PARADIGM SHIFTS IN ABORIGINAL CULTURES ?: UNDERSTANDING TEK IN HISTORICAL AND CULTURAL CONTEXT

Mark Nelson
Heritage Program, Little Salmon/Carmacks First Nation
Box 145
Carmacks, Yukon Territory
Canada, Y0B 1C0
mdnelson@canada.com

Abstract / Résumé

Traditional Ecological Knowledge (TEK) scholarship has become widely recognized in academic and policy circles over the past twenty-five years. However, political pressure often results in the objectification of Aboriginal knowledge, thus rendering it a commodity within resource management regimes. This paper begins by evaluating current TEK scholarship before examining an historical case concerning adaptations in Aboriginal people's knowledge. Thomas Kuhn's theories concerning revolutions in scientific knowledge are applied as a tool for understanding TEK as dynamic and socially-situated knowledge. To conclude, the ramifications of commoditizing TEK are examined in selected Canadian resource management cases, and new directions for Aboriginal participation in resource management are offered.

Les études portant sur les connaissances écologiques traditionnelles (CET) ont acquis une reconnaissance étendue dans les cercles universitaires et politiques au cours des vingt-cinq dernières années. Toutefois, les pressions politiques se traduisent souvent par l'objectification des connaissances autochtones et elles les ont transformées en une marchandise pour les régimes de gestion des ressources. Le présent article commence par une évaluation des études courantes sur les CET avant de passer à l'examen d'un cas historique portant sur l'adaptation des connaissances des peuples autochtones. L'auteur a recours aux théories de Thomas Kuhn, qui portent sur les révolutions dans les connaissances scientifiques, à titre d'outil de compréhension des CET comme des connaissances dynamiques et sociales. En conclusion, l'article examine les ramifications de la réification des CET dans certains cas canadiens de gestion des ressources et propose de nouvelles orientations à la participation des Autochtones à la gestion des ressources.

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Introduction

Traditional Ecological Knowledge (TEK) is a concept born out of political struggles for control over natural resources, and concurrently out of struggles for self-determination on the part of First Nations peoples. TEK has become the Aboriginal community's answer to the hegemony of scientific institutions and knowledge within the institutions that govern natural resource allocation and management. While the concept has its academic roots in earlier concepts such as ethnoscience (Berkes, 1999:38; McGregor, 2000: 440), it has been most clearly articulated and developed within modern political settings. The result has been the marriage of academic research to policy initiatives within the context of struggle over resource control. This has been at times a difficult marriage, which has produced certain concepts and approaches that do not adequately withstand critical scrutiny. In this paper, I first wish to demonstrate how TEK has been falsely characterized and objectified within much of the scholarship on the subject. This objectification may be overcome by re-situating Aboriginal people's knowledge in a dynamic, social context that both allows and accounts for historical change and adaptation. To accomplish this, I shall draw upon ethnohistorical literature in order to examine briefly the changes in Aboriginal beliefs concerning animal population dynamics, concepts of waste, and appropriate human behaviour towards animals. I suggest that combining ethnographic accounts with Thomas Kuhn's (1970) analysis of science as a culturally influenced social institution may help us to better understand Aboriginal peoples' knowledge of the environment as a dynamic process rather than a static entity. A clearer understanding of this process will help us to develop practices for a better treatment of Aboriginal knowledge. Following this, the implications and impacts of TEK's objectification within modern policy settings are explored. I suggest that a more fruitful approach to Aboriginal participation in natural resource management is required if that participation is to be robust and meaningful.

The Objectification of Aboriginal Knowledge

One need only consult the relevant academic literature to realize that "Traditional Ecological Knowledge" has become an entity unto itself, and the direct subject of its own field of inquiry. Many articles and books address TEK specifically, employing the term both in their titles and throughout the text (Freeman and Carbyn, 1988; Inglis, 1993; Berkes, 1999; Usher, 2000). Self-reflexive critical reviews of TEK scholarship serve to further cement the subject's status as a recognized field (e.g. Kuhn

and Deurden, 1996, Nadasdy, 1999, 2003). Most of the authors on this subject acknowledge (at least implicitly) that TEK is a knowledge system that is rooted in Aboriginal cultures, and that it derives both its substance and its meaning through these cultures. Yet, few actually deal with TEK in these terms. Instead, continual efforts are made to define TEK in and of itself and to enumerate its characteristics, thereby setting TEK apart as a discrete, coherent (and therefore definable) entity. "Despite the warnings from anthropologists and Aboriginal peoples themselves" writes Nadasdy (1999: 5), "the discourse on TEK continues to treat traditional knowledge as a set of discrete intellectual principles which are completely separable from the cultural milieu that gives them meaning." This effort is in itself a very scientific approach, in that something must be clearly defined and rendered falsifiable in order to be legitimate. In doing so, the subject is often abstracted from its setting and compartmentalized. For example, phylogenetic taxonomy classifies species of flora and fauna according to their genetic relationship to one another, but completely ignores how they relate to the ecosystems in which they are actually found. This practice generates a system of knowledge that is useful in the laboratory, yet is of little practical value for interacting with the environment. In objectifying TEK, social scientists implicitly impose the structure of their own knowledge system (i.e. western scientific inquiry) upon that which they profess to elucidate. As I shall illustrate, what results does not function very well outside of the academic laboratory.

