Journal of Indigenous Education* 34 (2005) 20–32; Porsanger, An essay about indigenous methodology (note 50).