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## 29. Indigenous knowledge traditions and science

*Helen Verran*

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Is Indigenous knowledge fundamentally the same as science, although different in some important aspects? Or, is the contrast better presented by recognizing that the world's many Indigenous traditions of doing and making knowledge are profoundly different than, and 'other' to, the sciences and modern knowledge generally? If you ask philosophers and practitioners of the many sciences interested in inquiring into what is involved in working with practitioners of Indigenous knowledge this question, the first answer will generally be given. There, it is assumed that knowledge is singular, as is reality: knowledge is knowledge. This response has all knowledges as generating symbolic representations, and these days it is generally agreed that all such representations are of equal value. This is where things get tricky, because here we get entangled with skepticism, an age-old unresolved issue in Western studies of knowledge.

On the other hand, if instead you ask practitioners of Indigenous knowledge traditions the same questions, they will likely take the opposite position. Many, perhaps most authoritative practitioners of Indigenous knowledge traditions, would claim that the sciences and the institutions of governance that they support, are profoundly different than Indigenous knowledge traditions and their institutions. Many Indigenous knowledge authorities will claim that in some sense at least, there is an absolute distinction. However, many will also add that despite differences, practitioners of different knowledge traditions can work together.

In the branch of Science and Technology Studies (STS) that concerns itself with sciences and 'other' knowledge traditions, a likely response to this question would be, 'Well, it depends...'. STS practitioners would be likely to defer judgement and rather, suggest that answers will be found in empirical inquiry. Agreeing with practitioners of Indigenous knowledges, they will likely add that in specific situations it is possible to partially connect-up knowledge communities animated by very different commitments well enough. If you want to answer the question you will need to do ground-work. For these STS practitioners it is possible for scientists and members of Indigenous communities to go on together as different in respecting their differences. But more is needed than tolerance, respect, good will and care. In addition, *in situ* epistemic accountability of practices is required on both sides as they contribute in-practice to the flourishing or otherwise of the institutions of Indigenous polities.

Practitioners in this branch of STS take knowledge as always happening just as it happens, in particular ways in particular places and times, and under specific conditions. Knowledge is simultaneously material and social, and it works as a collective enactment in a here-and-now; it is not always, or even often, a representation (see entries 1, 3 and 4, this volume). Knowledge, scientific knowledge included, is grounded making and doing, and accountable as valid (or not) epistemic practice as it is collectively performed. We might say that this is the STS practitioner working imaginary of what knowledge is, one which sees it as accountable in on-the-ground practices in particular situations.

The entry tells of some exemplary studies in the STS sub-field concerned with sciences and Indigenous knowledges. These are studies which contingently distinguish between, but also

connect-up Indigenous and scientific knowledges through a focus on practices. Honouring the concern of this STS sub-field with ‘the particular’, this overview is organized through naming specific inquiries, arranging them as an alphabetical list. Most of the exemplars I present here refer to studies published by a single author or group of authors, and often take the form of a single published paper, chapter, or in some cases a book. Other exemplars point to vast, long-lived sub-fields of study involving practitioners from a wide range of disciplines, in which STS practitioners are considered to have made a significant contribution. An example of the latter is the topic of Pacific Ocean navigation. What we might think of as the *ur*-text of this STS sub-field proposed it under the title ‘science and other indigenous knowledge systems’. This phrase served as the title of a contribution to the 1995 *Handbook of Science and Technology Studies* (Watson-Verran and Turnbull, 1995) which can be taken as marking the emergence of this STS sub-field.

Before I begin, I explain my use of two terms that may strike some readers as inappropriate. The arcane word ‘epistemics’ is a synonym for knowledge. Its use is usually confined to philosophy, and even many philosophers muddle it up with ‘epistemology’. As an object of study epistemics involves inquiry into knowledge in all its aspects, epistemics is concerned with the many different socialities that knowledge displays. Epistemology, is a constituent element of epistemics, it studies how any knowledge claim gets to be imbued with (enough) certainty. I use the term ‘epistemics’ rather than ‘knowledge’ to signal that when it comes to considering the workings of science and other knowledge traditions, we are dealing with the work of authoritative specialists; experts are always involved on both sides. While it is tempting to think that we are dealing with ‘ordinary’ knowing and knowledge where many assume scientific knowledge is somehow ‘a bit better’ in being formal, this attitude papers over what needs to be revealed (Longino, 2002: 124). Using the term epistemics and worrying about epistemics in practices, is a way of distancing from that pervasive assumption. Science is not ‘ordinary’ knowledge work, and no more ‘ordinary’ are the concerns of those knowledge authorities in ‘other’ traditions whose work is invoked in the descriptive paragraphs that follow.

