Tracking Knowledge

Science, Tracking, and Technology

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COMPULSORY DECLARATION

This work has not been previously submitted in whole, or in part, for the award of any degree. It is my own work. Each significant contribution to, and quotation in, this dissertation from the work, or works, of other people has been attributed, and has been cited and referenced.

Signature:_____Date:

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Abstract

Knowledges are not distinct entities. They cannot be held in isolation as if bounded, discrete, or systematic. They are far too dynamic and complex to be thought of in this way. 'Scientific' and 'Indigenous' knowledge, however, are often discussed polemically and held in dialogical tension against one another. They are part of a set of dualisms that work under certain universal assumptions critical to Western epistemology. These dualisms include modernity/tradition; nature/culture; and subject/object. This study examines the multiple perspectives, including both scientists and local trackers, involved in the Western Kgalagadi Conservation Corridor Project (WKCC) in an attempt to resolve some of these dualisms. It focuses on the dimensions of tracking animals and data collection with a GPS technology known as 'Cybertracker'. Involving both scientists and people from the Kalahari with knowledge of tracking animals, the dynamics of knowledge production and the movement of knowledge are explored. Their work together demonstrates ways that movement and embodiment are central to the production of knowledge. Knowledge production and the relationship between diverse knowledges and approaches in the WKCC project are investigated without reducing them to the same epistemological foundation or holding them in dualistic opposition. Knowledges become part of networks and engage with one another through their movement, embodiment, and interaction with various non-human subject-objects. The use of the Cybertracker databasing technology shows that an engagement of multiple perspectives, the significance of movement, performance, historical connections, and subject-object relations in a variety of contexts are key to understanding the production of knowledge. The movement, agency, and relatedness demonstrated in various 'knowledge objects', including data, shows that the complexities involve a continual exchange of influence in which knowledges are always changing. The presence of diverse knowledges, expressed in both their relatedness and their tensions, are evident in their very movement in these networks as actors and the interwoven trails they leave behind. In the process, the boundaries between the dualisms become blurred, if not irrelevant.

Chapter One: Introduction

In the Western Kalahari in Botswana, wildlife biologists and local trackers are collecting data on the migratory and population patterns of wildlife in a corridor between two protected areas. This dissertation is a study of this collaborative wildlife conservation project that is working towards formally establishing a conservation corridor in Botswana between the Kgalagadi Transfrontier Park (KTP) and the Central Kalahari Game Reserve (CKGR). The Western Kgalagadi Conservation Corridor (WKCC), sponsored by Conservation International (CI), is an ideal project to examine and discuss dualistic epistemological assumptions, specifically, the nature-culture, and science-'indigenous' knowledge divisions. Located across the Kgalagadi and Ghanzi districts, the corridor project provides a space where scientists and local trackers work hand in hand to gather data for the purposes of wildlife conservation. Focusing primarily on the animal tracking and data gathering aspects of WKCC, this dissertation takes an in-depth look at the multiple perspectives involved in knowledge production, and ways that knowledge is mediated via the process of data capture, with a special emphasis on the use of the Cybertracker databasing technology.

This study attempts to provide a symmetrical analysis in which the success of data collection is largely dependent on the integration of diverse knowledges. A symmetric analysis does not just represent a Western or modern perspective of non-Westerns or pre-moderns, but also subjects Western or modern life to analysis (Latour, 1993, Hornborg, 1996). Particular attention will be paid to the movement of knowledge as researchers extricate data collected in the field by the trackers. Cybertracker, a hand-held GPS field computer system with an icon-based user interface, was utilized by the trackers to record their observations, thereby introducing a technological intermediary into the exchange of knowledge between the scientists and trackers. As wildlife of the Kalahari are converted into data through the Cybertracker data-basing technology, the trackers knowledge of the wildlife and how that knowledge appear in the data will be discussed in relation to the

ways in which scientific discourse tends to subsume all data that is collected under its universalizing umbrella.

Cybertracker

Cybertracker is a free 'green-ware' program that works with any Windows Mobile hand-held computer with Global Positioning Systems technology, designed specifically with non-literate expert trackers in mind[1]. Arguing that tracking may have been the origin of science (1990), Louis Liebenberg developed the idea to create an icon-based interface Cybertracker software for use on hand-held computer technology as a tool to enable non-literate trackers to gather complex "geo-referenced observations of animal behaviour."[2] He envisioned Cybertracker as a way for trackers to utilize their depth of knowledge to gather valuable, usable data in scientific research. Since many of the best trackers are non-literate, the graphic interface for handheld computers was developed as a means to record their observations and apply their skills in conservation management and scientific research. With such a tool, Liebenberg has argued, "scientific discourse can be extended beyond the confines of conventional science" (Liebenberg, 2003: 2).

Cybertracker utilizes Global Positioning Technology (GPS), in conjunction with an interface that can be customized to suit the needs and goals of the research, to database detailed geo-referenced information. Maps can be designed to specify the research area and uploaded onto the handheld computer. While observing, or collecting data, an icon shows the location of the observer on the map, and can be used as a guidance system, which is useful while collecting along transects[3] in the dense bush, or forest.
Cybertracker records time, date, and GPS position for every observation, name of observer (if entered), while also recording GPS timer points that maps the path taken by the observer. Collected data can be analyzed in database form [Table 1], or it can be used to generate distribution maps [Figure 1] of the observations. In sum, Cybertracker provides a combination of usability in its interface design for non-literate trackers and a

[1] www.cybertracker.co.za
[2] http://cybertracker.co.za/index.html
[3] A transect is a line inserted onto a map to indicate the path along which data is to be collected.

level of detail that makes trackers' knowledge extremely valuable to scientific, environmental research.

Date	Time	Latitude	Longitude	Name	Hoof	Observation Type	Number Total
6/13/09	06:54:12	-24.11821833	21.40410667	TEST	Steenbok	See	
6/13/09	07:03:12	-24.13169	21.41557167	TEST	Duiker	See	6
6/13/09	07:06:39	-24.14022	21.41557667	TEST	Red Hartebeest	Spoor	1
6/13/09	07:07:12	-24.14178833	21.41556667	TEST		Spoor	1
6/13/09	07:07:43	-24.14319667	21.41559333	TEST	Kudu	Spoor	1
6/13/09	08:42:48	-24.33725	21.41476833	TEST	Red Hartebeest	Spoor	2
6/13/09	08:43:26	-24.33725	21.41476833	TEST	Steenbok	Spoor	2