In general, there have been three approaches towards defining TEK. Some attempt to achieve a broad, inclusive definition for scholarly purposes, while others attempt to achieve more narrow and discrete definitions for heuristic purposes. Finally, some who encounter difficulty in defining TEK (which is nearly all who try) attempt to define it by describing its characteristics in order to avoid broad and vague definitions. For a good example of the first approach, I turn to Berkes (1999: 8), who provides a very inclusive and fairly representative definition of TEK:

> ...a cumulative body of knowledge, practice, and belief, evolving by additive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment (emphasis in original).

Martha Johnson (1992: 4) provides a similar and often-cited definition of TEK:

> A body of knowledge built up by a group of people through generations of living in close contact with nature.... With its roots in the past, traditional ecological knowledge is *both*

> *cumulative and dynamic*, building upon experiences of earlier generations and adapting to new technological and socio-economic changes of the present (emphasis added).

Such definitions attempt to do justice to the broad range of ideas that are encompassed within Aboriginal people's knowledge. Yet, by casting their net so widely, these scholars produce a definition that has little value in practical application for environmental management purposes, which is arguably the *raison d'etre* of TEK research. Stevenson (1996: 281) criticizes a similar definition of TEK by the Dene Cultural Institute on these grounds, in spite of his respect for the complexity and breadth of Aboriginal knowledge. In response, he defines TEK by separating its cultural and empirical components in order to render it more useful for environmental management. Usher (2000) makes a similar attempt by creating four different categories of TEK: direct observation, secondary observation, cultural norms regarding the environment, and the worldview that informs norms and interpretations. He contends that empirical observation must be distinguished from culturally based interpretation for the purposes of environmental impact assessment (EIA). While this practical approach is certainly more systematic than ultra-holistic treatments of TEK, it inevitably exhibits the opposite shortcomings. Aboriginal knowledge is rendered fragmented and decontextualized, and does not properly reflect the growth, utilization and transference of knowledge within those cultures. Aboriginal participation in EIA is limited to offering observations that are supposedly a-cultural. Usher's point that an EIA hearing is not the place to discuss the broader issue of Aboriginal social marginalization is well taken, but tends to reflect the compartmentalizing approach to knowledge. In my experience, Aboriginal peoples would argue that one cannot separate environmental issues from social ones, and distilling that which could be termed "social" out of TEK does little to serve Aboriginal peoples' purposes. Further, in order to render observations into useful knowledge, somebody must interpret it at some point, be it an Aboriginal person testifying at an EIA hearing or an independent scientific panel. To remove the right of interpretation from Aboriginal knowers, only to leave it up to someone else, would be to perpetuate the historical mistreatment that has lead us here in the first place.[1] It would seem, then, that a practical approach to defining TEK causes more problems then it solves.

The third approach to defining TEK, by enumerating its characteristics, also exhibits shortcomings. TEK may be characterized as holistic, qualitative, value-laden, diachronic, and orally transmitted, to list a few of the adjectives that are commonly used (e.g. Berkes, 1993: 4; Usher, 2000: 187). Indeed, these should all seem like valid descriptions to any-

one familiar with knowledge within Aboriginal cultures. Yet, these descriptions do not seem like a satisfactory alternative to the failure to produce a viable definition of TEK; one does not demonstrate an understanding about the nature of a thing by describing it's characteristics. Now to be fair, TEK is not a distinct object, and it is doubtful that many scholars would call it such if directly questioned. Yet, in continually attempting to define TEK, or to list its characteristics, this is precisely what they do. Our understanding of knowledge as something that is culturally situated has become marred by the consistent and pervasive use of objectifying terminology.

