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Intellectual Property Rights Systems and the *Assemblage* of Local Knowledge Systems

Saskia Vermeylen,* George Martin, and Roland Clift*****

Abstract: The mounting loss of the traditional knowledge of indigenous peoples presents environmental as well as ethical issues. Fundamental among these is the sustainability of indigenous societies and their ecosystems. Although the commercial expropriation of traditional knowledge grows, rooted in a global, corporate application of intellectual property rights (IPRs), the survival of indigenous societies becomes more problematic. One reason for this is an unresolved conflict between two perspectives. In the modernist view, traditional knowledge is a tool to use (or discard) for the development of indigenous society, and therefore it must be subordinated to Western science. Alternatively, in the postmodernist view, it is harmonious with nature, providing a *new* paradigm for human ecology, and must be preserved intact. We argue that this encumbering polarization can be allayed by shifting from a dualism of traditional and scientific knowledge to an *assemblage* of local knowledge, which is constituted by the interaction of both in a third space. We argue that IPR can be reconfigured to become the framework for creating such a third space.

THE FATE OF TRADITIONAL KNOWLEDGE

The knowledge systems of indigenous peoples are getting increasing attention from environmentalists and researchers. One view of these systems is that they are in harmony with nature and offer a model of human ecology. For others, traditional

*Department of Geography, University of Lancaster. Email: s.vermeylen@lancaster.ac.uk
**Department of Sociology, Montclair State University. Email: martingt@mail.montclair.edu.
***Centre for Environmental Strategy, University of Surrey. Email: r.clift@surrey.ac.uk

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knowledge is a promising contributor to development, especially because northern knowledge systems have largely failed in their applications to southern poverty. Renewed interest in traditional knowledge also flows from the discourses of sustainable development and biodiversity conservation.[1]

Traditional knowledge has always been available to the larger world, but in recent years its fate becomes problematic. Advances in biogenetics, accompanied by the global marketing of drugs derived from indigenous usage, have multiplied the potential commercial value of flora. Developments in ethnobotany and medical botany have produced a potentially heady brew for the pharmaceutical industry. As flora acquires commercial value, there is a risk of its overexploitation, leading to extinction of species and loss of biodiversity. Exploitation is also a challenge to the continued traditional use of indigenous knowledge and thereby threatens the social integrity of indigenous peoples—perhaps leading to a loss of human diversity.

The growing appropriation of traditional knowledge throws up a number of political, environmental, legal, and ethical issues. For example, it draws new attention to intellectual property law: Are private property rights over biogenetic knowledge justifiable? How should society balance public *versus* private control over the intellectual commons of nature? Can an indigenous culture survive in the face of market forces *disembedding* its knowledge of nature?[2]

There is a central contradiction involved in the fate of traditional knowledge: the disjuncture between the present status of indigenous peoples and the character of their traditional knowledge. In terms of their contemporary social, economic, and political status, many nomadic indigenous peoples around the globe, as a result of increasing contact with the postcolonial world, are or are becoming sedentary agriculturalists and semiproletarian farm laborers. However, their knowledge base remains substantially rooted in their original livelihoods. Thus, indigenous peoples struggle to find a way to use and protect their traditional knowledge in changed circumstances.

To address the fate of traditional knowledge, this article focuses on its current status, particularly in relation to international property (IP) law. Specifically, we address the inferior and alienated position traditional knowledge occupies relative to scientific knowledge within the discourse of intellectual property rights (IPRs). Traditional knowledge fares better in sociological and feminist discourses, which focus on identifying the common nuances which can serve to bridge scientific and traditional worldviews.[3] Our approach is similarly focused on bridging this gap.

We argue that to protect traditional knowledge from further exploitation or extinction it is important to contextualize Western science and traditional knowledge. We argue that Western European science is a particular, standardized form of *local knowledge* produced by the scientific revolution of the seventeenth century. It was then universalized through colonialist and capitalist practices of knowledge production and ownership. During this period traditional knowledge was defined as a product of witchcraft, superstition, and heresy. It was marginalized and its social value was considerably undermined. Beginning under late colonial-

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ism, field research by ecologists, anthropologists, and others helped to reestablish its academic credibility. In recent years this process of renewal of traditional knowledge may have reached a new stage. Western scientists who led this effort did so within a historic atmosphere of colonial derision and neglect. In their struggle to reestablish traditional knowledge, they stressed its unique nature.

At the current juncture, in which indigenous peoples are striving to reestablish rights over their traditional knowledge in national and international forums, the emphasis on its uniqueness can be counterproductive. In contrast, in other discourses, such as science and technology studies (STS), traditional and scientific knowledge can be conceptualized as *local* knowledges. Actor Network Theory can be used to connect the various modes of knowledge production in *assemblages*. We suggest that the application of the logic of assemblages has implications for IPR.