Table 1: Sample Data Base of observations recorded in Cybertracker

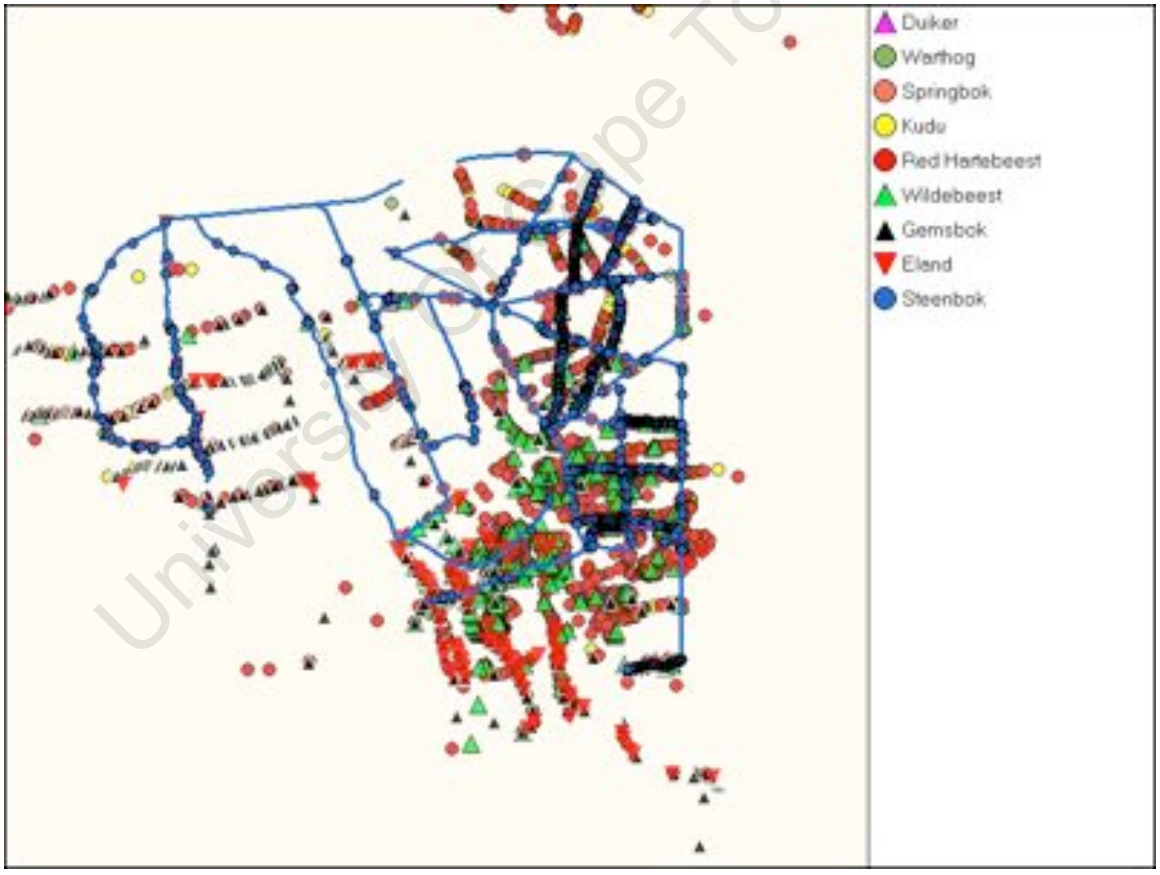

Figure 1: Distribution Map of hooved wildlife data collected with Cybertracker

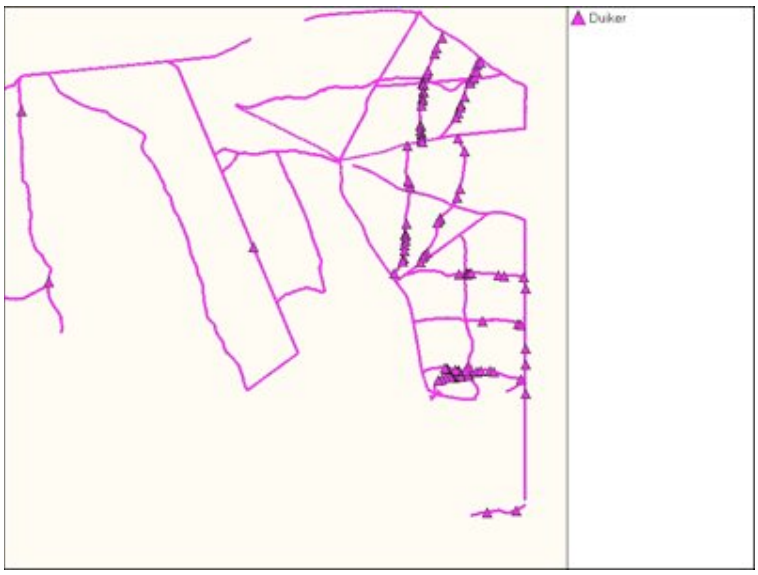

Figure 2: Distribution Map of Duiker antelope data collected with Cybertracker

The WKCC Project

The ultimate aim of WKCC is to address the disruption of migratory movements of wildlife between KTP and CKGR by formally establishing a wildlife conservation corridor between the parks, while involving and addressing the needs of people who live within the corridor[4]. The migration of wildlife between the parks has been impacted by a number of changes in land use that include human settlements, cattle ranches, fences, monopolization of scarce water sources, and heavily trafficked roads. Stated by

[4] The settlements within the corridor are composed of primarily San and Bakgalagadi people, both minority groups in Botswana. The recent history of San and Bakgalagadi people in Botswana is very complex and has received a great deal of attention, mostly focusing on the displacement of residents from the CKGR by the Botswana government (Hitchcock, 2003; Hitchcock, 1987; Solway, 2009). None of the settlements in the corridor fall within CKGR, nor are any of the trackers involved in the project former residents of CKGR. However, it is important to note that the settlements in the corridor face many socioeconomic and political obstacles similar to those often discussed in relation to the displacement. A great deal of scholarship has been dedicated to exploring the social and political issues facing San peoples in Botswana and southern Africa (ibid; Good, 1999; Sylvain, 2002). "Over the past several decades, enormous transformations have occurred among the San and their neighbours in southern Africa" (Hitchcock, 2003: 798). One such transformation, resulting from increased conservation efforts, has almost completely eliminated hunting, and thus associated skills and knowledge are much less frequently utilized. San peoples in Botswana, as Hitchcock points out, "exhibit some of the highest rates of infant mortality alongside the lowest living standards and literacy rates, and in many cases have insecure access to land and resources" (Hitchcock, 2003: 798). One of the hopes of WKCC is that community involvement in the project will address some of these issues by utilizing the skills and knowledge of people within the corridor to sustain the project.

Conservation International, the two broad aims of WKCC are to: "conserve the biodiversity and integrity of the Western Kalahari ecosystem by establishing ecological corridors between these two protected areas, and to improve the quality of life of the local communities through supporting local community development initiatives"[5]. As a wildlife conservation project, it is striving to address and support the socioeconomic development of the remotely located communities by involving them in the establishment and sustainability of the conservation corridor.

WKCC has four primary objectives:[6]

1. Contribute to improved biological, land-use and socio-economic knowledge of the region as a base for planning and management.
2. Contribute to community development through sustainable use of natural resources.
3. Provide capacity building within communities and stimulate increased cooperation between stakeholders.
4. Promote wildlife access to essential resources.

WKCC is employing three methods to collect data within the corridor: Aerial Surveys, Animal Collaring, and the Cybertracker Spoor survey. All three methods have advantages and disadvantages. For example, aerial surveys provide a lot of information about the distribution of larger animals while covering a large amount of space in a short period of time; however, it is expensive and does not offer much information about smaller animals, plants, or nocturnal animals. Collaring limits data to a small sample of animals and limited variety of species. With Cybertracker, on the other hand, WKCC can conduct in-depth spoor surveys that provide data about all animal species, including the small animals, nocturnal animals, and a wide-variety of plant life.

In addition to the added benefits in the way of data collection, Cybertracker also provides a means through which WKCC can involve people from the communities in the corridor.

[5] http://www.conservation-southernafrica.org/articles.php?id5
[6] ibid

In order to collect the spoor data, WKCC needed people who know animal spoor in the Kalahari and also have knowledge of its plant life. Moses Selebatso, the Biodiversity Manager and field coordinator for Cybertracker explains the two main reasons for employing trackers from local communities:

> One is that there is a drive towards Community Based Natural Resource Management (CBNRM). Governments are encouraging communities to manage their own resources. So if communities are going to organize their own interests they need to be empowered, and one way of doing this is by using modern technology to manage their resources. So we thought Cybertracker would be a good way to get the communities involved. And the other reason is that we wanted to use the traditional knowledge systems and recognize that this knowledge can add value to modern science. Without trackers we would not succeed in the spoor surveys, because us scientists do not have these skills, so we could demonstrate how these trackers and their skills could add value to ecological work.