More controversial is my use of the term ‘story’. Elaborating the studies below, I present them as ‘telling stories’. I use the term ‘story’ here to indicate that in each case the authors acknowledge that they are presenting a scholarly and evidenced interpretation which is open to generative re-interpretation. In the context of juxtaposing the knowledge of Indigenous communities and sciences, however, my choice of ‘story’ is controversial because stories are usually proposed as less trustworthy—mere opinion, compared to theories which are said to be proven truth. Knowledge authorities in Indigenous communities are often said to tell stories, whereas scientists speaking authoritatively from state institutions are said to wield theories. However, if we examine the difference between story and theory through the lens of the words themselves, and consider the difference in terms of the stories the words themselves carry, we see that a ‘*histōr*’ and a ‘*theor*’ in Ancient Greece were differentiated only in terms of power. A *histōr* spoke authoritatively according to those of his own time and place; a *theor* carried the message of an authority approved of by those who governed.

## ARCHIVE

This study is set in the contemporary life of the high Peruvian Andes—in the lands of a people who call themselves Runakuna. Its author, Marisol de la Cadena, grew up in Peru, and went

on to study anthropology. Here she tells of how her interest was piqued by a story told by an acquaintance about a cardboard box containing a variety of more than four hundred documents that had been collected between the 1920s and 1970s. In the 1990s, stored with the seed potatoes, an anthropologist found this collection of documents that recorded moments in an anticolonial political movement of peasant land holders. By then its contents were being used to kindle fires by the descendants of those involved as protagonists in struggles (De la Cadena, 2015: 117–151). The author announces her plan: she hoped that ‘working through the papers in Mariano’s archive, [they] could expound the history of a group of peasants and their allies as they fought against the abuses of (...) landowners (...) However (...) after a few sessions of [her] reading and his commenting on the documents, Mariano decided [they] would not do any more of that’ (De la Cadena, 2015: 118). Instead, they would just go on together as friends doing what needed to be done.

Here the concept of archive is problematized in a cluster of stories that offer detailed juxtapositions pitting sets of practices by which an archive is done in an *ahistorical* mode—as a Runakuna Indigenous archive of *queja purichiy* (walking the grievance across decades). This ‘doing of archive’ involves practices of enduring banishment, of being disappeared, of making public denouncement, of suffering incarceration in dungeons, of attending government supervised *comparendo* (face-to-face confrontations). This existent performative archive is always done in the present here and now. In de la Cadena’s stories, this Indigenous archive is set against those ‘do archive’ as acts of historicizing. Such practices involve collecting together, boxing up, storing, keeping, talking of, indexing, and sometimes displaying, in making an authoritative story of a past.

## CARIBOU POPULATION/*ATĪKU*

In Canada, Elders of the Innu Nation know the figure of *Kanipinikassikueu*, the master of *atiku*, which is the name by which Innu people refer to animals that settler-Canadians call caribou. These elders specifically know the conditions that attach to *Kanipinikassikueu*’s willingness to give animals to, and generally bless, the Innu people of *Metsheshu Shipu* (Eagle River). In contrast, expert practitioners of environmental science know the population dynamics of caribou, in particular they have modelled the George River herd caribou in Newfoundland and Labrador. Mario Blaser (2016), a settler-Canadian tells a story of a crisis that occurred in 2013. It was a crisis of connection and separation between *Kanipinikassikueu* and his *atiku* in *Metsheshu Shipu*, and what seems to be ‘the same thing’—the George River herd caribou. As readers, we see very clearly that the *atiku* of *Kanipinikassikueu* are *not* a herd of caribou.

Blaser helps readers see that this dispute is equally about knowledge and politics. If these two very different entities which many see as the same thing, are actually to be connected on the ground and a mutually satisfactory resolution in the form of a plan for the careful management of these animals to be achieved, elaborate and particular sets of situated practices will need to be invented and authorized as adequate *in situ* in accountable ways, by both sets of knowledge authorities.

## CLINICAL MEDICINE

Telling of happenings during clinical consultation in a prestigious medical establishment in Taiwan, sociologists Lin and Law (2014) characterize encounter and intersection between a version of Chinese medicine and biomedicine. The practices described in this study are those by which the working imaginaries of very different clinical traditions, which express different logics, are assembled and re-assembled as one in use. In this study readers see epistemics of biomedicine and of traditional Chinese medicine being ‘mixed together.’ The expert clinician in this situation ‘works on a processual body-in-its-environment [where] everything is related to everything else’ (Lin and Law, 2014: 816). In the paper we see how this imagined ‘vague whole body in place’ allows for practices that afford the possibility of an unproblematic adding-in of epistemic entities generated in the analytic procedures of biomedicine.

