

Recapturing the status of indigenous knowledge and its relation to Western science

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Abstract

Western science has become epistemically and politically correct over the last two or three centuries (in the West, and then elsewhere). Its practical correctness has been underpinned by claims about utility, about technological and other goodies derived from science – a sort of internal cargo cult, but one which is coming under pressure in the risk society. Indigenous knowledge is becoming practically correct (as an as yet insufficiently tapped resource for development) and politically correct (cf. reconciliation). Is it now also epistemically correct? For that matter, how 'correct' is Western science here? I will use sociology of knowledge insights to address these questions, after outlining the structure of debate and practice on indigenous knowledge.

Keywords: indigenous knowledge, Western science, political correctness, practical correctness, epistemic correctness, cosmovision

Introduction

The shift in status of so-called indigenous knowledge from what used to be the province of missionaries and anthropologists (and also geographers), and was then taken up in development studies and practical work in agriculture and health, is indicated by its now being one element in the work of science funding agencies like the South African National Research Foundation. It is not easy for the National Research Foundation (NRF) to accommodate indigenous knowledge, even if this is now politically correct. Indeed, when Wally Serote, Chairman of the Parliamentary Portfolio Committee for Arts, Culture, Language, Science and Technology, was successful in getting an earmarked budget for indigenous knowledge from DACST, and the Department shifted the burden of its implementation to the National Research Foundation, a key person in NRF was reported to react: 'We don't want it here, we're serious scientists'.

Clearly, there are still tensions. They can be brought out by distinguishing two narratives about indigenous knowledge; they are visible in the discussions since the 1980s and return in the call for applications that the NRF sent out. One narrative is about creating spaces for



indigenous knowledge, protect it and exploit its local value and validity for improving agriculture and the environment, health, spiritual well-being, and social cohesion (my terminology). The other narrative positions indigenous knowledge and indigenous knowledge systems as knowledge production in its own right, asks for 'cognitive justice' and suggests there might be an 'African paradigm'. In the first narrative, the cultural value of indigenous knowledge is accepted, but its cognitive contribution is to add the local to the overall Western-scientific approach. In the second narrative, cognitive independence is sought, which might then make eventual joint efforts with Western-scientific approaches (one should use the plural) more difficult.

There are asymmetries of status and occasional countervailing actions, up to the recent #ScienceMustFall movement in South Africa, after the protests about the statue of Cecil Rhodes at the University of Cape Town (#RhodesMustFall" – and indeed, it fell), and the subsequent movement about student expenses #FeesMustFall". As one analysis points out:

Students argued in all the chapters in the report that they do not simply require free education but a free education that is decolonised. It appears that students at different universities attached different meanings to the notion of a 'decolonised' education. For example, the students at the University of Limpopo argued that decolonised education means getting the same quality of education as students at historically white universities like Wits. Students at historically white universities (Wits, UCT, Rhodes and UKZN) argued that decolonised education means that the curriculum needs to be transformed to reflect the lived experiences of African people, including recognition of their scholarly work which is often on the periphery or taught as additional modules. It was argued that decolonised education means recentring the work of these scholars in the curriculum. Some universities have already started the process of transforming their curricula, given the concerns raised by the students during #FeesMustFall. (Langa, 2017: 10)¹

Post-colonial studies in general have drawn attention to the 'othering' that has occurred, and still occurs, and one can see these movements as a response, and thus as 'counter-othering'. This pattern is not specific for South Africa. It occurs in Canada with the 'First Nations', with Aborigines in Australia, the Maori in New Zealand, and in a more dispersed way in Latin America.

In this paper, I want to explore the contribution of the sociology of knowledge to provide a fresh perspective on the struggle about indigenous knowledge, overcoming impasses when the main response to 'othering' is 'counter-othering'. One element of the contribution of sociology of knowledge is to have a hard-nosed look at how quality of knowledge is assured, in Western-scientific approaches as well as in indigenous knowledge generation, and perhaps find a shared ground. The other element of a contribution from the sociology of knowledge is to

¹See also Writing and rioting: Diaries of Wits fees must fall activists (2017). Available at https://docs.wixstatic.com/ugd/de7bea_8ff05c74ed634e1fbf3d179284f74cd6.pdf

understand how Western-scientific approaches came to be what they are now, and assess their value, as well the potential (and need) for further approaches.

To indicate the importance of the latter contribution, let me turn to the South African National Research Foundation when they offer a definition of Indigenous Knowledge Systems (I will come back to the importance of talking about 'knowledge systems' rather than just 'knowledge'):

Indigenous knowledge systems refer to the complex set of knowledge and technologies existing and developed around specific conditions and communities indigenous to a particular geographic area. In the case of this focus area, indigenous knowledge refers to knowledge developed by the people of South Africa.

Interestingly, under this definition there is a probably unintended implication: since Western science is shaped by being developed in a particular geographic area, it would qualify as indigenous knowledge as well, except for its tendency to be exported. But such exportation derives from imperialism and colonialism and does not make it less indigenous (but still imperialist).