Although this article explores conceptual definitions of knowledge, it has been inspired and informed by empirical research carried out with the San in Southern Africa (July–November 2004, July–September 2005, June–August 2007). This research was part of a larger project that examined the San's stance toward IPR and the commercialization of their traditional knowledge, which was sparked by the *hoodia* benefit-sharing agreement. The San of the Kalahari have chewed the succulent, *Hoodia gordonii*, for millennia on long hunts. It is a thirst quencher and appetite suppressant. A patent was awarded to South Africa's Council for Scientific and Industrial Research in 1998 without the knowledge and consent of the San. After a campaign for their rights, a deal was struck so that the San could benefit from the commercialization of the slimming aid, *P57*, the active ingredient developed from *hoodia*.[4]

TRADITIONAL KNOWLEDGE AND INTERNATIONAL LAW

Intellectual property rights draws attention to a central question: How does one define traditional knowledge? Even scholars who have devoted careers to studying non-Western knowledge systems struggle to define traditional knowledge.[5] The institutions[6] looking for appropriate protection mechanisms for traditional knowledge are failing to provide terminological clarity.[7] Amid this definitional uncertainty, one strand of scholars (mostly anthropologists) has argued that traditional knowledge belongs to specific ethnic groups or the cultural heritage of minority groups.[8] Framing traditional knowledge in this manner (i.e., as something connected to a particular space, time, and people) is a continuation of the need to differentiate it from Western or scientific knowledge, which is seen as a cause for its exploitation. The work of Posey is exemplary of this argument.[9]

Posey was one of the first scholars to draw attention to the concept of bioprospecting, and he identified a connection between the role of anthropologists and the commercial exploitation of indigenous peoples' knowledge. He argued that

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there was a real danger that traditional knowledge as recorded by anthropologists could be legally expropriated by companies without acknowledging its indigenous roots. Posey sought to protect traditional knowledge by defining it as the *opposite* of scientific knowledge: "for indigenous peoples, knowledge is viewed as emanating from a spiritual—not a unilinear scientific—base. Thus, all *Creation* is sacred, and the sacred and secular are inseparable."[10]

Although Posey recognized the need for indigenous peoples to protect their traditional knowledge, he argued that it would be difficult to use IPR to achieve this goal. He saw IPR as a new form of exploitation in the long history of colonial subjugation of indigenous peoples—a concept which he called *genetic terra nullius*.[11] He also wrote that IPR was inadequate and inappropriate for the protection of traditional knowledge because it recognizes individual and not collective rights; requires a specific act of intervention; stimulates commercialization; recognizes only market values; is subject to economic powers and manipulation; is difficult to monitor; and is expensive, complicated, and time consuming.[12] Posey's view that IP law poses a threat to the cultural integrity and rights of indigenous peoples was taken further by other scholars, who argued that it also undermines their territorial and resource rights. Thus, it has become a widely held view that conventional IPR should not be applied to traditional knowledge.[13]

Much of the current discourse about bioprospecting emphasizes the incompatibility between traditional knowledge and IPR by engaging with a position that (a) highlights the uniqueness of traditional knowledge that is culturally bound in space and time; (b) emphasizes the oppositional traits of traditional and scientific knowledge in the ways in which they are generated, recorded, and transmitted; and (c) classifies the two into separate categories with regard to how culture and nature are related.

However, the current understanding of traditional knowledge has been produced within a specific set of assumptions and objectives.[14] In most cases, the term *traditional knowledge* is used not only to describe a category of knowledge but also to carry particular political messages, including criticizing Western approaches to development, protecting the environment of a particular group, and highlighting an exploitative Western stance toward nature. A combination of these political agendas is used in the bioprospecting or biopiracy literature.[15] Although we do not question the substance of these political messages, we do suggest that it is now timely to revisit the discourse which sustains a dualism between modernism and traditionalism. Our position has developed out of the research with the San, which has revealed that this group of indigenous peoples are not a priori opposed to the commercialization of their traditional knowledge or to its protection through IPR.[16] Another look at the Western/traditional dichotomy of knowledge, combined with an examination of the literature in the new commodification discourse may open a new chapter in the debate about IPR and traditional knowledge.[17]

The work of Sunder stands out in current debates about the fate of traditional knowledge. She argues that "reifying the public domain may have the unin-

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tended effect of congealing traditional knowledge as the opposite of property, presenting poor peoples' knowledge as the raw material of innovation—ancient, static and *natural*—rather than as intellectual property—modern, dynamic, *scientific*, and *cultural invention*."[18] Following Sunder's logic, we argue that the initial academic emphasis on the uniqueness of traditional knowledge has become counter-productive, adding to a situation wherein it is increasingly problematic that indigenous peoples can protect their knowledge (with IPR).[19] Although this proposition is a reconfirmation of Sunder, we hope to further the debate by drawing attention to a social construction of science as local knowledge, and by questioning the extent to which science is uniquely dynamic, innovative, and evolving.

International institutions like the Convention on Biological diversity and the World Intellectual Property Organization (WIPO) promote definitions that stress oppositional knowledge systems. This has repercussions for another debate: how traditional knowledge should be protected to preserve biological and cultural diversity. Although historical and social studies recognize the fluidity and permeability of knowledge and the cultural hybridity of innovation, law reinforces cultural boundaries by locating traditional knowledge in a fixed time and space.[20] Both law and science strive to detach knowledge from its local, organic social base and fit it into categorical abstractions. Both underestimate how their common framing template—the Enlightenment—continues to influence them.