This dissertation focuses specifically on the Cybertracker spoor-survey component of WKCC and the ways in which knowledge is produced and negotiated through the collaborative work of trackers, scientists, and Cybertracker.

Background of Cybertracker Data Collection in WKCC

For the spoor surveys, twelve men from seven villages in the corridor were hired and trained in the use of Cybertracker for the project. The trackers range in age, formal education level, and knowledge of tracking. The elder trackers tend to have a greater knowledge of tracking but generally have less formal education and lower levels of literacy, while most of the younger trackers have had more education but are less knowledgeable about tracking. This is reflected in the greater ease most of the younger trackers have with using the Cybertracker devices, and the elder trackers providing more in-depth detail about the animal spoor data they collect. Together they compliment each other's knowledge, increasing both computer literacy with Cybertracker and knowledge of tracking animals.

WKCC considers this cross-generational exposure and education to be one of the benefits of involvement for the trackers. As Moses put it, "Of course, they both understand both things (Cybertracker and tracking) but their levels of understanding are different, so they learn from one another." Furthermore, the project creates employment for these men and will hopefully contribute to an increased interest in wildlife conservation, reducing

human-wildlife conflict, and creating incentive to become successful trackers. At the end of the project, all of the trackers will receive certification in recognition of their tracking skills, and their involvement in the WKCC.

Through the use of Cybertracker and the employment of trackers, WKCC hopes to provide opportunities to develop ecosystem (including humans) based management of the corridor and promote the "integration of indigenous knowledge systems with modern science and technologies[7]."

Background of the Trackers

At the start of my study, there were twelve trackers whose known ages ranged from twenty-two to fifty-four, though one of the elder trackers did not know his age or year of birth. All of the trackers were selected to join WKCC from settlements that fall within the corridor. The corridor itself is a large expanse of land that stretches between the Kgalagadi Transfrontier Park (KTP) in Botswana and the Central Kalahari Game Reserve (CKGR). It encompasses part of two districts, Kgalagadi and Ghanzi, sixteen registered remote area settlements, numerous cattle posts, and eight Wildlife Management Areas (WMA's).

The wide variety of skill and knowledge among the trackers can largely be attributed to where the individual trackers reside within the corridor because of the regional ecological diversity. However, the men I considered the younger trackers, those who fell between the ages of 22 and 40, were almost always considered inferior trackers to the elder men. The one exception, Xhiko, 35, learned to track from friends and relatives of two of the older and most knowledgeable WKCC trackers, !Nate and Karoha, and lives in the same region as these men.

Much of the variety of skill level, of course, has to do with differences in the various experiences of the individual trackers. The multitude of diverse ecosystems that exist within the corridor range from the more open, sandy, woodlands in the Kgalagadi district,

[7] WKCC powerpoint presented to me by Moses Selebatso

close to the KTP, to the thicker, bushy woodlands in Ghanzi district towards the CKGR. Knowledge of specific ecosystems within the these areas is important, for as Louis Liebenberg suggests, "Hunter-gatherers… orientate themselves by visualizing the uniform and flat landscape of the Kalahari as a complex of smaller and larger plant communities, and by recognizing the position, shape, size and peculiar constitution of each plant community (Heinz, 1987b)" (Liebenberg, 1990: 79). Though there is comparatively little hunting and gathering in the corridor today, the same principles for spatial orientation apply while moving through the bush in the WKCC project. Constantly moving around the corridor during the course of the project, it was evident that trackers have differing levels of expertise about specific ecosystems based upon their experience in certain areas. Individuals familiar with an area would usually take the lead in orientating and familiarizing the other trackers, and also the scientists, with the region before setting out to collect data. Thus, the eco-geographical context in which tracking activities took place had much to do with the diversity in the kinds of context specific knowledge each individual exhibited.

The range of generational experiences of the trackers was the most prominent indicator accounting for the mixture of skill sets, especially with regard to depth of knowledge about animal spoor. One of the elder trackers told me that he can employ his tracking skills equally well throughout the corridor because "these animals are the same in these districts, but the knowledge of the young guys, it is different," since they have not had as much in-depth experience tracking animals. Older trackers grew up in circumstances where they were not inhibited by stringent hunting and conservation restrictions. They were not only allowed to hunt but were encouraged by their communities to do so as a means of subsistence, and therefore survival.

In recent years, particularly from the 1970's onward, an increase of control and/or regulation of human land-use changed the context in which inhabitants are allowed to hunt, and thereby develop highly refined tracking skills. Having experienced harsher hunting and conservation based restrictions and attended government schools, the younger trackers have had limited access to and are thus less familiar with tracking

animals. Furthermore, populations of domesticated livestock increased during this period and tending to these animals, as well as other employment opportunities, provided livelihoods that are more attractive options in light of the above-mentioned restrictions. None of the trackers, however, are engaged in any consistent form of employment, other than four months a year with WKCC.

All of the trackers told me that they learned to track from their parents, usually their fathers and uncles. Learning to track on a basic level begins at a young age, though most trackers said that they only really began to be *taught* how to track between the ages of nine and twelve. For the younger trackers, this period in life coincided with the time that a lot of them were sent to school. While many of the settlements have primary school facilities, secondary schools are often located in larger centers where children are sent to board. Thus, most of the younger trackers spent less time and had less incentive to learn and practice the tracking skills they had begun to develop as young children. In an interview, Bullets revealed that "Most people [who live in settlements in the corridor] now don't know how to track. The knowledge is mostly with the older people. When they die the numbers get smaller. Because of their experience they have the knowledge."

Though some of the younger men have hunted, their hunting activities have been relatively infrequent compared to the elder men. Furthermore, none of the younger trackers has had experience hunting with bow and arrow, for the use of dogs, horse, and spear had become much more prevalent by the time they began hunting. In a conversation with Kebogile, the youngest tracker, !Nate said, "Some of them are hunting with the donkey. Some of us are tracking on foot so we know the small animal's footprints, but those guys on donkey do not know the small tracks. It is like a car. When you are in a car you can't see the smaller footprints." Kebogile later confirmed this, stating, "they (the elder trackers) are teaching us about the spoor of the small animals and the animals that are only there at night. We are learning a lot from them."

As youths, the four older trackers, !Nate, Karoha, Nxjouklau, and Kakoshe, spent much their time during the day learning and practicing their tracking skills. "Although they

receive very little formal instruction," Louis Liebenberg points out, "children of Kalahari hunter-gatherers are exposed to a continuous process of learning in the form of play activities and informal storytelling" (1990:69). Some of these play activities included stalking insects, birds, and other small animals that served as a sort of pre-requisite for learning the more advanced skills required for hunting large animals. As teenagers, they began accompanying their fathers and uncles on hunting trips where they sought out larger animals, mostly antelope. Participating in regular hunting expeditions, they became very familiar with animal activity patterns while also learning about a wide array of environmental conditions that influence animal behavior under certain circumstances.