Rather than attempting to define TEK, we might take a word of warning from the very people to whom we ascribe TEK and its presumed qualities. The concept of TEK does not originate within Aboriginal cultures, but within academic institutions (McGregor, 2000: 439). Consider the words of an Inuk interviewed by Gombay (1995: 81): "Traditional knowledge? Never heard of it. I didn't even know I had it. What's the world thinking of it for?" (cited in Stevenson, 1996: 280). This quote illustrates that knowledge is not conceived of as a discrete entity within Aboriginal cultures, and therefore no definition for TEK exists in such contexts. TEK is not a "thing" that one "has" or "acquires" as they would a diploma. We might therefore question how well our theoretical constructions accurately represent what in fact happens in Aboriginal cultures. In seeking to define TEK as an entity unto itself, we also fail to notice that the ideas put forth bear a striking resemblance to definitions that anthropologists have traditionally employed to describe "culture," albeit with a more specifically ecological focus. Their descriptions of the two concepts also mirror each other; like culture, TEK is holistic, dynamic, learned, practiced, and governed by norms. One of my colleagues recently pointed out this resemblance during a presentation in which I employed Berkes' (1999) definition of TEK; "Aren't TEK and culture the same concept?" he asked. To be fair, we must consider that ecological knowledge represents only a part of the entire knowledge base within Aboriginal societies, which addresses all aspects of reality, the entire human social "environment" if you will, not only the ecological (Stevenson, 1996; McGregor, 2000). Yet, the likening of TEK to cultural knowledge as a whole seems valid insofar as relationships with the physical environment have played a pivotal role in defining meaning within Aboriginal societies, where these relationships form the nexus of cultural symbolism (Ingold, 2000). Indeed, within most Aboriginal languages there is no translation for the word "ecological" (McGregor, 2000: 442); that which is related to the natural world is not conceptually separated from the rest of the human social environment. It is thus reasonable to

propose that the definitions of TEK advanced so far are somewhat reworked definitions of culture as a whole.

In failing to produce a satisfactory definition of TEK, scholars of this field might take a lesson from the history of anthropology, which has seen countless attempts to define "culture," all of which have been lacking in some aspect. Over fifty years ago, Kroeber and Cluckholn (1952) were able to catalogue dozens of definitions of culture that had been employed in anthropological literature. Since that time, anthropologists have largely abandoned the notion that they will ever produce a satisfactory and encompassing definition of culture, partly because they have abandoned the notion that culture can be objectified and treated as "super-organic" (i.e. as existing unto itself, outside of human society). This has resulted in a fairly monumental shift in the field's self concept, which might do as much good for the field of TEK as it has for anthropology. As Clifford Geertz puts it, "anthropology is not an experimental science in search of law but an interpretive one in search of meaning" (1973: 5). If one examines an introductory textbook on anthropology, they are likely to find that the section within chapter one entitled something along the lines of "What is Culture?" does not provide one standard definition, but acknowledges the ambiguity and difficulty inherent in defining something that is not a thing at all. While anthropologists still believe that culture "exists" (for lack of a more precise term), they no longer feel compelled to define it precisely before exploring how a people's culture binds them and influences their lives. This same latitude should be extended to those studying TEK, who are in reality studying Aboriginal cultures in a specific fashion. Nadasdy (1999) notes that many ethnographers who study Aboriginal conceptions of environment, ecology, animals, and human relationships therein (such as Tanner, 1979; Nelson, 1983; Brightman, 1993), are in fact investigating the same elements that are often squeezed into the definition of TEK. Yet, they never employ TEK as a catch-all term to define what they are studying (nor do they attempt to define culture before presenting their findings). Since their works are not directly political in nature, these authors feel no pressure to validate their subject by turning it into an object, and their work is stronger for it.

In order to re-situate TEK in a dynamic cultural context, it shall be useful to examine an historical example concerning changes in Aboriginal peoples' beliefs about their observations of animal populations. I am referring here to beliefs about animal reincarnation and population dynamics that began to change during the fur-trade, and in many cases are still in flux today. I choose this approach for two reasons. First, knowledge of animal reproduction and associated spiritual values are consid-

ered very key components of TEK. Second, there is a large ethnohistorical literature on this subject, and despite its pertinence, it is rarely incorporated into the debates concerning TEK. Examining this knowledge shift in historical perspective will help to illustrate the difference between empirical observation and culturally-based knowledge, which are incorrectly subsumed together within TEK definitions (much as scientific observation and scientific knowledge are often confounded). This exploration is not intended to undermine the validity of Aboriginal knowledge of environmental phenomena, but rather to illustrate the constructed and dynamic nature of a knowledge base that is typically treated in a-cultural terms. Indeed, one could conduct the same analysis of scientific knowledge for much the same reasons; Thomas Kuhn (1970) has already done so to some extent, and a comparison of his efforts with those of this paper is offered below.

Shifts in Aboriginal Knowledge

Stevenson (1996: 280) states that all knowledge, past and present, should properly be understood as contemporary in nature, because it exists within and is informed by the social contexts of its time. It is thus misleading to describe any knowledge as "traditional" insofar as the term implies a static and fixed state over time. Where change is acknowledged by TEK advocates, it is said only to be cumulative in nature, so that knowledge is improved by addition rather than by revision. Indeed, two of the definitions of TEK that I have cited (Berkes, 1999: Johnson, 1992) employ the term "cumulative." Upon closer inspection however, it becomes clear that ecological knowledge in many Aboriginal cultures has undergone a process of change that is not cumulative in nature. I suggest that these changes must be understood in terms of the cultural contexts in which they occurred, and that Kuhn's concept of paradigm shifts in scientific knowledge can serve here as a useful tool for understanding.