This dualistic thinking about scientific and traditional knowledge within the IPR framework—useful as opposed to useless, obvious as opposed to opaque, and innovative as opposed to static—has its roots in the Enlightenment. Revisiting the history of ideas is particularly relevant for an IPR audience. The contemporary strand of Enlightenment thinking—the modernist discourse—continues to have considerable influence, as exemplified by the approach taken in the rediscovery of traditional knowledge in conservationist and environmental discourses.

MODERNIST AND POSTMODERNIST VIEWS OF TRADITIONAL KNOWLEDGE

As illustrated from Sillitoe's analysis of the literature, conventional wisdom usually depicts science as more rational, theoretical, and evidence-based in comparison to traditional knowledge.[21]

Whether or not there is substantive validity to these descriptive distinctions between indigenous and scientific knowledge, the typological method serves to exaggerate them, in much the same way that group stereotypes sharpen a few selected characteristics of human groups. Although it may be recognized that there is a diversity of knowledge traditions around the world, modern Western science is the epistemological standard.[22]

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Subject	*Traditional Knowledge*	*Scientific Knowledge*
Communication	Oral	Written
	Teaching through doing	Didactic
Dominant Mode of Thought	Intuitive	Analytical
Characteristics	Holistic	Reductionist
	Subjective	Objective
	Experiential	Positivist

Pottier argues it is the positivist view that knowledge is unitary and systematized, which explains why modern scientists regard their method as superior to traditional knowledge.[23] Other defining characteristics have been attributed to this positivist framework—that it emphasizes competition rather than cooperation, focuses on the individual rather than on the collective, and stresses regulation rather than responsibilities.[24]

During the Age of Reason knowledge production was deemed inefficient and overly based in subjective imageries. Experience was to be framed in a more mechanical, universal, and objective manner; and the emphasis in knowledge creation shifted towards the individual. The successes of Bacon, Descartes, and Newton offered a new way of producing knowledge, which was later tied to Hume's empiricism. Perceptions of individual scientists became increasingly important at the expense of community experiences in the process of knowledge production. In the quest for certitude, science—in this logical positivist form—separated itself from other forms of knowledge production.

This way of thinking about science had repercussions in the way society and politics were perceived. Locke and other Enlightenment thinkers universalized European society and its socioeconomic and political infrastructures by separating themselves from non-Europeans who were encountered in the spread of Western colonialism. Indigenous peoples were considered less advanced, and the Enlightenment assessed how far they were removed from achieving European civilization. The belief in the progress of humanity to a cosmopolitan and rational perfection gave Locke and company the authority to demean non-Europeans, who were at risk of being stuck in a lower state of development.[25]

Emergent social science was fully stamped with the Enlightenment worldview, because it developed a technocratic approach steeped in universal laws of behavior; "from then on, social science portrayed the study of a particular place as one that produced a deficient version of knowledge."[26] European civilization, through colonialism, universalized its assets, and linked its *raison d'être* to the purported inferiority of those outside it. A prime means by which this was accomplished was through systematically minimizing and distorting traditional knowledge.

The modern individual took form as opposed to its antithesis—the savage. "In order to define 'us' there must be a corresponding 'them' against 'we' come to rec-

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ognise ourselves as different."[27] The Enlightenment embraced Plato's dualist epistemology wherein the mind gains true knowledge to the degree that it separates from the body. This was a basis for a theoretical paradigm in which knowledge of the truth depended on a separation from its opposite.[28] The process of creating a universal modernity could be achieved only when the savage was included—but circumscribed as well. The indigenous were destined to perpetually strive for the status of the modern and were denied any alternative status on the basis of their intrinsic difference. Thus, modernity's ordered and deterministic worldview emerged in its opposition to the spontaneity and mimetic responsiveness of tradition.

Although the colonial conquest was built on the economic, political, and social dispossession of non-Western cultures, it also resulted in an epistemic erosion for these cultures. Most modern scientists shared the racist views of the European colonialists. The father of modern Western science, Bacon, conceptualized modern science as the "production of facts that were useful for the effective conquering of the physical universe, alien cultures, alien peoples, and alternative knowledge systems."[29] Bacon rejected all previous scientific traditions and imposed a new form of scientific knowledge that was equated with power and domination. The concept of knowledge as power meant for Bacon that with proper science it was possible for the "European white man" to manipulate nature to maximize a material exploitation of the natural world.[30]

Thus, from the outset the Enlightenment and its modernist project were steeped in a dualist discourse: preaching enlightenment, scientific rationality, and humanism but at the same time practicing violence and irrationality. How does modernist dualism relate to postmodernist views of traditional knowledge?