The four elder trackers all have a significant amount of hunting experience. !Nate, Karoha, and Nxjouklau are all from the Ghanzi district, near an area known as Lone Tree. The three have all hunted together using bow and arrow, as well as on donkey-back using spears. Kakoshe is from a settlement called Ukwi located in the southwest of the corridor in the Kgalagadi district, and his hunting has been limited to the use of spears. This is possibly due to an earlier introduction of dogs, donkeys, and horses for hunting in these parts of the Kgalagadi District. According to Louis Liebenberg, the people in the southern regions of the Kalahari in Botswana began hunting with dogs, donkeys, and horses significantly earlier than those in the more northerly central part of the corridor, near Lone Tree, the area that !Nate, Karoha, and Nxjouklau call home (Personal communication). Hunting with the aid of these animals requires less effort, skill, and in-depth knowledge of animal tracks and the various indicators that influence the behavior of the game. Liebenberg explained to me that this could be the reason that he found that the most skilled trackers tend to live in the vicinity Lone Tree. !Nate and Karoha, for instance, have participated in 'persistence hunts', hunts where they would chase large antelope on foot for hours, such as kudu, until they exhaust themselves and become stationary allowing its pursuers to spear it. Persistence hunts require a great deal of interpretive and predictive skill about animal behavior, as the animal a hunter is chasing is not visible for much of the pursuit. The two have also worked closely with Liebenberg, teaching him how to track, filming documentaries about their tracking expertise, and developing ideas that led to the creation of Cybertracker.

Spoor Survey

Data is collected twice a year, once in the dry season and once in the wet season. Each round of fieldwork takes about two months to complete as the WKCC team slowly moves through the corridor. The collection of Cybertracker data involves, first and foremost, the assemblage of a number of different individuals, and thus, assumptions, experiences, motivations and goals. In addition to the twelve trackers recruited from within the corridor, there are also the Department of Wildlife and National Parks research officers, one for each district, the Kgalagadi and Ghanzi, the WKCC Biodiversity Manager, and of course, myself. Though I primarily played the role of outside observer at first, I also eventually came to assist in coordinating data collection activities. As such, there is a wide diversity of interests among those involved in the data collection of the project, and it is important to examine the extent to which those interests are expressed in the data, if at all.

The details of research are planned and plotted out by the Biodiversity Manager the evening preceding data collection, though a more general plan is established at the beginning of each round of fieldwork. Because Cybertracker is the instrument used to collect and archive all the data, the appropriate maps must be uploaded onto the devices with the transects upon which the trackers will walk clearly marked on the maps. The area where WKCC collects data is very large and uploading a single map of this area does not provide enough detail on the screens of the Cybertracker devices for the purposes of this project. Therefore, a number of detailed, location specific maps, have been created that together cover the entire research area [Figure 3].

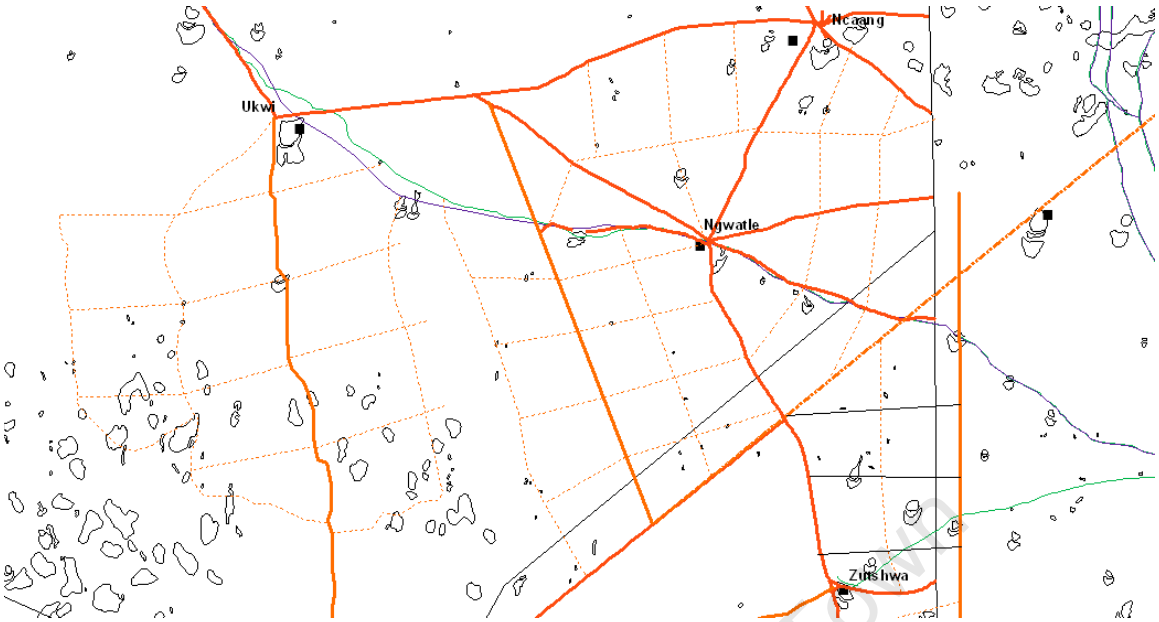

Figure 3: Map of one section of the WKCC data collection area. Solid red lines indicate roads or cutlines. Dotted red lines indicate transect for data collection.

Each evening Moses Selebatso, the Biodiversity Manager, goes into ArcView, a GIS mapping program on his laptop, and zooms in on the area where they will collect data the following day. Once the image of the map is pulled up, Moses identifies the best possible route to travel in order to establish transects. While Moses is familiar with these areas his knowledge is often limited in comparison to that of trackers that may be from, or near, that area, thus he frequently consults with them when making decisions about routes.

The maps in ArcView are very detailed and include images that demarcate various pans, sand dunes, roads, cutlines, and small sand tracks, among other things. Transects are usually set up along the roads, cutlines, and sand tracks shown in ArcView, but because these areas are very remote the perceived accessibility to these tracks on the maps is not always reliable. Rather than plotting out transects in places that may be completely inaccessible, Moses first consults with one or more trackers that knows the given area who, in turn, assists him with making decisions about the best possible route for the day. Sometimes, however, none of the trackers are familiar, or at least not enough to help make a definitive decision, with a specific area. When this occurs, it often means that Moses and a tracker with some knowledge of the area will spend the next day scouting the given area for accessible routes.

Once a decision has been made about a route, Moses sets up four or five transects spaced anywhere from ten to fifteen kilometers apart from one another (occasionally the transects will be less than ten kilometers apart when the bush is extremely thick). The trackers walk the transects in pairs, which means either eight or ten trackers will walk the transects on any given day, with two trackers remaining at camp to cook and tend to the camp. Most often Moses prefers that at least one tracker stays with the driver of a vehicle in case of emergency. Because there are usually two vehicles, this leaves only eight trackers, or four teams, which is why data is collected along four more often than five transects each day.

Depending on the terrain and its accessibility, transects can range from anywhere from eight to twelve kilometers in length. When the terrain is more open, the transects tend to be longer because the area is more accessible. In this case one vehicle usually drops the trackers at one end of the transect while the second vehicle proceeds to the end points of the transects to collect the trackers. This is the preferred method because of its efficiency as it allows the trackers to cover more space in less time.

When the terrain is less accessible, the transects become shorter because this usually requires the trackers to walk to the transects' endpoints and then return on their own to the starting point. Therefore, even though the transects might only be eight kilometers, it means that the trackers walk at least sixteen kilometers: the space they cover is less but the distance they walk is greater.

Once the route and transects have been established Moses, who almost always drives one vehicle, briefs the driver of the second vehicle about the planned route, although that person usually sits with Moses while the routes are determined. The second driver is usually a wildlife biologist from the Botswana Department of Wildlife and National Parks, or me, as was the case for the most part during my fieldwork. Moses then on occasion briefs the whole group of trackers, however the group as a whole is usually briefed in the morning before walking the transects.

An Ideal Day

During the summer months with WKCC, the day usually begins at 5:30am, earlier than winter the 7:30 am start time, in order to avoid the mid-day heat of the Kalahari. The two men assigned to tend camp that day are usually the first up to boil water for tea and coffee, and prepare something for breakfast. All of the Cybertracker devices are gathered and put into the two vehicles along with enough water for each tracker, at least one or two liters for each person.