The role of Aboriginal peoples in the game depletions that characterized the Canadian fur trade has long been debated by scholars of several disciplines. Various traders, explorers, and missionaries have provided historical accounts of the Aboriginal over-harvesting that eventually decimated furbearer and other animal populations.[2] The motivations for this over-hunting and the Aboriginal hunters' awareness of its impacts have been subjects of particular speculation. What is certain is that the desire to obtain European trade goods led to the harvest of furbearers on an unprecedented scale. It is less clear how this increased harvesting and concurrent reduction in animal populations was conceptualized by Aboriginal peoples at the time. The role of a so-called

Aboriginal conservation ethic has been hotly debated among scholars (Krech, 1999; Martin, 1978; Vecsey, 1980; Brightman, 1993), especially in the face of claims by current Aboriginal leaders that their people have practiced stewardship over their lands since time immemorial (Clarkson, 1992; Coon Come, 1994, cited in Krech, 1999: 199). This debate is often framed in dichotomous terms, leaving no room for ambiguity or alternative interpretations. As Krech (1999: 180-181) phrases it: "Did Indians possess conservation ideals...prior to the onset of trade only to abandon them in the face of a seductive array of novel goods, or did they develop [them] as a result of outside influences?" Framing the question in these terms imposes a modern concept of conservation and eco-ethics upon cultures of the past. In this conception, Aboriginal peoples were either ignorant savages with no knowledge of ecology, or they were "noble savages" whose inherent conservation values were overtaken by the temptations of market goods. This approach severely limits our ability to come to a careful understanding of the process of game depletion and its interpretation. What is required is a more emic analysis that properly accounts for the perspective of the Aboriginal peoples of the time without imposing modern political agendas.

A more culturally-based inquiry suggests that Aboriginal hunters and trappers were likely operating according to their beliefs about animals. As such, they probably did not initially conceive of their practices as being unsustainable at all. Such a cultural analysis has been undertaken by Brightman (1993), in which he applies experiences from his ethnographic work among the Rock Cree of northern Manitoba during the 1970's and 80's to the historical evidence concerning game depletions during the fur-trade. He contends that a purely economic explanation of unsustainable hunting by Aboriginal peoples is inadequate, for their actions would have been governed by the way that their existing cosmology articulated with new economic practices. Many modern Crees, he states, and very likely most of the past, understand that animals killed through hunting will be reincarnated if treated with the proper respect.[3] Respect, in this case, does not include limiting the amount that one kills or ensuring that one uses all possible materials from a kill are used. Rather, respect is the product of certain ritual observances, such as the hanging of specific bones, or maintaining taboos about handling the animal (e.g. menstruating women should not participate in butchering). Brightman explains:

> "Waste" and "overkill" could occur in this cosmos but only as events of ritual omission. The number of animals in the world, their distribution on the landscape, and their accessibility to hunters were all conceived to be determined by

> the wishes of the immortal animals themselves...animals live in the bush, are killed by hunters, persist as souls after their bodies are eaten, and return again to the world through birth or spontaneous regeneration. (1993: 288)

Brightman's hypothesis is derived from his contemporary fieldwork, but is also quite consistent with various testimonies from the fur trade era (see Note 3). He presents several historical reports of mass killings in which only choice animal parts were taken, or where some of the slain animals were left to rot (Isham, 1949: 81, Drage, 1968: 17). Also presented are the reports of missionaries, who recorded the belief among Aboriginal peoples that whatever animal is found should be taken, for it has freely given itself. Taking the animal and treating it properly ensures that it will be reborn, and will maintain its relationship to the hunter in the future. Failure to take the animal could jeopardize this relationship. Brightman's hypothesis is also consistent with the initial difficulties encountered by the Hudson's Bay Company in attempting to introduce furbearer conservation measures among Cree trappers following the 1821 merger of the HBC and Northwest Company (Ray, 1975). The trappers simply did not conform to the desires of the White traders, despite confirmed evidence by that time of decline in the numbers of beaver.

People's reactions to overkill reports has generally taken one of several forms, depending upon their predisposition towards Aboriginal hunting and ecology. Some take the historical facts at face value, and interpret them as evidence that modern Aboriginal ethical relationships to animals were either non-existent at the time (e.g. Krech, 1999; Kay, 1995) or too fragile to withstand the temptations of the market (e.g. Vescey, 1980). This conclusion may simply inform a historical analysis or may inform opinions about resource management policy (e.g. Miller, 1983). Others dismiss overkill reports as isolated incidents, or assert that they have been taken out of context and biased by the reporters. Indeed, the journals of traders and missionaries of the time are frequently coloured with ethnocentric bias and judgement. However, given the number and geographic dispersal of such reports, it seems unlikely that the events they describe are wholly false, even if their evaluation is ignorant.