## COVID TIMES COLLECTIVE WELLBEING

Telling stories of an Indigenous way of negotiating the COVID times, this study is concerned with the experience of articulating generative alternatives in provision of public health services for people who call themselves Yolngu and own lands in the northeast corner of Australia’s Northern Territory. The authors comprise a group of Indigenous knowledge authorities employed as university language teachers, and settler-Australian sociologists (Spencer et al., 2022; Wanambi et al., 2023). Like other Indigenous Australians, Yolngu clans have never ceded sovereignty to the Australian state and continue to devote considerable collective effort to maintaining their own sovereign governance practices. This includes ensuring that contemporary Yolngu forms of governance, including public health, are informed by elaborated Yolngu epistemics which are properly accountable in Yolngu institutions.

As the stories told here reveal, in COVID times this work entailed actively bringing into view, simultaneously, human bodies that know themselves through and in quite different sets of practices (see entry 59, this volume). On the one hand, the Yolngu authorities work with the biomedical bodies that hospitals are familiar with and know inside and out through sets of practices organized around microbial entities, and the Yolngu human bodies that are not distinct or separable from kin and place in being part of a loose whole. The study reveals the methodological distinctiveness of Yolngu Indigenous Australian research and institutional knowledge practice, and interestingly also the political work which generates and sustains an active public within Australia’s democracy, one that recognizes, values, and supports the continued working of a lively Yolngu life-way.

## LAND MANAGEMENT FIRE/*WORRK*

An account of the method of an environmental science ‘prescribed burn’ is juxtaposed with an ethnographic account of an episode of purposeful setting fire to a Yolngu Indigenous Australian estate, *worrk* (see entry 48, this entry). The scientists account the purpose of such an exercise as an instrumental intervention in landcare; the Indigenous knowledge authorities tell the purpose as metaphysical; as an expression of the existential connection between the beings

of people and the being of the land. For the clan landowners, *worrk* episodes ask and answer the question ‘How should we live?’

The practices of two disparate conceptualizations of a single actual episode are systematically accounted in a detailed manner. The juxtaposition shows that each set of practices, albeit very different, is at once social and rational. The paper systematically dissolves the orthodox dichotomy between sociality and rationality in accounting knowledge work and governance. Both the concepts ‘prescribed burn’ and ‘*worrk*’ are revealed by the social studies of science practitioner as praxial. In actuality the content of the concepts is practices enacted. Knowledge is constituted by experts carrying out particular sets of practices together in a place and time, respecting that ‘others’ do things differently. The mutual translation of doing together affords the possibility for the disparately constituted epistemic traditions to evaluate the worth of a single episode (Verran, 2002, 2015).

## MAPS

Proposing knowledge as constituting and constituted by ‘spaces’, and hence maps as an exemplary form of knowledge, historical sociologist of knowledge David Turnbull (1989, 2000) considers the ‘messy motley’ of practices that give the lie to ‘the great divide’ between modern science and ‘other’ knowledges. This so-called great divide in epistemics is the outcome of the assumption that rationality and sociality are dichotomous. Whereas modern science is rational, other knowledges (it is claimed) are merely expressions of beliefs espoused by social groups. Spatiality is treated here as self-evidently a common experiential element: ‘Maps are the paradigmatic examples of the kind of spatial knowledge that are produced in the knowledge space we inhabit. Not only do we create [knowledge] spaces by linking people, practices, and places, thus enabling knowledge to be produced, we also assemble the diverse elements of knowledge by spatial means’ (Turnbull, 2000: 89). A founding study in this STS sub-field, inquiry here promotes the idea that the common experience of space can be used in logical knowing and doing in many ways.

The origins of this study of maps arose in studies of the history of navigation across the Pacific Ocean. A famous episode in early 1770 stands out. This involved the devising of a translating map by a master Indigenous navigator, Tupaia. The hybrid-map effected translation between the Western European scientific system of spatial navigation and determination of location in part through measurement of passage of time, within which English naval captain James Cook operated, and the route-following mode of navigation, which operated through narrative sequencing and star compass plotting, as exemplified in the practices of Tupaia. This master navigator was an *Arioi* priest, chiefly advisor and master navigator from Ra‘iātea in the Tahitian islands of Fenua Raro Mata‘I (Eckstein and Schwartz, 2019; Turnbull, 2019).

## MEDICINAL PLANTS

Several types of ground-hugging plants that grow in Namaqualand in South Africa are the focus of this study. Natural products chemists, botanists who focus on phenology, the study of seasonal cycles of plants, and anthropologists cooperated with Namaqualand *kruiedokters* (herbalists) in this study. *Kougoed* or *Scelletium tortuosum*, is one of the plants of interest in all

four epistemic communities, it is used both in the medical practices of the traditional healers, and in the scientific practices of organic chemists, and botanists.