Postmodernism shares some of the methods of modernism but its substance is different. "We Westerners are absolutely different from Others!" is the moderns' victory cry, or protracted lament.[31] This great divide continues to obsess. The savage has become the other and is now used to highlight how it once was for Western societies, a process labelled as "a lament of falsely re-collective nostalgia for some lost sense of spiritualism, family, place [and] unity."[32] This sort of thinking is found in the conservationist discourse in which indigenous peoples are portrayed as existing in harmony with a pristine world. It is assumed, because indigenous peoples now have, and have had in the past, a relatively small ecological affect, that they are in harmony with nature. This has been called the "myth of ecological wisdom" by Milton.[33] The reality is that indigenous peoples have always altered their environments, including extinguishing species—that their small ecological footprints have been in part the product of low populations.

There is a danger that such an idealized authenticity, for which postmodernity longs, imposes an unjustifiable burden on indigenous peoples: *re-traditionalism*. Although it mirrors outside expectations, it also inhibits the capacity to recreate a sustainable society from within. An example of re-traditionalization is the Khwe San revival of hunting. Even though hunting is forbidden by the game park status

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of their West Caprivi (Namibia) homeland, the Khwe emphasize the importance of hunting with bow and arrow as a main feature of their heritage. This may be a disservice to their efforts to preserve their society and knowledge in the new world in which they now live. There is a risk that the Khwe will become occupants of an indigenous theme park, rather than of the post–hunter-gatherer world that surrounds them. Like the Khwe, many indigenous peoples now live in dramatically changed circumstances.[34]

In summary, both modernist and postmodernist views tend to rely on a categorical partition of indigenous knowledge. In science, it often is seen only as a resource of testable data. In the alternative *noble-other* vision, it is seen through a *back to the future* lens. The result is that, despite the fact that most indigenous peoples live in a *present* far from their hunter-gatherer days, to establish their case for sustainability they are compelled to choose between two paths, both defined by outsiders: modernist in which they are backward or postmodernist in which they are forward.[35]

Such expectations reinforce the indigenous/scientific knowledge dualism. Practical scientists use the dualism to get an argument across that science trumps traditional knowledge. Simultaneously, idealistic conservationists use a dualism to promote a romanticized version of indigenous lifestyles. The emphasis on differences inhibits a search for potentially useful similarities and synchronicities in the two knowledge systems.[36]

Berkes suggests that the continued referral to two distinct knowledges—one abstract and the other concrete—can be traced to the writings of Weber and Nietzsche.[37] This system-of-knowledge analysis emphasizes that traditional knowledge is characterized by its embeddedness in local milieu; boundedness in space and time; sense of community; and lack of separation between nature and culture, between subject and object. These features contrast with Western scientific knowledge, which is characterized by disembeddedness; universalism; individualism; and nature-culture, subject-object dualisms. Today, Western cultural and natural preservationists wish to see exotic peoples preserved as idealized, superior cultures that live in harmony with nature.

A FALSE DICHOTOMY?

Thus, many outsiders, both modernist and postmodernist in outlook, differentiate between indigenous and scientific knowledge in such a way that the two are pictured only in essentialized forms; the former being organic, holistic, intuitive, local, practical and egalitarian, and the latter being rationalistic, reductionist, theoretical, abstract and objectively verifiable.[38] Although it must be acknowledged that there are numerous substantial differences between the two approaches, there remains the question of whether or not these differences compose a dichotomy that accurately describes reality—and is therefore useful. Some argue that even the

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bedrock polarities, between oral and written, fixed and flexible, particular and universal, are too simplistic.[39]

Emphasizing that traditional knowledge is incompatible with science diverts us from the task at hand. Ellen argues for an integrated approach that incorporates both to preserve traditional knowledge.[40] Another analyst points to what is missed in technocratic approaches: "Technocratic arrogance does not recognize that biodiversity will not survive without the co-evolving human diversity that is particular to place, which also includes linguistic diversity, diversity in food and medicinal systems, and even in the ways we see how culture and nature intermingle."[41]

Ironically, science owes its existence to traditional knowledge. Western science's birth is usually traced back to the scientific revolution that began in seventeenth-century Europe, but it did not emerge de novo. It was built on existing folk knowledge, from Europe and (later) its colonies. Thus, horticulture grew out to botany, alchemy grew out to chemistry, and practical mechanics grew out to physics. The practice of codifying folk knowledge continued into the nineteenth century and led to work that, although presented as Western science, resulted from earlier practices rooted in traditional knowledge.[42]

Only in the early twentieth-century, when folk knowledge was sufficiently absorbed into science, was it rejected on the grounds that it was inferior. However, the historical fact that traditional knowledge is part of what is now labelled modern or Western science makes it awkward to continue to draw boundaries between them. Indigenous peoples today can rightfully claim that their knowledge is, in an organic sense, already part of science.[43]

Scientific and traditional knowledge are not only connected through historical practices, they also share a framework of assumptions about how the world is constructed and how people relate to the world. Human beings, in their perceptions and representations of nature, distinguish between empirical facts and the symbolic and mythical values attached to them. Cultures blur the borders between the objective and the subjective. However, within science a separation between its subjective and technical aspects has been introduced to promote an objective rationality. Nevertheless, science, like any other knowledge system, springs from and protects the interests of a particular culture. Thus, scientists conform to an institutionalized model, which is exemplified through practices such as specialist terminology, taxonomic nomenclature, methodological protocols, specialist journals, and so forth. Science and scientific knowledge also serve particular economic and political interests. This is not to argue that they are contaminated so much as it is to argue that they are socially embedded. Scientific knowledge is, like traditional knowledge, a social and cultural as well as a technical practice. Indeed, there is an extensive literature within science itself, which details its social dimensions and underpinnings—that of the social construction of science.[44]