When we depart camp, the Cybertracker assigned to the vehicle is turned on. Once the device is on GPS position is established, which enables operation of the Cybertracker program. The tracker accompanying the driver then logs into the application under his own name and puts it into 4x4-count mode. Throughout the day, while driving, the tracker enters any evidence of wildlife we observe, from tracks to actual sightings.

During my time with the project the closest transect was about twenty kilometers from camp, and the furthest was close to 100 kilometers away. Driving speeds rarely exceed 50 kilometers per hour because of the rough and sandy nature of the roads, if there are roads at all!

When the trackers are dropped off at the transects they follow the same activation procedure with the Cybertracker devices, though, since they walk in pairs, both trackers log onto the application to keep track of who was collecting data that day. In addition, instead of selecting 4x4 count, the trackers select "foot count". The trackers then begin collecting data along their designated transect. The vehicle, or vehicles, departs and drop the rest of the trackers at the remaining transects.

At the end of the day, all of the trackers are collected and return to camp. Most times the two vehicles return around the same time and everyone can rest easy, but if one of the vehicles does not return by an agreed upon time, the other vehicle must go out in search of our possibly stranded colleagues. This only happened four times during my two

rounds of fieldwork and each time we found those missing. Before I joined the project, however, there were several occasions where people were stranded, and spent a night in the bush before being found.

In the afternoons, Moses and the DWNP wildlife biologist would rest for an hour or two before starting up the generator to charge all of the Cybertracker devices and the two laptops. The trackers attended to various chores such as laundry and cooking, or spent the time relaxing. While the devices charged, Moses tended to various tasks, usually having to do with vehicle maintenance. Once the devices were charged, they were synced with the laptop in order to upload the day's data. After this is done, planning for the next day begins.

I was told that the idea was to have six days of work and then one day off, usually Sunday. During my time in the field, we encountered many unexpected problems that delayed our work and meant more off days. Mostly the problems were vehicle related which meant that the vehicles had to be taken to the closest mechanics for repairs, and could take as many as four days. Rain also set us back a few days for one as the water quickly erases evidence of animal spoor, not to mention the wet and uncomfortable conditions.

Methodology

Research was conducted in two intervals, the first in February and March 2009 during the wet season, and the second in June and July 2009 during the dry season. Though WKCC data collection in the wet season began at the end of January, I was only able to join in the second week of February because of problems with my research vehicle and complications with acquiring the necessary research permits. When I joined the WKCC team in February, it was primarily as an outside observer. However, because of vehicle problems of their own, my vehicle and I were utilized by WKCC to assist in data collection, and specifically to transport trackers to and from the transects. Having taken up such a role, I became involved in every facet of data collection, driving to, from, and along transects, as well as walking transects with the trackers when possible. As the

second driver, Moses Selebatso took the time to explain all of the maps and processes of data collection to me. This intimate involvement provided me with an in depth look into the workings of the WKCC spoor study.

Because of the role I took on during the first round of fieldwork, WKCC offered to fund my second round of fieldwork if I were to take up the position of coordinator of data collection activities while Selebatso was needed at the WKCC offices in Gaborone. Thus, I accompanied the WKCC team for the entire duration of the June-July data collection. Conducting my fieldwork in two intervals provided me opportunity and time to learn about the project at first, develop my thoughts, and then return for a second time with some context for my research questions to investigate some of the finer details of the project and ways that the trackers were using Cybertracker.

I conducted observations while participating in data collection on a day-to-day basis. Driving to the transects meant that I spent many hours each day with the individual trackers, during which time I learned much about their knowledge of animals and the Kalahari, their feelings about the project, and their understandings of Cybertracker. As often as possible, I also walked the transects with the trackers. It was during these walks that I learned most about their tracking knowledge and how they apply their knowledge in the use of Cybertracker. All of the trackers were very willing to teach me about the various signs, and, along with Moses, taught me how to use the Cybertracker device.

During the course of my fieldwork, I interviewed all of the trackers and Moses at least once, though !Nate, Nxjouklau, Karoha and Kebogile were interviewed on multiple occasions. While these interviews provided a lot of valuable information, I learned most during informal conversations when the camera and voice recorder were turned off. During these conversations, I learned a great deal about all facets of the trackers lives, from their histories, families and settlements, to their employment, or lack thereof, and their views on conservation and their relationships with the local government.

!Nate and Karoha, having worked extensively with Louis Liebenberg, were extremely eager to teach me about animal spoor and their knowledge of tracking, and took a lot of time to do so with the help of Nxjouklau. These men represent three of the most knowledgeable trackers in the WKCC project. Kebogile, on the other hand, is the youngest of all the trackers. I am extremely indebted to Kebogile for his willingness to assist me at all times. Kebogile has one of the highest levels of formal education and is also one of the most fluent English speakers. He is an eager learner and spent a lot of time learning from the elder trackers with me, translating when !Nate, Karoha, or Nxjouklau had trouble explaining something to me. Kebogile also offered many insights from the perspective of a younger tracker about tracking and the use of Cybertracker.

I focused my observations and questions on my primarily interests for this dissertation: tracking knowledge and the use of Cybertracker. The two, however, cannot be held in isolation from the lives of the trackers and their real life experience, and a number of additional topics of interest began to emerge. Topics included: the socio-economic realities of remote area dwellers (RAD's); poverty and associated issues such as alcoholism and HIV/AIDS; gender relations; relationships between RAD communities and government authorities, conservation organizations, and tourism initiatives, and all of the attached discourses; poaching and other forms of human-wildlife conflict; community trusts; and various development initiatives, to name a few. These are all topics that deserve more attention than the scope of this dissertation allows, but that I hope to explore in the future. The presence of women is regrettably absent in this dissertation. Researchers (trackers and scientists) in the WKCC field study were exclusively male. Though we did camp in settlements where women were present, the busy nature of the project left me little time to interact with them and discuss their views on initiatives such as WKCC.

Thesis and Research Problem

Tim Ingold points out that, "whereas the biologist claims to study organic nature 'as it really is', the anthropologist studies the diverse ways in which the constituents of the natural world figure in the imagined, or so-called 'cognized world' of the cultural

subjects." (Ingold, T. 2000: 14). In this study, I, the anthropologist, will be taking into account the experiences of both the biologist and local trackers as subjects, working together in the same place, but with different conceptualizations of the space in which that place is located, in which the 'natural world' cannot be held in isolation. Thus, conceptualizations of 'nature' and the interaction with non-humans will be discussed in a way that is not so disjunctive by demonstrating how 'natural' objects figure into the practice of tracking and collection of data as subjects, or subject-objects. The way in which science and indigenous knowledge have been viewed in dualistic opposition to one another has been subject of much anthropological literature, and critique (see Hornton, 1993; Agrawal, 1995). With conservation biologists and trackers informing each other's knowledge in the WKCC project, this work will contribute to such discussions, demonstrating ways diverse knowledges can work together and destabilize the discourse of such dualisms.

A project that is centred on tracking and involves multiple perspectives provides an ideal site in which knowledge production can be studied. Tracking involves "movement through the environment, following prey, and reading the signs, creates a complex of intellectual and cognitive connections and, at the same time a physical trail" (Turnbull, 2007: 142). Turnbull, citing Louis Liebenberg, points out that trails were among the first human artefacts and, "may have been one of the foundational practices on which the formation of cognition, knowledge and technology are based" (Turnbull, 2007: 142). Liebenberg et al have even argued that tracking fundamentally involves the same reasoning process, and "the differences between tracking and modern science are mostly technical and sociological."[8] How knowledge produced in the WKCC project and the relationship between the knowledges and approaches of the scientists and trackers will be explored, without however, reducing them to the same epistemological foundation.