Before attempting to theorize as to how and why Aboriginal beliefs about animal populations changed since the fur trade, it is necessary to acknowledge the shortcomings in the available information. We have only several scattered and isolated reports from various historical sources, and this cannot be considered adequate evidence to claim an understanding of the process of knowledge changes in multiple Aboriginal cultures. We do know for certain that Aboriginal harvesting during the fur trade was significant enough to drastically reduce animal

populations, and that this would appear to be inconsistent with the ethics and morals expressed by Aboriginal people today. We also know that both the past game depletions and the modern conservationist ethic occur on a broad geographic scale, suggesting that a similar change has occurred within various societies. The process of change in between these points in time is less clear. We do, however, have several ethnographical sources from modern Aboriginal communities in which the type of change discussed above has been documented. I believe that these give us some justification for conjecture about the changes of the past. Of these modern sources, Brightman's work most clearly addresses the issue of cultural beliefs about animals and how they change over time. Brightman reported that some Crees with whom he worked in 1979 employed conservation techniques in their hunting and trapping, while others did not (1993: 303). All of them held beliefs about the consciousness of animals and the necessity of proper human interactions with them, but some people's actions indicated a belief that animal resources are finite and may be depleted by humans, while others' did not.

Fienup-Riordan (2000: 18) notes a certain level of inter-generational disagreement among Nelson Island Eskimo hunters concerning the decline of goose populations in the area. Many older Nelson Islanders attribute the decline to disrespectful behaviour by hunters. The geese are still there, they assert, but are hiding themselves from hunters because of disrespectful behaviour. Younger hunters tend to believe that there are actually fewer geese than before, and do not believe that the geese's numbers remain unaffected by predation levels. Fienup-Riordan concludes that "it remains to be seen if and when this particular interpretation will become widely accepted by Nelson Islanders" (2000: 19). Given the increased exposure of young Nelson Islanders to western science through schooling, it is possible that the newer pattern of explanation will displace the older one, though the concept of respect may remain.

Berkes (1999) documents a similar case from his fieldwork experience with the Cree of Chisasibi, Quebec. Large herds of caribou had recently returned to the area after 110 years of absence, according to Elders. Hunters took after them with zeal, bringing in very good harvests. Some animals were not fully used, others were not retrieved when wounded. In subsequent years, however, fewer caribou appeared and harvests declined. Elders cautioned that disrespectful treatment of the caribou through over-hunting and waste was causing many animals to stay away. They said that it was the same sort of disrespect that had caused the caribou to leave in the first place. Berkes notes that young hunters may be "sceptical" (1999: 107) of the sort of explanations for animal shortages given by Elders. Once hunters reduced their harvests,

more caribou began to appear. No doubt some hunters believed this was a result of proper respect, while others believed it was due to reduced hunting pressure.

The process of culture change is a complex one, the study of which is a distinct sub-field in its own right. It is not possible to account adequately for all the factors involved in the cases cited above in the space available, nor do I believe it is necessary to my purpose. The point is that, given changes in the actions of Aboriginal hunters, we can reasonably assume that change in knowledge did in fact occur, and we can draw upon documentation of this process in modern contexts for corroboration. Further, change was and is governed by the socio-cultural framework of those involved. People would attempt to explain their experiences and observations within the context of their cultural beliefs, and might modify these beliefs should they prove inadequate to explain things. Changes in beliefs would no doubt be influenced by interactions with other cultures as well. Brightman theorizes that the initial game shortages during the fur trade would not have threatened the existing cosmology of Aboriginal peoples, who had no doubt witnessed periods of scarcity before.[4] It was not until population shortages exceeded the intensity and duration of any previous ones that Aboriginal hunters might have begun to re-evaluate the impacts of their actions. Brightman guesses that the sporadic success of the HBC's post-1821 conservation policies (see Ray, 1975) may have had some impact upon Cree thinking at the time. Whatever the cause, it is clear that Aboriginal hunters began to reduce their harvesting intensity, and in some cases began to implement conservation measures.[5] Ideas about limiting harvests and limiting waste probably arose as practical issues, but were also woven into the existing conceptions of relationships between humans and animals, including norms of proper behaviour and respect. There has emerged among modern First Nations a sense of responsibility for stewardship of the lands that they rely upon. This is conceived of partly as a sacred duty, and partly as a practical duty to preserve opportunities for future generations (Clarkson, 1992; Feit, 1973).

I suggest that Thomas Kuhn's (1970) theories concerning science as a socially and culturally mediated form of knowledge may have some application to our understanding of Aboriginal knowledge. Indeed, Kuhn suggested that scientific knowledge must not be objectified by separating it from the socio-cultural context of scientists, much as I am suggesting for TEK. Kuhn also used historical explorations to illustrate the dynamic and non-cumulative nature of scientific knowledge, much as I have done concerning Aboriginal knowledge. This analogy is also appropriate in that Kuhn, like myself, seeks not to undermine the knowl-

edge in question, but to help us better understand its socially-constructed nature and thereby to develop more realistic expectations of it.