While the definition attempts to emancipate indigenous knowledge by emphasising its qualification as knowledge, it also imprisons it, because it has to be developed locally, and by those who qualify as locals. In South Africa, that is a difficult question. Not only because of the whites who colonised the country, brought in people from India and the Indies, and contributed to the creation of coloured people; black Africans are colonisers themselves, driving away the earlier Khoi and San people. Thabo Mbeki, the earlier South Africa's President (and successor to Nelson Mandela), made a brave attempt to (at least rhetorically) create a home for everyone in his speech 'I am an African.'² But when a white journalist, Max du Preez, wrote a column presenting himself as an African, he got furious reactions: 'Whites cannot be Africans', said Thobeka Mda.³

²I will quote his speech at some length, partly because I appreciate his eloquence, but also because of his argument. On the occasion of the adoption of the new South-African constitution (May 8, 1996), the then Deputy President Mbeki spoke on behalf of the African National Congress. "On an occasion such as this, we should, perhaps, start from the beginning. So, let me begin. I am an African. I owe my being to the hills and the valleys, the mountains and the glades, the rivers, the deserts, the trees, the flowers, the seas, and the ever-changing seasons that define the face of our native land. ... I owe my being to the Khoi and the San whose desolate souls haunt the great expanses of the beautiful Cape I am formed of the migrants who left Europe to find a new home on our native land. Whatever their own actions, they remain still, part of me. In my veins courses the blood of the Malay slaves who came from the East. ... I am the grandchild of the warrior men and women that Hinsta and Sekhukhukene led, the patriots that Cetshawayo and Mphephu took to battle I am the grandchild who lays fresh flowers on the Boer graves at St Helena and the Bahamas (...). I am the child of Nongqause I come of those who were transported from India and China Being part of all these people, and in the knowledge that none dare contest that assertion, I shall claim that – I am an African!" (<http://www.polity.org.za/govdocs/speeches/1996/sp0508b.html>).

³I quote this after Oomen (2000: 5). Thobeka Mda has been vocal in 'counter-othering', for example asking for rehabilitation of the lost historical memory of victims of 'mis-education', for averting the privilege by default given to English, and for 'awakening the agential citizen within us': 'We should see ourselves as people who are capable of taking initiatives, especially to create a new perspective that will challenge the dominant perspective that has

Clearly, there are fraction lines, and these cannot be simply overcome by well-intended declarations. Still, I want to introduce a cautionary observation. Post-colonial arguments can be put up referring to the 'othering' that was, and to some extent is, prevalent. They are strategically important to undermine intentional and *de facto* power play of Western science, and to create needed space. The 'cognitive justice' argument of the second narrative I identified earlier, can lead to positive discrimination, i.e. turn the space into a protected space. A concrete example of such a protected space, shaped by a research funding organisation, is the special budget in New Zealand's Science Vote for Maori Knowledge and Development, which is translated into dedicated portfolios of the science funding agencies. The explicit argument is that Maori Development research must be by Maori, for Maori, and work from a Maori world view and approach to knowledge (*kaupapa Maori*). In addition, the conduct of research must adhere to *tikanga Maori*, customary practices and principles, including the judgment of what looks right. High-level (non-Maori) science policy officials insist that 'Maori worldviews have equal status alongside Western science'.⁴

The problem with protected spaces, for Maori knowledge, or more generally, to protect against the epistemic pressure of an ideology of Western science, is that such a strategy risks devolving into accepting everything as long as it is non-Western (this happens for example in the decolonisation of curricula argument, and in versions of the African Renaissance movement, cf. Makgoba, 1999). So, we need an additional criterion, or better characterisation, and one which has to do with quality and robustness of knowledge, rather than its source. And it must be a criterion which does not recreate the *de facto* imperialism of universalism. Inspired by insights of the sociology of knowledge, I shall introduce 'cosmopolitan' (as a characteristic of knowledge) and its always precarious achievement in relation to the local as such a criterion.

I can return now to the two narratives I distinguished earlier and consider strategic implications. Agrawal noted, already in 1995, that theorists of indigenous knowledge are caught on the horns of a dilemma:

On the one hand, their focus on indigenous knowledge has gained them an audible presence in the chorus of development. At the same time, talking about indigenous knowledge commits them to a dichotomy between indigenous and Western knowledge (...).

And he then claims:

The classification into indigenous and Western knowledge fails not only because there are similarities across these categories and differences within them. The attempt founders at another, more fundamental, level as well. It seeks to separate and fix in time and space

engulfed Africa'. The 'we' are black Africans, as is clear from the earlier and subsequent text (Odora-Hoppers et al., 1999: 234, 236).

⁴For in-depth discussion, see Smith (2000). Details of the science funding set-up can be found at the Ministry's website, including a report on a workshop from which I drew my quotes (<http://www.morst.govt.nz/creating/maori>).

(i.e. separate as independent and fix as stationary and unchanging) knowledge systems that can never be so separated or fixed. In the face of evidence that suggests contact, diversity, exchange, communication, learning and transformation among different systems of knowledge and beliefs (...), it is difficult to adhere to a view that separates indigenous and scientific/Western knowledge. (Agrawal, 1995)

Agrawal would probably also agree with me that sometimes a dichotomous discourse is necessary to act politically – this in spite of the fact that dichotomies lead to fraction lines which can hinder interaction and learning. In practice, a variety of partial solutions emerge, as I will try to show.

My own perspective is that the contrast between Western science(s) and indigenous knowledge(s) is historical, and in that sense, contingent. Thus, there is space (but not a protected space) for alternatives, in particular by focusing on ‘robustness’ of knowledge across time and place. Western science is then one way to achieve robustness and cosmopolitanism but is itself heterogeneous. For Western science, the challenge then is to recognise the heterogeneity, and add to it by including *further* (rather than *other*) ways of knowledge production. For indigenous knowledge, the challenge is not to seek shelter in cultural reserves (however important preservation might be), but to address the quality of the knowledge as well.