To address these issues the knowledge histories of the scientists and trackers, but focusing primarily on the trackers, will be contextualized. This entails an investigation into subject-object relations between humans and non-humans (including wildlife and

[8] http://cybertracker.co.za/IntegratingKNowledge.html).

technology), as they move through the multiple and shifting contexts of the Western Kgalagadi. This will include taking into account how knowledge is produced and generated in this particular space where perceptions may be quite different. "Differences in ways of interacting with space depend on history of activity," (Ross, 2004: 38), of which the scientists and tracker have very different histories of activity within that space.

Cybertracker introduces a technological dimension in the collection of data that negotiates knowledge through the movement of data, as a knowledge object, across multiple contexts. The use of Cybertracker will be examined to explore a space where scientists and trackers interact in a way that may not be incommensurable. As a GPS tracking system that involves the spatial, this research will further interrogate how other senses are, or are not, involved in the process of data collection. Following Turnbull (2007), of particular interest will be an investigation into the knowledge formation/generation as it is related to space and the performative aspects of such generation through movement across space. How do other senses, emotive, and historical components influence that movement, and how are they captured in Cybertracker? Also, as the paths of these multiple knowledges cross, link, and connect, how do they influence each other as they come to occupy shared spaces? What sorts of factors play a role in the occupation of that space (i.e. emotional, historical, discourses, etc.)?

In 'Perspectival Anthropology and the Method of Controlled Equivocation' Viveiros de Castro argues that comparison is a constitutive rule of anthropology: that is, a translative process in which the 'native's' practical and discursive concepts are put into terms of anthropology's conceptual apparatus. Thus, "controlling this translative comparison between anthropologies is precisely what comprises the 'art of anthropology'" (2004: 2). In the case of this project, the scientists and trackers must interpret each other's perspectives: engaging in their own anthropological comparisons. As a means to interpret and/or translate these perspectives, the significance of movement, performance, historical connections, and subject-object relations in a variety of contexts are key to understanding the production of knowledge and use of Cybertracker in the WKCC project.

Chapter Two provides the theoretical underpinnings of the discussions that follow. It aims to provide a framework in which knowledges can be discussed together and not held in dualistic opposition (i.e. Western/Scientific vs. Non-Western/ Traditional knowledge). It looks at ways to diffuse such dualisms, including the divisions between nature and culture, and subject and object, by examining the concept of networks. Chapter Three provides an exploration into in-depth knowledge of tracking animals. It emphasizes a relatedness to the wildlife of the Kalahari as expressed by the trackers to demonstrate ways of of integrating perceptions of nature-culture and subject-object as actors within networks. Drawing on the relatedness discussed in the preceding chapter, Chapter Four investigates meanings of data and the movement of data as a subject-object. Cybertracker and perceptions of technology are then discussed in relation to knowledge production and subject-object relations. Chapter Five concludes by drawing together the themes of relatedness, knowledge production and the movement of diverse knowledges through networks.

Chapter Two: Knowledge Diversity, Data Collection and Cybertracker

There have long been tensions between different knowledges, especially between that of 'Science' and that of everything else deemed 'not of science'. Most often, it seems, the broad category of 'Indigenous knowledge' carries the flag of the 'not of science' designation in discussing this dichotomy. The difficulty in dealing with these tensions and the issues surrounding them is that the distinctions made between knowledges turn knowledge into an object, as if it were a monument representative of the people who produce it. The very dynamism of knowledge production is stripped and it is portrayed as a static mass of knowledge objects rather than the *process of knowing*.

While there are camps that advocate the importance and value of 'indigenous knowledge' and camps that dismiss it as irrational and irrelevant, both sides are often guilty of engaging in the practice of objectifying knowledge as if it were matter, or an immovable monument bounded by the social or the cultural. These arguments work within a modernist discourse in which 'modernity' and 'tradition', 'science' and 'indigenous' knowledge, 'nature' and 'culture', 'subject' and object', to name a few pairs, are discussed as mutually exclusive and pitted against one another. The 'moderns', as Bruno Latour puts it, "have confused products with processes" (1993: 115), and depend on this dichotomy. Arguing against one another, but from within the same framework, they end up trapped in discussions that emphasize a binary of knowledges. The dismissive stance of International Council of Scientific Unions (ICSU), for example, sees 'indigenous knowledge' as confined to the site of its production, and incapable of 'rational evaluation, unification and assemblage' (Turnbull 2007: 141). On the other hand, the argument is made that the "value of indigenous knowledge lies precisely in its local, place and practice based character and that to decontextualise it, to relocate it and render it commensurable with scientific knowledge would be to lose its cultural specificity" (Turnbull. 2007: 141).

Both arguments maintain that science and 'indigenous knowledge' should remain separate in order to protect authenticity, or 'purity' of knowledge. Science is universal, goes the argument, but should not be contaminated by what is 'not of science'. The implications of such arguments marginalize all that is deemed 'not of science', and somewhat ironically places it outside of the realm of the universal. 'Indigenous knowledge' is portrayed as purely contextual. Once removed from its context it loses its value, or worse, ceases to exist. In this regard 'indigenous knowledge' becomes relative only to specific contexts: it loses its 'distinctiveness' once it is produced outside of a 'local' context. Both extremes of these arguments are dependent on a divide that emphasizes distinctions and the boundedness of knowledge. Knowledges are far too mobile and complex to inhabit a single context.

This dissertation seeks to adopt a flexible view that is not dependent on dualisms and knowledge distinctions while taking cognisance of Universalist and Relativist approaches, but only as *part* of a discussion about ways of knowing. Thinking through ideas of multiplicity it is possible to work within and around spaces where discussions are neither reliant nor dismissive of these extremes. Rather than depending upon bounded knowledge distinctions, knowledges and the movement of knowledge will be discussed together in relation to a conservation project that is dependent upon the skills and knowledge of scientists and people of the Kalahari with knowledge of tracking animals. Furthermore, the role of various non-humans, from plants, animals, and landscape to Cybertracker and other technologies, will be considered in the production of knowledge. In doing so, knowledge will be tracked with an emphasis on movement, including that of *data as a knowledge object,* in relation to all the contributors of its production.

The Dichotomy in Practice

The 'science' and 'indigenous' knowledge dualism often reveals itself very prominently in conservation debates, though this dualism has been central to the discourses of colonialism and development as well. Although the motives for maintaining the dichotomy may have differed along the way, the discourses behind them share many

similarities (Agrawal, 1997). They are rooted in the western logic of progress and a teleological history in which order and reason are thought to dominate nature (Agrawal, 1997: 475). During colonialism, for example, the colonies were believed to possess the raw materials necessary for progress and enlightenment, the 'natives' were viewed incapable of utilizing these raw materials on their own, and therefore, the 'white man's burden' was to 'enlighten' these people (Agrawal, 1997: 464-467). In development, theorists "saw indigenous and traditional knowledge as inefficient, inferior and an obstacle to development" (Agrawal, 1995: 413), and conservationists often view indigenous people as an obstacle to preserving those resources.

In the 1980's and 1990's, however, a renewed interest in 'indigenous knowledge' arose, both in development and conservation rhetoric. 'Indigenous' people and their knowledges came to be viewed by many as key to development and conservation efforts. Much of this grew out of the logic that 'local' people would have a better working knowledge of the environment in which they exist. This seemed to contradict the idea that nature and culture are separate as it placed 'indigenous' people within nature, when in actuality, as Ingold argues, is simply evidence of compounding the dichotomies between humanity and nature, and modernity and tradition (2000: 15).