Through several historical explorations, Kuhn demonstrates that current scientific knowledge (or at least some major aspects of it) is not the product of a continuous, cumulative process of discovery. They instead result from revolutions that saw old patterns of explanation (termed "paradigms") discarded in favour of new ones, which are wholly or partially incommensurable with each other (i.e. they cannot both be true). Kuhn argues that the structure of these revolutions (termed "paradigm shifts") is influenced by the fact that scientists are social beings like everyone else, and like other people tend to organize their observations and beliefs in terms of patterns rather than fragments. He also reminds us that scientific work is carried out within a distinctive social setting, the norms and structure of which also influences revolutions. Kuhn's work thus raises questions about the "objectivity" of scientific knowledge, which is in fact not an object at all, but rather the product of scientists. This in turn raises some questions about the role of scientific knowledge in the public sphere, as I shall do concerning TEK in the following section. While the social embededness of TEK is readily recognized by most scholars, the consequences of this are not: namely, that TEK is not entirely cumulative, as claimed in various definitions, but is instead the result of changing interpretations of experience ("revolutions", in Kuhn's terms). These changes have resulted in old ideas being at least partially displaced by new and incommensurable ones. In the case discussed here, ideas about finite numbers of animals came to displace beliefs about the infinite reincarnation of animal populations, whose numbers were unaffected by the intensity of predation.

I should be careful to state that I do not claim that the process of knowledge change in Aboriginal cultures precisely mirrors the structures of paradigm shifts as theorized by Kuhn, which are based upon the specific structures of western scientific practice. To make such a claim would be to assume detailed knowledge of the process of past culture change, which is of course uncertain. What is certain is that non-cumulative (i.e. incommensurable) changes in knowledge have occurred both within science and in Aboriginal cultures, and that the process of change is socially mediated; herein lies the applicability of Kuhn's approach. While we must be careful not to over-generalize, we must also recognize the flexibility of his concepts. Indeed, Kuhn himself stated that his core ideas have applicability outside of science, and were in fact derived from other disciplines (1970: 208-209). Further, both science and TEK deal with culturally-governed explanations of natural phenomena, so I believe that it is valid to apply Kuhn's ideas here.

I should also be careful to point out that paradigm shifts are not absolute, either within science or Aboriginal cultures, but instead may see new concepts blended in with the existing pattern of explanation. These new concepts do not result in a wholesale discarding of old ones, but rather result in a revision that incorporates a fundamental new principle. Such changes may be produced by observation of a novel phenomena (as Brightman believes happened during the fur trade) or exposure to new ideas as a result of changes in the social milieu of those involved (e.g. residential schools). The belief in population dynamics of animals has not necessarily negated beliefs in the consciousness of animals, or of the animal giving itself to the hunter, or of respect and certain ritual observances as being key to hunting success. Among Aboriginal hunters, new ideas have been incorporated into an existing framework concerning human-animal relationships. The cases cited by Fienup-Riordan and Berkes are interesting in that they demonstrate several levels of change. The concept of respect remains, but has been redefined to include minimal killing and proper usage of animals. Further, the impact of respect (or conversely, disrespect), and essentially the consciousness of animals, may be doubted by some members of younger generations. Respect may still remain virtuous in their eyes, but it does not adequately explain the presence or absence of animals. As Ingold (2000) points out, knowledge is "grown" in the members of successive generations, not passed down wholesale from the previous ones. Being that contemporary Aboriginal people occupy a world that is significantly different from those of their ancestors, their knowledge is grown in a very different environment. It is only reasonable to expect that this knowledge will differ in some regards from that of the past. The portrayal of knowledge in objectified terms does not allow for such dynamics, either with scientific knowledge as critiqued by Kuhn, nor with the ecological knowledge of Aboriginal peoples.

TEK as a Political Commodity

The previous sections have established that TEK is generally objectified and treated in a-cultural terms within natural resource management and scholarship. In most cases, this occurs inadvertently and despite best intentions, often as a result of political pressures. Put simply, TEK has become a political commodity (Stevenson, 1998:5), a recognized and accredited entity within policy circles that is today one of the primary means of access for Aboriginal peoples into resource management regimes. While Aboriginal peoples may feel that they should be involved in the resource management process because of their right to self-determination, others often view the legitimacy of their presence

in these settings as a product of their knowledge. They are admitted on the grounds of their "expert" status, rather than their sovereign status as First Nations. Aboriginal concerns may be given a hearing in any case, but only specific and applicable knowledge has been effective in ensuring Aboriginal participation in management decisions. True sharing of authority based on principles of equality is the exception rather than the rule.

The validation of TEK has resulted in no small part from the attention that it has received from international sustainable development initiatives. These include the Bruntland Report from the World Commission on Environment and Development (1987), and the Rio Declaration of the United Nations Commission on Environment and Development (1993). Principle 22 of the Rio Declaration states that "Indigenous people and their communities...have a vital role in environmental management because of their knowledge and traditional practices." The Statement of Forest Principles reiterates this emphasis on Indigenous knowledge:

> ...local knowledge[6] regarding the conservation and sustainable development of forests should, through institutional and financial support, & in collaboration with the people in local communities concerned, be recognized, respected, recorded, developed, &, as appropriate, be introduced in the implementation of programmes.