Although as an object of study in each epistemic community the plant is construed quite differently, the four groups of knowledge practitioners can work together, in part through the help of a philosopher and a sociologist of gender. The work was sponsored by a university looking for a way to begin the process of reversing the ‘the epistemic erasures that have been part and parcel of the expansion of the [modern]academy’ (Green et al., 2015: 8). In connecting the various projects of knowing, a vague whole compendium of knowledge about these insignificant looking, but hardy plants as ‘a form of being’ is assembled; the plant is understood simultaneously as just one thing and as many things.

## NUMBERS

In the years after the declaration of the policy of universal elementary school education in Nigeria, classrooms scattered around the ancient African city of Ilé-Ifè in southwest Nigeria were full of enthusiastic children speaking Yorùbá. Tasked with training the teachers required to implement this policy, an expatriate teacher educator found her comfortable working knowledge of number challenged at its foundations. Teaching and learning the use of numbers was high on the agenda of both teachers and parents. The official curriculum specified that numbers as used in modern science were to be taught. However, as it happened the Yorùbá-speaking teachers and children crowding into classrooms brought with them an alternative conceptual form of number. Almost imperceptibly, the practices of counting and measuring in the classroom practices were profoundly altered (Watson, 1987; Watson et al., 1989; Watson, 1990).

The story of a lesson given by a teacher named Mr Ojo, who is very much on the wavelength of these Yorùbá children, is telling. He teaches the children to ‘do’ numbering with a set of practices quite different than what the science curriculum prescribes, and even devises a quite alternative set of equipment (Verran, 2001: 1). Three insights arise for the reader: conceptually, Yorùbá number is quite different in form to the numbers of science; the valuations of things like length that these disparate numbers generate agree; while Yorùbá numbers and science’s numbers remain different in what they do when people are using them, they can be connected in-practice, so that a number that is neither and both a Yorùbá number and a science number comes to life.

Rendering numbers as practices in this way, a more general insight also emerges—numbers come into view from a different perspective, and we recognize the social roles of metrics more generally (Verran, 2022, 2023).

## SALMON POPULATION/LUOSSE

The Deatnu River in northern Norway is a home for fish who jump, and hence in English are called ‘salmon’, derived from the Latin verb *salire* (jump). The language of Sámi people, across whose lands the Deatnu River flows, is remote from Latin, and they do not call these fish who jump ‘salmon’. *Luosse*, is one of the names Sámi people call these fish. Both environmental science and Sámi fishing traditions know these fish who jump in the Deatnu River,

and both these knowledge traditions have a voice in the Sámi Parliament. In juxtaposing these disparate traditions of knowing these fish, Solveig Joks and John Law (2017) propose that both epistemic traditions express care. However, they find that despite this, these two traditions do not work well together when it comes to voicing concerns about these fish to the parliament. It seems that scientific tradition speaks too strongly and with definitive concepts and cannot listen. The Sámi tradition listens well but does not speak in concepts which hold together strongly enough. Sámi concepts cannot easily be made to travel. They are concepts made for particular places and peoples.

## STONES-STORIES/SIEIDIES

In the municipality of Guovdageaidnu/Kautokeino in northern Norway, Sieidies announce themselves to the traveller. Those who can read the landscape know a Sieidi when they see one. They are rocks, stones, often but not always, quite large. Yet seemingly they always sit just-so in the terrain. Sámi peoples whose lives have intersected with the on-going being of these stones, know the stones in practices that take those stones as ‘stories in another form’. In consequence of these stones-stories among other things, Sámi peoples know themselves as peoples.

In vastly different sets of practices the Norwegian State Riksantikvaren (Directorate for Cultural Heritage) also knows the stones. Inscriptions generated in their practices take the form of GPS locations, maps, lists, and rules and regulations concerning what can and cannot be done to or in the proximity of Sieidi. Tourism operators in northern Norway also know Sieidi, and as entrepreneurs they also know those who live in or visit, and love, these northern European landscapes—tourists. As STS practitioners who form a partnership with one such tourism company, Britt Kramvig and Anniken Førde know that in Norway’s colonial past, so-called shamanistic traditions associated with Sieidies, including healing storying practices, were prohibited. They point out that both the people and the land itself have paid a heavy price for this prohibition (Kramvig and Førde, 2020: 39). Through storytelling events, tourism brings the lurking colonial past into the present (see entry 12, this volume). Such actualization in here-and-now practices generates a moment enacting reconciliation. Opening up possibilities for dialogues and multiple engagements is relation-weaving both for locals, Indigenous and settler alike, and for other travellers.

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