The notion of 'indigenous' people being part of nature and protectors of the environment has been problematized in recent years for its tendency to romanticize knowledges while maintaining the divide between Western Scientific knowledge and non-western, non-scientific knowledges. These knowledges have been valorized in contrast to scientific knowledge thereby reinforcing polemical distinctions. And, as mentioned in the beginning of this chapter, such designations lock all non-western, non-scientific knowledges into the single bounded category 'indigenous'. Agrawal, while discussing the surge of interest in 'indigenous' knowledge, points out that the validity "of separating traditional indigenous knowledge from western or rational/scientific knowledge" (1995:414), needs to be questioned. He suggests that maintaining such distinctions resembles earlier anthropological literature that attempted to study 'savage minds' and 'primitive culture'.

Evidence of the drawbacks of the distinction made between 'indigenous' and scientific knowledges is brought to our attention when Nadasdy (2005) critiques environmentalists' vision of the "ecologically noble" indigenous person. The "ecologically noble" is championed by many environmentalists who see her/him as living in nature, rather than with it. They are the ultimate environmentalists. Such a stereotype again pits 'indigenous' knowledge and scientific knowledge against one another, often leading to adverse effects on disempowered, and often marginalized people. As Nadasdy points out, this has very real political implications for people deemed 'indigenous', and when they fail to live up to the stereotype they are criticized for betraying their cultural beliefs.

Advocates for non-western knowledges suggest that these knowledges can and should be archived because of their utilitarian value distinct from that of science. However, "[j]ust as Levi-Strauss felt that savage cultures could be understood by a man endowed with 'traditionally French qualities' (1955: 101), indigenous knowledge theorists suggest that development specialists can use objective scientific methods to catalogue and preserve indigenous knowledge" (Agrawal, 1995: 428). The distinctions they seek to maintain disintegrate as non-western, non-scientific knowledges are simply legitimized in terms of science. Archiving knowledges in terms of 'Western knowledge systems' can lead to subsumption of all knowledges under the grand old heading of 'western knowledge' as it becomes the facet through which all knowledge is controlled. Producers of knowledge are undermined along the way as their processes of knowing and knowledge production become visible only through the controlled composition of archives.

In conservation efforts, the valorization of knowledges often attempts to incorporate local knowledges into a framework of western thought(or 'Euro-American' to use Nadasdy's words), but here is thrown onto the western political spectrum in environmentalist debates (Nadasdy, 2005). Maintaining a Euro-American dominant discourse that has very strong allegiances to science, the politicization of these knowledges exposes them to critique on those political terms, even though the knowledges may not align with the Euro-American political spectrum, and may even contradict environmentalists'

perceptions of that spectrum. Thus, while Agrawal argues that to talk about a distinction between indigenous and western knowledge is "potentially ridiculous," and "[i]t makes much more sense…to talk about multiple domains and types of knowledges, with differing logics and epistemologies" (Agrawal, 1995: 433), it remains necessary to be wary about the possibility of discussions about these multiple domains taking place in the backyard of the dominant western epistemological domain that perpetuate imbalances of power.

Getting Around the Dichotomies

In discussing attempts to get around stale dichotomies, Spiegel refers to Michael Lambek (1989) who demonstrates the necessity of recognizing the integration of mind and body, another old dichotomy, saying Lambek "persisted with the dichotomizing even as he tried to integrate the two 'poles'" for as problematic as dichotomies may be, "they are necessary to think with" (Spiegel. 2004: 9). Expanding upon this in a footnote, Spiegel adds that "In this respect he again agrees with Scheper-Hughes and Lock (1987: 30) when they write that the Cartesian mind-body duality of modern thought is 'good for us to think with' because it enables us to avoid 'fall[ing] into the void and into the chaos of absolute relativism and subjectivity" (2004: 9). This is useful in trying to think around discussions of universalism and relativism without getting caught in the many traps of either extreme. It recognizes the futility of a kind of deconstructionism that disregards many of the useful tools available to us. In other words, we do not have to destroy in order to rebuild.

However, this option has its limits. It may be possible to work our way out of this conundrum and rebuild without being overly reliant on the dichotomies and distinctions we seek to overcome. Working within the framework of dichotomies may be 'good for us to think with', but only to the extent that our thinking remains concealed under the cover of such dichotomies. Once we reach the edges of this cover we find that these dichotomies only reinforce a specific way of thinking that leaves little room for others. Latour suggests thinking about networks instead of universals: a net rather than a blanket. This is no easy task for us because, "there is science, which always renews and totalizes

and fills the gaping holes left by the networks in order to turn them into sleek, unified surfaces that are absolutely universal" (Latour. 1993: 118), where the 'truth' can be found 'out there' in a single Nature. Thus, we often remain stuck under the same cover.

Turnbull addresses the issue of interaction between knowledges by,

> focusing on the encounters, tensions and cooperations between traditions and utilizing the concept of cognitive trails – the creation of knowledge by movement through the natural and intellectual environment – the socially distributed performative dimensions of differing modes of spatially organized knowledge ["…then can be held in dialogical tension to enable emergent mapping."] (Turnbull, 2007: 140).

This is a very strategic method for finding a way out of discussions of knowledge that are reliant on oppositional categories by investigating movement and space. The tactics Turnbull employs allow for an exploration of alternatives. However useful, this approach too is limited in the way it utilizes the very distinctions it tries to get around. But using Turnbull's tactics to move through Latour's (1993) alternatives to 'The Great Divide', or divides, will enable an exploration of knowledge production by focusing on tensions, cooperations, movement, and performative dimensions of spatially organized knowledge. We may be able to emerge from under the cover of Science and Universalist discourses and find ourselves moving through networks.

One of Latour's goals is establishing the possibility for symmetrical comparison, as opposed to the asymmetrical comparison we are reliant upon in a 'Western', 'Scientific', or 'Modern' framework of thought. He is not entirely dismissive of current ways of thinking through the conundrum, but has introduced a more agile way to engage with the issues. "More supple than the notion of system, more historical than the notion of structure, more empirical than the notion of complexity, the idea of network is the Adriane's thread of these interwoven stories" (1993: 3). Recognizing that critique of science within the very framework that produced it has proven itself to be counter-productive, Latour places an emphasis on social processes as components that make up *matters of fact*, all the while questioning, but not dismissing, the facticity of such matters.

Science, though overly dominant, is very important, and of course has a place within a series of networks, if it is not a network in and of itself. The role of 'truths' and 'facts', at

least in the way Science thinks of them, can be diminished when they are placed in networks and therefore become comparable:

> if we superpose the two positions – the one that the ethnologist occupies effortlessly in order to study cultures and the one we have made a great effort to define in order to study our own nature – then comparative anthropology becomes possible, if not easy. It no longer compares cultures, setting aside its own, which through astonishing privilege possesses a unique access to universal Nature. *It compares nature-cultures* (Latour. 1993: 96).

Facts should not be naturalized, but rather considered politicized *matters of concern* (as social processes move in and around such facts) that comprise a larger shifting *state of affairs* (Latour. 2004: 232). This is possible when natures (the plural) are considered instead of a singular truth-defining Nature. Such a view takes diverse knowledges as subject-objects within collectives of nature-cultures, and symmetrical discussions about knowledges become possible. They constitute networks and allow us to rethink the ways all subject-objects, humans, nonhumans, and knowledges alike, are discussed and the roles they play as actors within these networks (Latour, 1993) in which the natural and the cultural exist together.