Although the formats of indigenous and scientific knowledge may differ (e.g., story telling versus academic publications), the concept of knowledge as a social practice is just as relevant for science as it is for traditional knowledge. This means

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that, in the words of Ravetz, "the deepest problems in the understanding of science are social rather than epistemological."[45] He argues that in fact science embodies a fundamental paradox between being an enterprise requiring a creative, personal, and subjective craft, on the one hand, and being an objective, impersonal, and data-manufacturing factory, on the other.

Acceptance of the idea that all knowledge is socially produced softens the dualism between indigenous and scientific knowledge. Instead of existing within totalizing binary poles, indigenous and scientific knowledge can be more usefully placed on a continuum, in which at least some differences are not absolute but relative. Such an approach might be rooted in studies of particular social practices that are the basis of the differing knowledge systems.[46]

Feminist analyses contribute to the contemporary critique of an idealized science, as noted by Feldman and Welsh: "[G]reater attention to the nuances posed by feminist perspective can challenge some of the assumptions of a positivist framework [of science], particularly the tendency towards dualist thinking."[47] Much of the feminist critique of a pure science is based in its earlier critique of the essentialist dichotomy of male–female. Indeed, it has become a commonplace realization that the indigenous and the feminine have been portrayed by a hegemonic scientific-masculine culture as sharing similar characteristics (e.g., being intuitive and subjective).

Scholars engaging feminist theory argue that the oversimplified rhetoric of indigenous versus scientific knowledge fails to address underlying asymmetries of power—that a distorted power relationship can be held responsible for the continued marginalization of indigenous peoples and the subordination of their knowledge systems. Ultimately, the continued existence of indigenous knowledge and the societies they underpin depends on the outcome of the confrontation between the powerful and the powerless. The question has been framed by Davis: "Can massive cultural appropriation of the intangible cultural heritage of indigenous peoples be treated as an autonomous issue, or does it follow more or less inevitably from the power difference between small-scale societies and the world's industrial giants?"[48]

What is needed is to "find ways to give a voice to local knowledges without smothering them in totalising theories."[49] The fact is that all knowledge systems are shadowed and even fragmented by power relations, involving differences of class and race as well as of gender. This has been analyzed as "knowledge politics" by Stehr.[50] The essence of knowledge politics lies in strategic efforts to move the social control of knowledge into the cultural, economic, and political center of society, where the main concern then becomes the generation of rules and sanctions to subsume knowledge within property relations.

Totalizing definitions of traditional knowledge are often linked to the distinctiveness of its temporal borders and spatial contexts. However, it is not stationary or unchanging. Instead, it is syncretic and dynamic, continuously influenced by outside ideas.[51] Traditional knowledge interfaces with other knowledge systems,

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while at the same time it is socially and culturally embedded. Neither indigenous nor scientific knowledge exist in a silo; both have been transformed through mutual exchanges since at least the fifteenth century.

Arguments to the effect that indigenous peoples are still living in the past and are unable to incorporate new challenges and situations into their knowledge systems can be challenged. For example, most of the indigenous communities that dealt with colonialism were able to survive, however marginally, and they had to have flexible as well as tenacious knowledge systems to do so. In this sense, indigeneity has more to do with its encounter with modernity—through the institutions of the state, capital, science, and property—than with timeless and locally bounded identities. Notions of embodiment, location, and history are an antidote to such essentialism.[52] Understanding any knowledge production, whether scientific or indigenous, requires an appreciation of the value of historically framed and situated experiences.

For scholarly disciplines such as STS, the fundamental basis for thinking about science is that theories, observations, institutions, methods, machines, and networks are socially shaped in one way or another. We suggest that by accepting this episteme it becomes easier to put traditional knowledge on a par with scientific knowledge. The approach of examining science as an active process of social construction, in which a variety of actors build a heterogeneous network of relations to make their theories and devices, allows for a questioning of the conventional narrative of Western scientific truth.[53] The fact that traditional knowledge is as innovative as scientific knowledge is already acknowledged in the literature.[54]

As we have tried to demonstrate by engaging a critique of the Enlightenment, the narrative of science has always been part of the general culture of society. The scientific revolution's abstract and positivist epistemology was just as much a part of the colonialist era as was the conquest of *vacant* land. In considering science as such a set of situated practices it becomes easier to decenter it and to develop a more comprehensive framework in which all knowledge systems can be recognized and protected—*for what they are*.[55]

LOCAL KNOWLEDGE

Rouse proposes that any knowledge, from an epistemological and political perspective, should be defined as a field of practical skills and activities, and questions the conventional view of science as consistent and coherent. Instead, he argues that science is a *local knowledge* "embedded in the ability to employ concrete exemplars in the absence of agreed-upon interpretations of them; science is not dependent upon the particular developments of theoretical explanations [but depends] on the importance of locally, materially, and socially situated skills and practices for all understanding and interpretation."[56]

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Rouse posits that scientific research cannot and should not become disentangled from "one's involved, skilful craft knowledge of a field of objects and practices or from one's practical needs."[57] He refers to Heidegger's idea that the interpretation of opportunities in scientific research requires *Vorhabe* and *Vorsicht*, the understanding of which is locally situated in that it refers to a particular configuration of persons, skills, equipment, and so forth. For Rouse, science is an activity that takes place against a backdrop of localized practices supported by acquired skills, practices, and equipment (including theoretical models), rather than an exercise in systemized theorizing.