Indigenous knowledge

The last decades have seen an explosion of interest in indigenous knowledge, linked to the shift in political orientation which was affirmed in Rio 1992, and is visible in activities of UNESCO, World Bank, and networks, but also in the increasing voice and power of indigenous communities and non-Western approaches to knowledge.⁵ UNESCO created a Management of Social Transformation (MOST) programme which includes indigenous knowledge for (sustainable) development. There is an Indigenous Knowledge Initiative headed by the World Bank, which sees indigenous knowledge as a valuable resource that can be used to improve the impact of development assistance.⁶ A network of Indigenous Knowledge Resource Centres has sprung up, which was supported by a NUFFIC-based Centre for International Research and Advisory Networks (CIRAN) and an *Indigenous Knowledge and Development Monitor*.

The main lines of the discussion, and the activities, were already visible in the 1990s, after the introduction of the term ‘indigenous knowledge’ by Warren and Brokensha in the early

⁵For example, the 1992 Convention on Biological Diversity, article 8j, says: ‘Subject to its national legislation, [to] respect, preserve and maintain knowledge and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and [to] promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and [to] encourage the equitable sharing of the benefits arising from [their] utilisation’.

⁶Their intent is broader, though, see Knowledge and Learning Group 2004, and the articles and reports contained in that volume.

1980s, to emphasise the value of indigenous experience, culture, tradition.⁷ The idea of indigenous knowledge systems is a further step: not isolated bits and pieces of knowledge, but background coherence, perhaps to be specified as a cosmology or 'cosmovision'.

As I indicated already, indigenous knowledge is recognised as a resource (for development, for exploitation), and at the same time seen as a cultural heritage that has to be preserved (and recorded) and hopefully remain vibrant. In the battles about (intellectual) property rights, the two views come together. When linked with Western or formal science, there can be combinations (and it is interesting to see which kind of combinations are successful, and why), but also tensions and struggles which cannot be resolved without rethinking the (epistemic) assumptions of Western science, as well as of indigenous knowledge.

Thompson's (1996) useful review distinguished two main approaches in the literature, which are still (after twenty years) relevant:

The first considers the study of IK to involve analysing and interpreting the validity of local agroecological and sociocultural beliefs, concepts and practices, using the conceptual apparatus of Western science. It aims, first, to empower local people *vis-à-vis* research scientists and development planners who, it is assumed, will be convinced of indigenous 'wisdom' only through science; and, second, to 'blend' IK with formal Western science in the research and development process. (Thompson, 1996: 106)

Examples come from agriculture and ethno-botany (…), from health (integration programmes of WHO (Van der Wiel 1996), Aboriginal medicine men (Elkin 1994), shamanism, ritual healing (Csordas 1999) and witchcraft (with socio-cultural and politico-economic explanations as in Comaroff and Comaroff (1999) and Stephen (2000)).

This approach in fact continues a much longer tradition of viewing indigenous beliefs, thoughts, culture as social phenomena to be explained – by the others.⁸

⁷In 1980, David Brokensha, Oswald Werner and I were struggling to find a term that could replace 'traditional' in the designation 'traditional knowledge'. In our view, 'traditional' denoted the 19th-century attitudes of simple, savage and static. We wanted a term that represented the dynamic contributions of any community to problem solving, based on their own perceptions and conceptions, and the ways that they identified, categorized and classified phenomena important to them. At the same time Robert Chambers and his group at Sussex were struggling with the same issue. Independent of each other, we both came up with the term 'indigenous'. Now, 16 years later, it is clear that the term 'indigenous' has its own set of problems and misinterpretations …'. (Warren 1996)

⁸Verran (1999) discusses the debate on African thought and indicates the 'counter-othering' induced by 'relentless "othering" explanations'... the 'African thought discourse', an academic debate that raged from the mid-1960s to the early 1980s. On one side we had 'realists' and 'rationalists', those committed to a 'physical entities foundationalist frame' who, in relentlessly 'othering' explanations elaborated moral legislation over 'Their' primitiveness, and the consequent need for 'Their' up-lifting through 'development' (education). On the other side we had 'relativists', working from the given 'foundations of disparate social practices', who in an equally relentless 'othering', legislated over 'Our' base and spiritually deficient reductionism compared to 'Their' wholeness, emphasising that 'We' (moderns) had lost compared to 'Them' (traditionals)' (Verran, 1999:142). Verran's (1999: 150) interest is in the 'mixing and messing' and in 'routines which translate between domains'.

The second approach sees the cross-cultural study of agroecological and sociocultural beliefs as challenging the basic conceptual apparatus of Western science. It questions the assumption that Western concepts and methods, once suitably refined, will ever reveal facts about the world, suggesting instead that they produce them in the process. Thus, in the same way as social anthropologists have changed their thinking regarding the social construction of knowledge, certain social and physical scientists who study IK are now willing to admit that the practices and concepts in which their own knowledge is grounded (i.e., their epistemology), like the indigenous practices and concepts they study, are conditioned by their discipline's historically and geographically particular social, cultural and political economic determinants (Thompson, 1996: 106)

The recent emphasis on local contingency and heterogeneity in sociology of knowledge is also visible in the literature on indigenous knowledge, for example in the way Thompson at the time criticised the implicit assumption in the papers in Warren et al. (1995):

that it is possible to integrate local knowledge into existing scientific procedures. This assumes that IK represents an easily definable 'body' or 'stock' of knowledge ready for extraction and incorporation, a presumption which recent writings have challenged forcefully (Scoones and Thompson, 1994; Long and Long, 1992). These critics point out that indigenous, like scientific, knowledge is always fragmentary, partial and provisional in nature; it is never fully unified or integrated in terms of an underlying cultural logic or system of classification... knowledge is always in the making. (Thompson, 1996: 108)

The important additional (and epistemic) point is that packaging of knowledge occurs and is the precondition for knowledge to travel. Packaging can be done by the practitioners themselves, who then send out the packages into wider worlds. Or by scientists and social anthropologists, who can take the package 'home' with them. Clearly, there are issues of the nature of the packaging and the direction of the traveling.