Similarly, the Bruntland report states that Indigenous knowledge "can offer modern societies many lessons in the management of resources in complex...ecosystems" (1987: 12). It should be apparent from these quotations that knowledge is seen as a key factor in Aboriginal involvement in resource management processes. Indigenous knowledge receives more direct attention in these international declarations than do issues of colonialism and self-determination, thereby emphasizing the value of knowledge more so than the lives of people.

Following the lead of these international initiatives, local governments have begun to implement policies in order to involve Aboriginal peoples in resource management. This is intended as a recognition of cultural legitimacy, and is most often based upon the recognition of traditional knowledge. For example, Alberta Pacific Forest Products Ltd. has implemented a traditional land-use and occupancy study among the First Nations in its operating area as part of its obligations for public consultation under its Forest Management Agreement (FMA) with the Alberta government. The documentation of TEK was considered an essential element of this study, partly as a step towards applying this knowledge in forest management. While improving relations between the cor-

poration and First Nations communities, this project has resulted in little improvement in Aboriginal participation in forest management planning (Robinson and Ross, 1997). Rather than being granted authority to improve management processes, the First Nations simply reported their knowledge to researchers, who then recorded it and filed it away for future reference. Knowledge may have been integrated into forest management planning in this case, but Aboriginal people were not. The texts containing their knowledge became the important and authoritative references, rather than the people themselves.

A similar approach to First Nations involvement in resource management occurred during the environmental impact review of the Ekati diamond mine in Canada's Northwest Territories in 1996. The impact review panel was required to give traditional knowledge equal consideration with scientific knowledge for the purposes of assessing the potential impacts of the mine. In this case, however, the Aboriginal response to the situation reflected at least implicit awareness of the shortcomings of a TEK-based approach to their involvement. During the review process, First Nations representatives were often unwilling to deliver traditional knowledge to the panel, stating that such knowledge should not be decontextualized by separating it from the social and cultural context of those who possess it. TEK was regarded in this case as "intellectual property" for which the Aboriginal holders of that knowledge should retain the right to use and manage (Stevenson, 1997). The First Nations' position in the Ekati case is a direct response to the overall structure of the impact review process, in which knowledge is objectified and becomes the primary focus of attention and effort. If knowledge is going to be a commodity that serves as the First Nations' admission ticket into the impact review process, then it is one that they wish to retain control of. This created an unfortunate situation in which TEK became a "political football," one that the mining company needed in order to proceed, and one that the First Nations were reluctant to turn over (Stevenson, 1997).

The response to the objectification of TEK in the Ekati mine case illustrates an imminent danger to First Nations' sovereignty that results from the current structure of resource management processes. Governments and resource managers have been quick to adopt TEK collection studies as an approach to addressing First Nations' concerns with representation, sensing that they can do so without relinquishing any real management authority. TEK has thus quickly become a recognized and generally accredited entity within resource management circles. For their part, First Nations have often pursued this avenue because it presents a relatively easy means of access to policy regimes, which has rarely been

available before. Even if there are apparent problems with the TEK approach, the alternative is to pass up obvious opportunities for input in favour of long and difficult battles that attempt to address more fundamental issues of representation. Given that projects such as the Ekati mine are likely to have immediate environmental and social impacts, and that most First Nations have limited financial and human resources, it is not surprising that many have opted for the less radical approach. Yet, if we are to continue with the TEK-based approach to Aboriginal participation, it is likely that the stalemate encountered in the Ekati case will be repeated ad infinitum as First Nations grow increasingly wary of the potential for loss of authority.

Critical public responses to the Ekati impact review process demonstrate another potential danger involved with TEK-based approaches to resource management: namely, that TEK, when treated as an authoritative object rather than situated knowledge, is particularly easy to critique and at times to refute. Once objectified, TEK is changed from a unified whole into a collection of individual data that are individually falsifiable. This sets up the "one negative case" situation, in which particular cases of questionable decisions become the basis for attacking the overall validity of TEK. For example, Howard and Widdowson (1996, 1997) attack the "spiritual" aspect of TEK on the grounds that it prevents critical interpretation of environmental phenomena. They cite a case in which three Inuit hunters killed a bowhead whale, a restricted species on the endangered list, because they believed the whale had given itself to them (1996: 35). This becomes the basis for critiquing the validity of TEK for sound resource management. They further criticize those who use the value-laden aspect of TEK as a shield to deflect criticism; if one critiques TEK, one is critiquing Aboriginal values, and is therefore labelled as insensitive or ethnocentric. Others have attacked the conservationist ethic that is ascribed to (and often claimed by) Aboriginal peoples. Krech (1999) takes it as his personal mission to debunk the concept of the "ecological Indian" that is mythologized in both popular culture and pseudo-academic culture (e.g. Vescey, 1980). While Krech's purpose is more benign (i.e. less political) than that of others, his method demonstrates the type of reaction that may be provoked by one-sided, absolutist characterizations of Aboriginal knowledge.