As such, knowledge is a space in which linkages and then assemblages are established. A variety of components—people, skills, knowledge—are linked by social strategies through which a local space is created where knowledge can flourish. The innovative aspect of knowledge does not lie in the unique substance of technoscientific knowledge but rather in the innovative assemblage of different knowledge producers who may operate in different spaces. Assemblage is a term Turnbull borrowed from Deleuze and Guattari, who use it to identify the connection of a wide variety of components which at first sight seem to be incompatible.[58] We extend Turnbull's argument that knowledge production is essentially a local process by suggesting that such an explicit focus on *localness* allows for a bridging of cross-cultural knowledge systems.[59] This localness is a proximity or community of praxis and is not geographically limited.

When the cultural uniqueness of traditional knowledge and the innovative quality of scientific knowledge are emphasized, the two cannot be compared, let alone bridged. In STS discourse, science is—just like traditional knowledge—steeped in culture and social processes. Thus, the defining characters of both scientific and traditional knowledge can be reduced to a local knowledge space. As Turnbull argues, through such a reduction, it is easier to "assemble" different knowledge spaces to create a third space: what he calls *trust*.[60] This third space is relevant when the process of knowledge production begins in traditional knowledge and is developed in scientific knowledge.

It is precisely at this point of creating a third knowledge space that we suggest IPR can play a significant role. For local knowledge spaces to move in place and time (i.e., from their local site and time of production to other places and times), a framework is needed. Such a framework should allow for the free movement of knowledge spaces without powerful restrictions—power in the Foucauldian sense. For knowledge to become mobile, its producers must have room in which to deploy a variety of social strategies and technical devices for establishing a network of connections. This assemblage, providing for a safe movement of knowledge, could be framed through IPR. We elaborate this point with the example of *hoodia*.

According to our suggestion, it would be erroneous to mark any knowledge related to *hoodia* as either traditional or scientific. Whether it is consumed in its natural setting in the Kalahari or in a laboratory in Pretoria, its appetite-suppressing and thirst-quenching properties remain the same. Although the San refer to *hoodia*

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as their "life force" and the Council for Scientific and Industrial Research (CSIR) technicians call it the "P57 molecule," both are referring to the same qualities of the same flora. This illustrates that the dualism between traditional and scientific knowledge can come down to what Latour calls *articulation*, a difference in language, or as we have described, two local knowledge spaces.

The difference between traditional and scientific knowledge lies in the "notion of the articulated propositions."[61] Although P57 relates to the articulation of appetite suppression, *hoodia* relates to the articulation of life force. However, in the current IPR model only the articulation of P57 fulfils the criteria of being innovative and is protected by law. *Hoodia* as life force is what Sunder calls "raw material" and it is not protected.[62] We suggest that *hoodia* as a local knowledge space of life force and *hoodia* as a local knowledge space of P57 can be linked and assembled. In this respect we argue that the defining character allowing knowledge to be patented should not be the innovation of scientific practices (*miracle molecules*) but the creation of a third space of trust that provides legal recognition (through IPR) for the historical creation of innovation across local knowledge spaces. Such a third space for knowledge can cover the entire process of production and consumption, from plants in nature to pills in pharmacies.

CONCLUSION

Sunder has proposed to shift poor people's knowledge from being a subject of IP to an object of IP by emphasizing the innovative aspect of traditional knowledge, putting it on a par with scientific knowledge.[63] We propose an additional shift: to define both traditional and scientific knowledge as local knowledge, with both acting as agents of IP. In this sense IPR could become a legal knowledge space that recognizes and encourages the connection of a multitude of local knowledge spaces. This legal knowledge space must be characterized by trust (justice) to facilitate the movement of local knowledge between different places and times.

Thus far it has been argued that traditional knowledge is just as innovative and evolving as scientific knowledge, and therefore compatible with current IPR requirements. We suggest that the idea of the innovation of science is a descendent of a dualistic Enlightenment. In positing scientific knowledge as another form of local knowledge, traditional knowledge can lose its inferior status. The act of assemblage between different local knowledge spaces is the innovation. Intellectual property rights could become a mechanism that frames the full life cycle of innovation, instead of simply validating its last stage (i.e., the technoscientific one). If the last stage results in a marketable commodity, its owners are the assemblage of local knowledge spaces that produced it, not just the pharmaceutical companies that claim its IPR.