In this respect, an interesting illustration is the response of Michael Warren (doyen of indigenous knowledge studies) to Arun Agrawal's (1995) discussion paper:

[Indigenous knowledge systems] are not inferior to the global system, they have just been generally unavailable. They represent contributions to global knowledge, but until they are recorded no one from outside the particular language group, local community or ethnic group will even know of them. ... one of the most important roles of indigenous knowledge resource centres in the various countries. By recording knowledge, and making it available to the global community, I am confident that community-based knowledge systems will in the near future begin to be regarded as contributions to global knowledge. (Warren, 1996)

Agrawal, in his discussion paper, had actually criticised the *ex situ* recording as transforming local knowledge out of recognition (and allowing indiscriminate access). Clearly, there is another fraction line here, which has become more important in the discussion about intellectual property rights and the possibility of community-based intellectual property.⁹ What is interesting in the situation depicted in the quote from Warren is the proposed particular arrangement of transforming local to cosmopolitan, which can be compared (and contrasted) with the arrangements that have emerged in Western science. The focus on concrete arrangements is a key step, because it is only then that questions about quality (validity, robustness, cosmopolitan character of knowledge) can be asked productively. In other words, after what could be called the negative diagnosis, that everything is fragmentary, partial and provisional, there is also a positive route, and a design challenge: how is relativism and fragmentation overcome, to some extent?

There are building blocks in the sociology of knowledge to meet such a design challenge. Earlier studies have looked at local knowledge (Van der Ploeg, 1993, 1996) and local knowledge in relation to scientific expertise (Wynne, 1996). Note that naming something as 'local' implies the possibility of trans-local, but also puzzles about what exactly counts as local.

Indigenous knowledge has been studied as such (two important authors are David Turnbull and Helen [Watson] Verran) and in relation to dominant Western science. This literature is ambivalent, in that it urges a non-foundationalist framework, but also wants to highlight the value of traditional, indigenous and/or local knowledge. In that sense, there is a strong ideological element in such studies in that they set out to demonstrate the value of local and indigenous knowledge, perhaps emancipate it.

There are good reasons to want to do so, when the non-expert world is treated as 'epistemically vacuous' (Van der Ploeg, 1993: 61). But as Van der Ploeg (1993) has shown for Andean potato farmers and made into a general point by Wynne (1996), so-called lay knowledge is 'complex, reflexive, dynamic and innovative, material and empirical, and yet also theoretical. It is experimental and flexible, not dogmatic and closed. Whatever its ultimate demerits or merits, it is epistemically alive and substantive'. (Wynne, 1996: 72-73) After this panegyric from Wynne, he emphasises that '[i]t is important not to misunderstand this as a claim for intellectual superiority or even equivalence for lay knowledge'. (Wynne, 1996: 74) But he does see the recognition of their value as an important correction to science's self-image:

The romantic seductions of local knowledges and identities do not come as an *alternative* to modernity's ahuman and alienating universals, but as an inspiration to find the collective self-conceptions which can sustain universals that do not bury the traces of their own human commitment and responsibility. (Wynne, 1996: 78).

⁹There is more recognition of community-based property rights with the advent of open-source innovation and arrangements like copy-left, even if the fundamental problem remains how to attribute ownership when an outcome derives from tradition and cultural transmission. Joly et al. (2010) locate this movement as part of an overall shift in patterns of innovation, from promising high-tech to what they call 'collective experimentation'.

Positive discrimination may well be in order, but it can lead to a version of standpoint epistemology: the standpoint from which knowledge is produced is more important than the quality of the eventual product. In other words, to counter the 'othering' from the centre, actors as well as analysts fall back on 'counter-othering' strategies. With the risk of creating a zero-sum game, where you cannot appreciate and emancipate indigenous knowledge without detracting the value of Western/formal science and deconstructing it.

Instead consider the possibility that partial solutions emerge in practice to what may be intractable problems in principle. And this in the face of initial inflexibilities, where actors (like spokespersons for the South African National Research Foundation) say they are prepared to accept indigenous knowledge only if the 'same kind of rigour' is applied to it as to western science. But western science's rigour is a historically specific form, and its achievements do not imply that it is the only possible form. Other forms, where experience and judgement play a larger (but quality controlled) role, are possible; still professional, but not limited to those with official accreditation.

Western science

Scientific and other valid knowledge is a precarious outcome of efforts to overcome variability across time, across place – so that you can learn from one place and time to another, and act on it with some confidence. This includes actions in further knowledge production, I add.

There are the twin aspects of cumulative experiences of a practitioner, and the master-apprentice relationship of transferring experiences as part of learning-by-doing. There is a sense in which such experiences start out as tacit, but when challenged, are articulated and become explicit. On-the-job learning also requires the supervisor to give advice, and thus articulate his experiences. Within science, there are additional incentives to articulate tacit knowledge, to write it up as a paper or an article that will further the career of the practitioner. This is not a simple process, and reputational profits must be sufficiently high to induce scientific practitioners to continue along this route.

Publicness, accessibility, ease of uptake, must be seen as practical achievements, rather than characteristics of kinds of science or kinds of institutions. MacKenzie and Spinardi (1995: 45) phrase this as follows: 'Universality and context independence are not to be taken as given but must be analysed as precarious achievements'. In other words, mobility (and movability) of knowledge packages is the key question, and the embeddedness or embodiedness of knowledge, emphasised by evolutionary economists and sociologists of science like Harry Collins is not the final word. The challenge is then to understand how knowledge can be usefully packaged, articulated, certified so as to become moveable, relatively context independent.