Reformulating Aboriginal Participation in Natural Resource Management

Criticisms of the TEK concept come not only from the political rivals of Aboriginal peoples, but from supporters as well, including many scholars (e.g. McGregor, 2000; Nadasdy, 1999; Stevenson, 1996). They often

observe the same issue addressed in this paper: the decontextualization of culturally-based knowledge. Some have proposed that we should replace the term Traditional Ecological Knowledge with "Indigenous Knowledge," thereby recognizing the inseparability of ecological knowledge from cultural knowledge as a whole (McGregor, 2000). Unfortunately, this expanded definition simply leads us back into the same conundrum of validating knowledge through objectification, and it in fact even more closely replicates typical definitions of culture as a whole. In order to overcome these issues, it is necessary to reformulate our understanding of Aboriginal participation in natural resource management.

The political emphasis on the validity of knowledge systems must be abandoned, as it invariably leads to attempts to validate and critique TEK vis a vis scientific knowledge. By this, I do *not* mean that Aboriginal knowledge has no place in resource management (quite the contrary). My point is that the current approach, based on the legitimization of knowledge itself, is misguided and will not achieve Aboriginal peoples' goals. It amounts to a showdown of worldviews, in which the one that is deemed most correct is declared the winner and earns the right to govern. Of course, neither approach provides all the answers or is correct all the time, and this uncertainty becomes the basis of mud-slinging and attempts to deface the opposing view (Campbell, 1985). As Nadasdy (2003: 147-221) illustrates, Aboriginal people generally come out on the losing end of these power struggles, as they have little control over dominant resource management institutions. Continued reliance on the proven validity of knowledge systems will lead TEK proponents into a perpetual process of redefinition and refinement in order to prove the worth of their commodity. Instead, we must perceive two groups of people, Aboriginal peoples and other Canadians, participating in resource management as equals, each group being informed by a culturally-based based body of knowledge. Their right to participate is based upon their legitimacy as a people, not on what form their knowledge takes. This will be a difficult for western resource managers to accept, as it will require them to abandon the belief that theirs is the most legitimate form of knowledge, and that other forms must be integrated into scientific knowledge in order to be useful. Yet, the alternative is to accept the easier path of the status quo, and to perpetuate the types of failures discussed above.

We must also bear in mind the political context of Aboriginal rights to participation in governance. As Smith (1995) notes, Aboriginal people are "not just another stakeholder" in natural resource allocation because of their specific constitutional rights. The right to self-determination for Aboriginal peoples is affirmed in the Canadian constitution, as are treaty

and Aboriginal rights to subsist from the land through hunting and gathering. That the nature of Aboriginal subsistence harvesting has changed does not invalidate these rights; and indeed, this change must be acknowledged rather than disguised in misleading definitions of TEK. Further, we must see Aboriginal participation as a vital part of reconciliation, an acknowledgement of the impacts of colonization, and of a history of unbalanced scales of power. Ultimately, the issue comes down to a struggle over the allocation of resources, with each side either wanting to prevent a loss of access, or wanting to restore already lost access. Because the terms of this debate have been poorly framed, it has unfortunately taken the form of a debate over cultural legitimacy.

Notes

1. One might also question whether any observation can be truly objective and independent of interpretation, as what we perceive tends to be influenced by our socio-cultural background. Indeed, Thomas Kuhn makes this argument concerning the observations of scientists (1970: 128-129).
2. See particularly the accounts by Andrew Graham (1969), a resident of the York Factory HBC post between 1753-74, and by James Isham (1949), chief factor there from that late 1730's until 1761. See also the account of over-hunting among the 17th century Montagnais by Jesuit missionary Father Paul LeJeune (1897).
3. The anthropologist Diamond Jenness (1935) noted this belief in reincarnation among the Ojibwa during the 1920's. Of the Crees around York Factory, Graham states that "they kill animals out of wantonness, alleging the more they destroy, the greater the plenty" (1969: 154), implying a belief in some form of reincarnation.
4. It is not clear that intensified harvesting would have produced any immediately perceptible depletion in animal populations. "It's a little strange the breed of these beaver does not diminish greatly considering the many thousands that is killed of a year" wrote James Isham, chief factor of York Factory, in the 1740's (1949: 143).
5. Eastern Algonquian groups have managed animal populations through hunting-tract allocations since at least the early twentieth century (Speck, 1915). Great debate has arisen about whether or not this practice occurred prior to contact with Europeans, or arose as a response to the population pressures and market opportunities of the fur trade (see Tanner, 1986 for an overview of the debate).
6. The term "local knowledge" in this case can be taken as a synony-

mous with TEK, as can other terms that commonly appear in the literature, such as Indigenous Knowledge (IK) and Traditional Knowledge (TK).

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