A focus on local knowledge allows for recognition that it is heterogeneous, that it is part of an interconnected world and tied to scientific and technical networks

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through which it interacts.[64] Through such interaction, it is possible that knowledge can be simultaneously and dynamically situated in the local and the global, the historic and the contemporary, the cultural and the legal.

The contemporary lives of most indigenous peoples are a far cry from an idealized past. Imposing unrealistic definitions of an authentic indigeneity not only distorts their present reality but constrains their social, economic, and political capabilities. Ultimately, the debate about what is traditional knowledge and how it differs from scientific knowledge is as much rhetorical as it is substantive; and it diverts attention away from more important issues at stake, including the sustainability of indigenous peoples and their knowledge and the potentially valuable contribution of each to sustaining global biological and cultural diversity.

By reducing differences between indigenous and scientific knowledge to a binary opposition of superiority-inferiority, possible fundamental areas of compatibility are ignored. Instead of marking any piece of knowledge as exclusively indigenous or scientific, it makes more sense to assume that knowledge has different logics and horizons, depending on the interests it serves or the manner in which it is generated. Polarities can promote hierarchy and rigidity, whereas assemblages can further equity and flexibility. The present polarity between indigenous and scientific knowledge does little to protect or enhance traditional knowledge, which faces a range of threats, including corporate expropriation, theme park caricature, and extinction.

How might such an approach impact indigenous peoples? The San are an illustrative case. Although most are now poor farm workers, their knowledge of local nature can still be a valuable resource for them. In addition to serving to sustain their evolving culture, this knowledge could be leveraged in negotiations with outsiders interested in profiting from it, applying it to sustainability projects, or preserving it. In addition, formal recognition of the San claim to a local knowledge space will help them sustain its related social practices, including collective sharing. However, the principal point would be to treat them as potential partners in an assemblage of knowledge. This would serve to legitimize them and contribute to their efforts to move out from under domination by the Europeans and Africans who historically subjugated, and continue to dominate, them. Of course such a shift would present a significant challenge to national governments, as well as to the international IPR regime.

The concept of traditional knowledge limits knowledge to traditional land where the San lived in the past. However, they have been resettled to land where there are other ecosystems and where they have developed a new knowledge base for local biota. A major value of the concept of local knowledge space to resettled indigenous peoples is that it links knowledge to their new lands. Although traditional knowledge ties knowledge to traditional places (or historical homelands), local knowledge space ties it to local places (or present homelands).

Local knowledge space also allows for recognition that different ethnic groups living on the same land can share rights over it. In areas where different ethnic

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groups have been exchanging local knowledge for generations, it does not seem just that only one group is designated as its sole custodian, with exclusive ownership rights. The concept of local knowledge argues for a *bundle* of land and knowledge rights, in which the focus is on sharing through the negotiation of access and usage rights.

Focusing on the local will also facilitate the (re)discovery of a living law. The sources of law that regulate IPR are found on library shelves as well as in local practices and local stories. Incorporating these local practices into a global script is the challenge. However, as argued throughout this article, by unpacking the assumptions made about traditional and scientific knowledge systems, the gap between the global and the local, *us* and *them*, may be bridgeable. Without such bridging, traditional knowledge's fate remains problematic.

ENDNOTES

1. See Ellen and Harris, in *Indigenous Environmental Knowledge*; Pottier, "Negotiating Local Knowledge;" Blakeney, "The Protection of Traditional Knowledge"; Berkes, Colding, and Folke, "Rediscovery of Traditional Ecological Knowledge"; and Escobar, "Whose Knowledge, Whose Nature?"

2. See Brown, "Heritage Trouble," and Mulligan, "For Whose Benefit?"

3. See Ravetz, *Scientific Knowledge and Its Social Problems*; Sillitoe, "Globalising Indigenous Knowledge"; Sillitoe, "Participant Observation; and Hess, *Science & Technology*; Hess, *Science Studies*; Golinski, *Making Natural Knowledge*; Knorr-Cetina, *Epistemic Cultures*; Turnbull, "Reframing Science"; Turnbull, "Local Knowledge and Comparative Scientific Traditions"; Rouse, *Knowledge and Power*; Knorr-Cetina and Mulkay, "Emerging Principles in Social Studies of Science"; and Harding, *Science and Social Inequality*.

4. For information on the Hoodia benefit-sharing agreement, see Vermeylen, "Contextualising 'Fair' and 'Equitable'" and Wynberg, "Rhetoric, Realism and Benefit Sharing."

5. See Sillitoe, "Participant Observation."

6. For example, WIPO, the Convention on Biological Diversity, and the Trade Related Aspects of Intellectual Property Rights under the General Agreements on Tariffs and Trade.