The transformation of local experiences to findings with a cosmopolitan status is an essential ingredient of the scientific mode of knowledge production: it is the basis of scientific claims of universal validity. Such transformations are not limited to the specific mode of knowledge production of modern western science, however. Professional knowledges are one

example, and craft knowledge, folk knowledge and indigenous knowledge can also fall under this rubric.

The particular local-cosmopolitan combination typical for modern (western) science, with its emphasis on controlled conditions, is often seen as the main, perhaps unique answer to the challenge of creating cosmopolitan, transportable knowledge, where the ascent from local to cosmopolitan is what counts. As practitioners of science very well know, this requires interaction and infrastructure (from visits to other laboratories, partial standardisation of conditions to improve replication, to codification of measures and protocols), and utilisation of such cosmopolitan knowledge is conditional on the existence or build-up of the relevant infrastructure.

The ideology of universal knowledge claims and generalised applicability of modern (western) science neglects what happens locally, however. This is a problem, already for science itself, because the quality of cosmopolitan knowledge depends on what happens on location. The additional problem is that the return route, from the cosmopolitan to the local, is seen as unproblematic because whatever has become cosmopolitan must be good, so that any problems must reside in resistance of the local to the good message from the cosmopolitan. That is, the translations necessary to return to the local are neglected as an epistemic challenge in their own right.

The translation back to the local is easier if the context of uptake of research results resembles the context of the research process. The controlled conditions of production in chemical plants, for example, as well as the chemical specification of the feedstocks, allow easy transfer of laboratory findings to chemical production practices. But this is a historical achievement, based on a variety of efforts (partly driven by economic and political circumstances) in the late 19th and early 20th century. And the achievement depends on the transformation of industrial practices to become more like the controlled experiments in laboratories.

A similar trend is visible in agricultural research, where the applicability of experimental studies is predicated on the transformation of agricultural practices, and of the land itself, into something resembling laboratory conditions. By phrasing it in this way, it is clear that there are advantages (productive set-ups) as well as disadvantages (distortion of earlier practices, neglect of side-effects).

Thus, there is a colonial element in utilisation of research, if the original context of knowledge production dictates the circumstances of its application. This is not intended as a blanket indictment. But it leads to unnecessary neglect of the knowledge accumulated in the local practices; transfer of knowledge is never from 'full' to 'empty'.

To counteract this 'high science' perspective, the variety of local-cosmopolitan combinations must be recognised. There are three main modes of knowledge production, successively becoming more independent of local practices, and thus having more difficulty in linking back to them (see Figure 1).

For sociology and philosophy of knowledge, as well as for practitioners of various kinds, one challenge is to make natural-history modes of knowledge production more robust without

going in the direction of experimental, laboratory-based science, with the consequent distance to other types of local practices.

Indigenous knowledge, even when trans-local, still focuses on understanding the immediate situation and environment, building on accumulated and refined experience. One implication is that if the environment changes, the existing knowledge becomes irrelevant. Trial-and-error learning starts over again. Robustness of indigenous knowledge is precarious, because it cannot create and maintain the conditions for its validity.

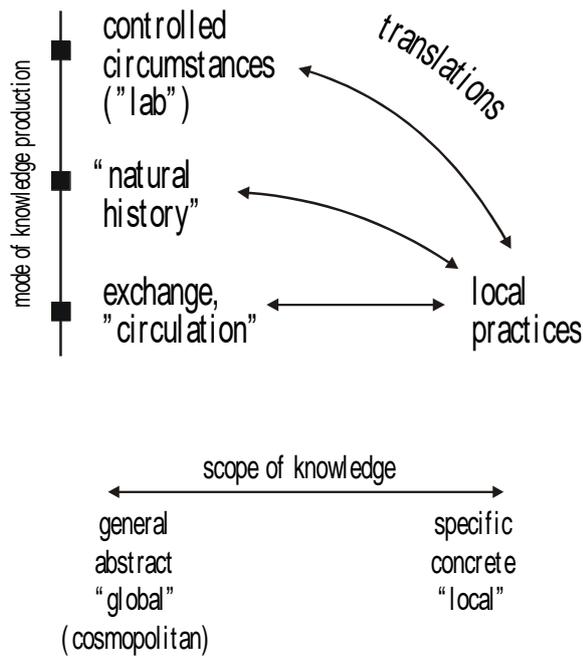


Figure 1: Modes of knowledge production

Western science has taken the high road of restrictedness (Rip, 1982) to reduce variability. The socio-cognitive arrangements which stabilised were heavily influenced by the interactions with sponsors (Rip, 1997). It has led to various backgrounding, and to the low status of 'natural history' which accepts variability even when it tries to discern patterns.¹⁰

Thus, there are good reasons to look into the antecedents of Western science and try to disentangle generally productive local-cosmopolitan dynamics from specific arrangements – of varying quality, with quality also depending on context.

¹⁰The world has to be domesticated before the findings from the lab are applicable. And such domestication may create its own problems. The war against the germs, made possible by Pasteur and other's domestications (see Latour, 1983), has its sequel in the acquired resistance of bacteria against antibiotics, and the equivalent of the arms race between men and bacteria. More broadly, the environment 'strikes back', and environmental monitoring, mapping and modeling are becoming high-status activities.

Starting from scientific practices, two socio-cognitive dimensions are important: high/low science and restrictedness-natural history. Both have to do with extent of purification of heterogeneity.

For high sciences, social distancing and exclusion is important, and development and struggles occur according to Kuhnian paradigms. In low sciences, practitioners can (and must) fend for themselves, and cognitive structuring at the cosmopolitan level is more open and inductive.

Historically, 'natural history' refers to our attempts to map the world and its development. From a major intellectual thrust (with Aristotle, and the scholars of the 17th and 18th century, and practitioners all along) it became a backwater, pushed aside by experiment-oriented high science.

The intellectual developments can be set out with the help of a 2x2 table:

<i>variety of search practices and knowledge production</i>	low science	high science
natural history	Aristotelean tradition (cf. meteorology), field sciences	Darwin, Wegener
restrictedness	chemistry, technical sciences	Boyle etc. physics, economics, psychology; now also molecular biology?

The main diagonal reflects the purification trend (also recognisable in Whitley's (1984) typology of scientific fields). From the lower righthand corner, colonisation has occurred into the neighbouring boxes, and by now also into the top left corner (think of present meteorology). But the challenge to address the phenomena there has led to new ventures which claim to challenge the tradition embodied in the bottom righthand corner.¹¹

The scheme should be read, not as a demonstration of three centuries of progress in science, but as reflecting the historical foregrounding of some knowledge production as (modern) science. There will be *débordements*, and these become visible in boundary struggles and in problems of applying scientific insights in the real, that is, unprotected, world. And this messy real world might strike back.

The critical look at the limitations of high and restricted science can be taken as a call to unrestrict and perhaps not restrict at all. Such arguments are heard, and not only in New Age contexts. What I am interested in is the possibility of search practices and robust knowledge production which do not need theory derived from the bottom righthand corner of the scheme.

¹¹ Cf. the ambitious undertaking of Prigogine and Stenger (1984).

We need a revitalisation of the natural history approach, but require robustness of knowledge, how to be cosmopolitan on location.¹²

A range of cases in practice

Concrete combinations of Western science and indigenous knowledge definitely occur in agriculture and health. There are promising pockets for integrated development. Both areas have an interest in practical results and recognise variability. So, limitations of generalising Western science are felt acutely, and there is a willingness to use further inputs, in particular, judgments based on experience. But one can also consider education and socio-cultural life as possibly having 'promising pockets'.

Agriculture and landscape

Agricultural knowledge is local in a strong sense: place (soil, climate, specific combinations) and variability over time and place. Location is not accidental to the knowledge, and there are specific ways of circulation (see Van der Ploeg (1993) on Andes potato farming). So Western science in this area is more like natural history and will be receptive to indigenous knowledge. How does this work out in practice?

As Jiggins et al. (1996: 97) emphasise (when criticising a diagnosis of Norman Borlaug), farmers are pro-active, also in what is often called 'traditional', with connotations of a static and unproductive agriculture. There is 'the active and on-going experimental tradition among farmers, which draws on locally circulated materials and experience as well as the products of formal science and institutional research'.

Western agricultural science and practice has attempted to restrict local variability but is having second thoughts. 'Soil history' is, by now, a new specialty and the International Journal of Soil Science is having a special issue on 'ethnopedology', i.e. local soil knowledge.

An intriguing recent example is of 'blended' knowledge is the link with Geographical Information Systems (GIS).

Incorporating indigenous and scientific knowledge means integrating information collected from farmers with scientific information and technology. This means that we must find a way to process indigenous information in the same way as scientific information (Lawas and Luning, 1996: 2), and

... collecting genuine information from indigenous farmers (Lawas and Luning, 1996: 3) (note the asymmetry), and

¹² This is an argument for entertaining heterogeneity. As Latour (1993) has argued in more general terms (referring to modernity), purification and separation of science and society occludes the 'hybrid monsters' from our view which act locally, mixing science and society productively, and are actually responsible for the vitality of science and society.

... farmers were often suspicious and reluctant to talk (Lawas and Luning, 1996: 3) (the farmers' defense to the asymmetry, but they can be persuaded to cooperate through 'village immersion' of the collector of data).

This sounds matter-of-fact, but when the authors proceed to show how Geographic Information Systems (GIS) can be used for this purpose, complications occur: 'Before making use of a GIS, one must first decide how the real situation is to be represented (modelled)'. What happens then is the translation of farmers' categories, e.g. areas in the valleys and up the slopes, into equivalent elevation in metres. Cropping styles for different areas can then be mapped on the metric of the GIS, and further analyzed.

The work of translation is clear, and Lawas and Luning are also clear about aggregation and how cosmopolitanism is achieved:

Farmers' knowledge can be quantified and systematically organized by means of a GIS. This approach maximizes the utility of indigenous information for development, since it can be shared by a number of users. These users include natural resource managers, project or development planners, and decision makers or people with a particular interest in indigenous knowledge functions. Moreover, there is a greater likelihood that information stored in a GIS environment will actually be shared, since it can be easily accessed and analyzed. ... As GIS software development continues, products are becoming increasingly affordable and thus accessible to more and more people. (Lawas and Luning, 1996: 5)

Also, to the original farmers, one dares to ask?

With the increased recognition of indigenous knowledge, there is also an access issue. Australian Aborigines now limit access to databases which contain their knowledge. Harmsworth (1999) developed a GIS tool geared specifically to the Maori. It has more categories: in addition to the usual data also space for "special places, sacred sites, metaphysical" and for specific knowledges for which access is limited, as with knowledge at the *iwi* or *hapuu* tribal level, or extended family (*whaanau*) level. There is also the epistemic question of in-situ versus ex-situ knowledge packaging (cf. Agrawal, 1995): will the GIS data and linkages actually be applicable in local situations, in contrast to their obvious usefulness for overall planning purposes?