7. See Leistner, "Traditional Knowledge."

8. See Dutfield, *Intellectual Property Rights*.

9. For an overview of all the work Posey has done in this area, see Posey, *Indigenous Knowledge and Ethics*.

10. See Posey, "Upsetting the Sacred Balance," 28.

11. See Posey, "Upsetting the Sacred Balance," 32.

12. See Posey, "Commodification of the Sacred"; and Posey and Dutfield, *Beyond Intellectual Property*.

13. See Simpson, *Indigenous Heritage*; Simpson and Jackson, "Effective Protection"; Hayden, *When Nature Goes Public*; Greene, "Intellectual Property, Resources, or Territority?"; Greene, "Indigenous People Incorporated?"; Tucker, "Land, Tenure Systems"; Berman, "As Long as the Grass Grows"; Riley, "The Amerindian Rights Movement"; Solomon, "Intellectual Property Rights"; Gibson, *Community Resources*; Pretorius, "TRIPS and Developing Countries."

14. See Antweiler, "Local Knowledge Research Methods."

15. See Shiva, *Biopiracy: The Plunder of Nature*, and Shiva, *Protect or Plunder?*

16. See Vermeylen, *Between Law and Lore*.

17. See Sunder, "The Invention of Traditional Knowledge," and Sunder, "Property in Personhood." For more details on the new commodification debate, see the edited volume by Ertman and Williams, *Rethinking Commodification*.

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18. See Sunder, "The Invention of Traditional Knowledge," 100.
19. See Sunder, "The Invention of Traditional Knowledge."
20. See Martin and Vermeylen, "Intellectual Property, Indigenous Knowledge."
21. See Sillitoe, "Globalising Indigenous Knowledge," and Sillitoe, "Participant Observation."
22. Turnbull, "Reframing Science."
23. See Pottier, "Negotiating Local Knowledge."
24. See Smith, "Protecting and Respecting Indigenous Knowledge."
25. Whitton, "Herder's Critique."
26. See Curry and McGuire, *Community on Land*, 33.
27. Shore, cited in Fitzpatrick, *Modernism and the Grounds of Law*, 63.
28. Mire, "The Genealogy of Witchcraft."
29. Mire, "The Genealogy of Witchcraft," 88.
30. Mire, "The Genealogy of Witchcraft."
31. Latour, *We Have Never Been Modern*, 97.
32. Gough, "History, Representation," 93–94.
33. Milton, *Environmentalism and Cultural Theory*, cited in Argyrou, *The Logic of Environmentalism*, 71.
34. For information on the Khwe, see Vermeylen and Martin, "Land Rights, the Namibian San"; and Vermeylen, *Between Law and Lore*.
35. See Martin and Vermeylen, "Intellectual Property, Indigenous Knowledge."
36. However not all *postmodern* scholars romanticize the *native*. With regard to the IPR literature, see for example Brown, *Who Owns Native Culture?* and Martin and Vermeylen, "Intellectual Property, Indigenous Knowledge." Nevertheless, as we have argued in the introduction there are scholars who have highlighted the uniqueness of traditional knowledge and have used this uniqueness as a basis to negotiate property rights. For more details on this see Vermeylen and Martin, "Land Rights, the Namibian San."
37. Berkes, *Sacred Ecology*.
38. See Cleveland and Soleri, "Indigenous and Scientific Knowledge."
39. See Nygren, "Local Knowledge in the Environment-Development Discourse"; Sillitoe, "Participant Observation"; and Smith, Burge, and Ward, "Globalisation and Indigenous Peoples."
40. See Ellen, "From Ethno-Science to Science."
41. Parajuli, "Learning from Ecological Ethnicities," 584.
42. See Ellen and Harris, in *Indigenous Environmental Knowledge*; and Ravetz, *Scientific Knowledge and its Social Problems*.
43. See Barsh, "How Do You Patent a Landscape?"
44. For an overview of this literature, see Yearley, *Making Sense of Science*, or Chambers and Gillespie, "Locality in the History of Science."
45. Ravetz, *Scientific Knowledge and its Social Problems*, 71.
46. See Leach and Fairhead, "Manners of Contestation."
47. Feldman and Welsh, "Feminist Knowledge Claims," 31.
48. Davis, "Some Realism about Indigenism," cited in Brown, "Heritage Trouble," 53.
49. Turnbull, cited in Nygren, "Local Knowledge in the Environment-Development Discourse," 282.
50. See Stehr, "The Social and Political Control."
51. See Nel, "Indigenous Knowledge Systems"; and Sillitoe, "Participant Observation."
52. See Layton, "From Clan Symbol to Ethnic Emblem;" Escobar, "Whose Knowledge, Whose Nature?" and Wuthnow, "Deleuze in the Postcolonial."
53. Hess, *Science & Technology*.
54. Sunder, "The Invention of Traditional Knowledge."
55. Turnbull, "Reframing Science."
56. Rouse, *Knowledge and Power*, 72. Rouse was mainly inspired by Kuhn who argued that textbook views of science misleadingly construct the development of science as a steady accumulation of results and the evidence to support them.

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57. Rouse, *Knowledge and Power*, 92.
58. Turnbull, "Reframing Science."
59. Turnbull, "Local Knowledge and Comparative Scientific Traditions."
60. Turnbull, "Reframing Science."
61. Latour, *We Have Never Been Modern*, 143–44.
62. Sunder, "The Invention of Traditional Knowledge."
63. "The Invention of Traditional Knowledge."
64. Hassanein and Kloppenburg, "Where the Grass Grows Again."

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