This example focuses on GIS, but the point is more general. It is about programming and use of computerised systems which allow a combination of local knowledge and overall structuring. An interesting example is the use of traditional rules for water management on Bali,

which are the responsibility of the priests, and are now integrated by the engineers in their computer system.¹³

Health and medicine

The health area lives with variability at the individual level (diagnosis) and at the collective level (e.g. epidemiology). Greene (1998) gives a brief overview from 'primitive medicine' to ethno-medicine to medical pluralism in which the different approaches can interrogate each other:

Because of a sole concentration on 'primitive medicine' as essentially a magico-religious phenomenon based on local traditions conceived as being culturally and historically static, these earlier investigations effectively ruled out the possibility of *finding any type of medicality* [my italics] present in these medicines. Always in contrast to Western biomedicine, 'primitive medicine' was considered pre- or non-medicine in typical socio-evolutionist fashion. (Greene, 1998: 635; he also gives a list of asymmetric binaries)

Anthropologists like Elkin who wanted to overcome these binaries in the 1940s still struggled with the dominant view. Elkin's solution was to emphasise the role of medicine men in maintaining integration in/of the sociocultural order, while recognising the medicine men as professionals in their own right, and sometimes interrogating the Western science tradition as being unscientific in its refusal to treat these phenomena empirically.

Anthropologists, but also critics of traditional exclusively biomedical approaches in (parts of) Western medical practices, then attempted to create a broader view. This shift was preceded by a gradual shift in practices to allow 'bicultural treatment' for indigenous people (and occasionally applied for white people as well). Already by the 1980s, the official medical system was changing itself, as indicated by the growing official interest in alternative medicine as not always necessarily quackery and superstition.

In such a changing world, a Collaborative Research Centre for Aboriginal and Tropical Health could be set up in Darwin, Australia. The actual practice shows a segmentation of the research programme which allows the various participants to do their own thing. From the data on the website, Aboriginals are definitely present in the Board (a majority is required), but less so in the research. And there is definite split between the education-oriented programmes (research and services) and the biomedical programmes.

At the level of understanding the struggle for hegemony remains visible. At the same time, the practicalities of doing health-related research and obtaining consent from subjects force medical/health scientists into some compromise. The Australian National Health and

¹³ Example drawn from Stephen Lansing's book, *Priests and Programmes*. A 'modern' water management system was introduced in Bali (Indonesia), bypassing the traditional management system centred on the priests in their temples (for example, deciding upon letting certain fields dry out for a time, which - as it turned out later - killed the weeds and the pests). The 'modern' system led to great problems, and a software engineer and an anthropologist collaborated in the repair work: the anthropologist reconstructing traditional system and its rationale, the software engineer putting the rules of these practices in a computer programme. Jakarta could accept the new programmes as rational and modern (because computerized), and the priests went along because it was their rules which were programmed.

Medical Research Council has issued guidelines in a number of documents which protect the rights of traditional communities, up to the recognition

that aboriginal peoples may have epistemologies – that is, ways of knowing – that differ from the Western scientific method. Projects need to take account of the fact that oral tradition is considered an important source of knowledge in many aboriginal communities. The guidelines indicate that researchers ought to collaborate with the community to define how the research problem might be approached and, where relevant, oral tradition and other sources of communal knowledge ought to be used in a respectful manner. (Weijer et al., 1999: 277)

Education

Education is potentially a very contentious area, and not just in so-called developing countries. Cf. the teaching of evolution in USA schools and its contestation by religious fundamentalist groups. In developing countries, the emphasis has been on translating Western science for local consumption, and this has mostly been accepted by local populations as it promises upward mobility. The unidirectional and assimilationist approach to education of cultural minorities has been recognised and criticised for a long time, but it was not always clear what to do instead – respecting the cultural background is hard work and may not lead to anything useful if the classroom and the structure of education in which it is embedded do not change.

While there are bottom-up initiatives of devoted individuals and groups, there is now increasing political pressure for change. In South Africa, Wally Serote (1999) had wanted indigenous knowledge to be ‘integrated into curricula at all educational levels’ and argues that ‘the balance between these two bases of knowledge [indigenous knowledge and Western science and technology] should change’, in the interest of ‘development of humanity’. His claim is now upfront in the #ScienceMustFall movement. In Canada, there is not only recognition of the ‘ethnostress’ experienced by Native students (in universities) who find that what they are being taught (not how they are being taught) is somehow inimical to their identity as North-American Indian people (Bobiwash, 1999: 5), but also strong calls for ‘a radical shift in the epistemological approaches current within our universities’ (ibid 8).¹⁴

¹⁴ Bobiwash (1999: 8), former Director of the First Nations House at the University of Toronto and a member of the Anishinabek Nation, thinks in terms of balanced presence (‘in the building of a new social order in which Aboriginal people take an equitable place in the learning of our young’): ‘There should not be a curriculum in any subject taught in a Canadian university or college (with perhaps the exception of some pure sciences, mathematics and pre-Columbian European philosophy and history) that fails to incorporate First Nations perspectives, history and philosophy and ontology’. I add, between parentheses: What is the difference with USA School Boards requiring the teaching of Creation instead of (or in addition to) biological evolution?

He does have an epistemic interest; his article opens with: ‘In the epistemological sense there is no question that the tribal method of gathering information is more sophisticated and certainly more comprehensive than western science. In most tribal traditions, no data is discarded as unimportant or irrelevant. ... [T]ribal knowledge systematically mixes facts and experiences which western science would separate by artificial categories (Bobiwash, 1999: 8).

To conclude this section, the cases presented had their own mixtures of issues where local and practical might take precedence over global meaning, to issues where the contest might be about global meaning, what one could call a cosmovision -as Western science has its cosmovisions (and calls them (grand) theory). There is the ambivalent role of theory/cosmovision, as helpful to bridge across places and times, but also as eclipsing the local and practical in favour of a top-down grand narrative.

Conclusion

An important part of my diagnosis was that positioning epistemic differences as just cultural differences takes the angle out of them. There are cultural differences, obviously so, and these may be barriers to internally or externally motivated change. Indigenous knowledge may be positioned as culturally bound, and Western science not so. Then, the defense of indigenous knowledge against epistemic critique (or rather, condemnation) is to assert cultural rights – and political correctness replaces epistemic debate. Instead, in this paper, I have focused on epistemic aspects of developments and debates, not to adjudicate but to understand what is happening.

What happens are mixed practices and heterogeneous interactions. These start out locally (even when they may derive resources from the global, up to resorting to political correctness). Peter Galison's use of the concept of 'trading zone' is illuminating here. The concept derives from anthropological studies of unlike cultures that do interact, most notably by trade, and Galison applies it to the interactions between engineers, experimenters and theorists in high-energy physics. The key point is that

... groups can agree on rules of exchange even if they ascribe utterly different significance to the objects being exchanged; they may even disagree on the meaning of the exchange process itself. Nonetheless, the trading partners can hammer out a *local* coordination despite vast *global* differences. (Galison, 1999, 138)

Thus, in the interactions between Western science and indigenous knowledge, in general, not just in the cases discussed in detail, they should be looked at as possible trading zones.

Then, building upon my cases, but not being limited to them, I see three interesting phenomena.

The first is how developments in Western science create opportunities for inputs from indigenous/traditional knowledge:

- Experiential knowledge of farmers becomes input in GIS (Lawas and Luning, 1996);
- Traditional rules applied by priests (in Bali) become one input in a computerised decision support system for irrigation;

- Modeling as a general approach which separates a generalisable shell from specific data to let the model run. The general approach can be published, while the specifics remain proprietary.

This shows how uptake of indigenous knowledge is relatively easy if it can be reduced to 'data' that are recorded and put into one of these 'shells'.

The second, and much bigger, challenge derives from a struggle about insight in invisible forces (of nature, of society). Western science has an interesting, perhaps impressive, record of such insights combined with application in the world of action. But their 'ticket' to such insights is philosophically precarious, and thus open to contestation by other claims on insight. Think for example, of the curious neglect of placebo-effects in western science. It is accepted as real (thus, double-blind trials are done to check the performance of a drug or a treatment), but neglected (and deemed to be a resort of quack doctors who have no 'real' treatment to offer) and until recently, not researched as to its mechanisms).¹⁵

Shamanism is a real challenge. Actually, in health care, mutual syncretism is visible, with shamans including western treatment in their practices, and western doctors accepting indigenous contributions as effective. When talking about invisible forces, the big difference between the occult and what happens in the Western establishment is taken to be that the invisible forces are now manipulated by/through science. There may well be a difference, but it cannot be settled by attribution to a source.

My earlier analysis of modes of knowledge production turns out to be too limited now, because it did not address visions, ontologies, metaphors and their status. These refer to findings and experience which transcends the immediate and the local and can be linked to a cosmo-vision. This is not metaphysics: articulation of the ontology is possible in terms of patterns, and will thus be empirically informed, and open to interrogation.

A third observation is more sociological, about various positionings along the political, practical and epistemic power gradients, and the net effects of the various positionings. The ongoing shifts in health care practices and health research are the outcomes of myriads, and cumulative, positionings. Including strategic positioning, as when traditional healers in South Africa's Northern Province distance themselves from witchcraft, and thus lower the credibility of witchcraft (as long as their own position remains respected).

Another sociological observation is the increasing force of 'others' (than Western scientists) to look ('gaze') at Western science and be heard. The 'natives' strike back. Australian Aborigines now publish their readings of earlier anthropological studies of Aborigines (Nakata, 1998) and their hybrid personal and scholarly experience (Anderson, 1997). Australia and New Zealand have gone a long way in this direction, but recognition of indigenous knowledge as such is relatively easy because the numbers of Aborigines are small. So the gaze of the Aborigine is not dangerous: if it can be kept as a cultural reserve, there is no danger of overall

¹⁵However, there is now a growing interest in placebos: they are cheap, and they are given a place in the scientific hierarchy by talking about the "body's inner pharmacy" stimulated by supportive thoughts and circumstances (see Brody, 2000)

change. The Maori in New Zealand are 14% of the population (Harmsworth, 1998), but have a strong presence because of political correctness. The situation in South Africa is different again: there may well be a majority positioning themselves outside Western science (except when it offers goodies).

I started with the two main narratives about indigenous knowledge, visible since the 1980s, and still with us: indigenous knowledge as a resource, and as a cultural heritage to be preserved. I have made the picture more complex by adding insights from the sociology of knowledge and showing how Western science itself is struggling to overcome the challenge of how to be cosmopolitan on location. This has not led to an alternative, 'grand' narrative. Indeed, that might be self-defeating as a project. Instead, I have drawn attention to what is essentially an evolving patchwork of trading zones, shot through with fraction lines. The tensions will not disappear, but they might become tractable in practice. And be reflected in improved teaching and learning. That is, perhaps, as much as we can hope for.

Author biography

Arie Rip studied chemistry and philosophy at the University of Leiden, switched to Chemistry and Society teaching and research, and Science, Technology and Society studies more generally. He was guest professor of science dynamics at the University of Amsterdam (1984-1987), and then moved to the Chair in Philosophy of Science and Technology at the University of Twente. For a time, he was also Visiting Professor at the University of Stellenbosch (1997-2009, 2017-2019). As Emeritus Professor, he continues working on his central research themes: changes in modes of knowledge production (including indigenous knowledge) and their impact on science institutions like universities and funding agencies; technology assessment, in particular constructive technology assessment of nanotechnology; national systems of research and innovation and their evolution.

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