By addressing difference differently we can think against standard oppositionality without adopting a stance that subsumes all knowledges under the guise of Science, or rational thought (in the western sense). Though Turnbull sometimes relies on distinctions in an attempt to create a more balanced way of thinking about knowledges, his emphasis cognitive trails, movement, embodiment, and performative knowledge, move away from a culturalist vision where culture and place are entirely synonymous. 'Indigenous knowledge' and 'science' distinctions can be troubling but by adopting the Latourian notion of 'network' while investigating the components of knowledge Turnbull emphasizes, the binary distinctions can be avoided. As such, we can focus on how knowledge is produced (and co-produced), shared and constantly shifting in the ways knowledges interact, co-mingle and cross fertilize, rather than being held in a constant state of opposition (Turnbull 2000: 220).

Furthermore, by allowing a re-conceptualization of the often taken-for-granted division between nature and culture, the division so central to science, knowledges can engage with one another without a preconceived notion of the order of things. '*Natures*' will be

considered instead of the single concept 'Nature' upon which Science lays claim to truth statements. Allowing for the possibility of multiple views of nature, or multiple 'natures', in conversations where diverse knowledges are engaged provides an open table whereby no assumption shall be taken for granted or dismissed.

Tracking, Science and Cybertracker

Louis Liebenberg's discussions about the connections between science and tracking are extremely insightful and open an arena in which diverse ways of knowing can be practiced and spoken about together. Liebenberg argues that, "[t]he art of tracking may well be the oldest science. Yet tracking can be developed into a new science with many practical applications in nature conservation" (Liebenberg. 2005: xi). For him, "the differences between tracking and modern science are mostly technical and sociological" (http://cybertracker.co.za/IntegratingKNowledge.html). For Liebenberg, equating tracking to science legitimizes the knowledge processes of tracking as an intellectual endeavour. Looking at tracking through the lens of science, Liebenberg levels the discussion of and between knowledges where one is often considered superior to the other, extending the scientific network to include tracking. However, in order to work with Liebenberg's theories about tracking and science, given the issues raised above, we need to get beyond relagating tracking into the realm of science. Instead of relying on epistemological distinctions, it may be more beneficial to think about the relations between processes of knowing and knowledge objects. Not necessarily oppositional, objects of knowledge are nonetheless positioned.

Objects of knowledge, such as data, is taken into consideration in conjunction with the processes of knowing that produce objects, a symmetrical comparison of the knowledge actors in the WKCC project is possible. In other words, knowledge can be investigated in a way that avoids concrete distinctions and subsumption of knowledge by considering the multiple agents in a network, or networks, of knowledge production. Investigating how data is negotiated and mediated through the use of Cybertracker, this will become evident through the engagement of different actors involved in the process of collecting of information. The questions then include, but go beyond, what kind of role

Cybertracker plays in conversations between and around knowledges in the Western Kgalagadi Conservation Corridor (WKCC)? As a tool, how does it mediate knowledge? What are the effects of that mediation and movement of data as data becomes the referent[9] to that field? Meaning, what aspects of the trackers and their knowledge are included and excluded in the collection and movement of data? Surely the Cybertracker does not capture all the trackers' knowledge and processes that go into the data collection, but that does not mean that the data entirely strips, or silences the trackers. Therefore, what are the *immutable mobiles (Latour. 1995 [1983])*? The knowledge of the trackers may not be entirely subsumed into the realm of a "common, or universal ontology," being that of the wildlife biologists and conservationists. Rather, something else may be going on that demonstrates the movements and fluctuations of performative knowledge that does not require the relegation of knowledge into the realm of definitively distinct or ultimately universal, as mobile knowledges can simultaneously inhabit multiple contexts.

Immutable Mobiles: movement and data as an object of knowledge

Through re-enactment or re-performance knowledge is reproduced and becomes accepted. Ingold (2007: 90) argues that "[l]ying at the confluence of actions and responses, every topic is identified by its relations to the things that paved the way for it, that presently concur with it and that follow it into the world." In scientific endeavors, for example, data is gathered and examined upon a history of previous examinations by other people that lay the groundwork for current and future scientific examination. Though a single scientist may make new discoveries, those discoveries are very much entangled with, and based upon the foundation that was laid before. This is not just true for scientists, but also for trackers and all forms of knowledge. These examinations,

[9] "Reference, referent: Terms from linguistics and philosophy that are used to define, not the scenography of words and the world, but the many practices that end up in actual propositions. "Reference" does not designate an externeal referent that will be meaningless (that is, literally without means to achieve its movement), but rather the quality of the chain of transformation, the viability of its circulation. "Internal referent" is a term from semiotics to mean all the elements that produce, among the different levels of signification of text, the same difference as the one between a text and the outside world. It is connected to the notion of shifting" (Latour. 1999: 310).

depending on their production and repetition, eventually become accepted in different settings.

Knowledge is produced in and moves through space. In addition, the temporal aspects through which knowledge is acted out and performed in the present are based upon past performances and lead to future productions of knowledge. One of the most fundamental characteristics about knowledge is that it is acted out and produced in the body through both space and time. While the embodiment of knowledge is central to this study of knowledge, we should keep in mind that there are many other factors that influence knowledge production. Over time people have developed certain strategies to aid the production, and especially exchange, of knowledges. Some of these strategies are key to understanding how specific forms of knowledge and epistemes have come to be more dominant than others. The more knowledge is spread, and the more people come to understand specific ideas, the greater influence or sway it may have. As knowledge is shared and spread, it comes to be accepted through the allies it builds (Latour, 1995 [1983]).

Several scholars have pointed out that for the Western episteme, printed text and images are among the tools and strategies that have facilitated its pervasiveness, for it takes those spatio-temporal aspects of knowledge and lays them on the flat surfaces, creating borders and boundaries, allowing for easy and efficient dissemination of ideas and knowledge (Latour, 1995 [1983]; Ingold: 2007). In writing, images, and presentation, the goal is to win allies (Latour, 1995 [1983]). However, in the process the body and many of the senses, other than vision, fall to the wayside in the sake of expedience, and what is left are *immutable mobiles* that can be enumerated or visually represented. The immutable mobiles show themselves in 'knowledge products' – those aspects that make the jump from the lived world to the written page, for instance – while the processes that go into the production often disappear.

Latour argues, that in anthropology,

> "we should concentrate on those aspects that help in mustering, the presentation, the increase, the effective alignment or ensuring fidelity of new allies. We need, in other

> words, to look at the way in which someone convinces someone else to take up a statement, to pass it along, to make it more of a fact, and to recognize the first author's ownership and originality" (Latour. 1983 [1995?]: 5).

This is especially relevant in the case of the WKCC project where the co-production of knowledge is central to the context where the organization and presentation of co-produced knowledge is reliant upon an historically assymetrical relationship: between that of the scientists and the often marginalized San and Bakgalgadi trackers. Knowledge in this case, is captured in the Cybertracker as *data*. As data is collected by and dependent upon the trackers and their knowledge, it is important to not only recognize the ownership and originality of the trackers, but to also acknowledge that it is, and they are, visible in the data. Though there have been processes whereby the senses and the body has been silenced, they remain present in the lived world where a diversity of knowledges are engaging one another and 'mustering' new allies.

These processes of knowledge production are contingent on movement in space, time, and based upon experiential connectors that cannot be lost as we marvel at their products. Once extricated from the field site, to continue with the example of science, data becomes entangled not only in itself and the body of data into which it is categorized, but also the history on which it is based. Data may be taken out of the field for purposes of specificity and closer examination, but once out of the field it is incorporated into other 'fields of data', or 'collections' as Latour puts it. "Knowledge derives from such movements, not from simple contemplation of the forest" from whence the data was collected (Latour. 1999: 39). Here the immutable mobiles travel long distances and eventually find allies, but as subject-objects, alongside their human counterparts.

Taking the movement of data as example, one can see that Cybertracker, in addition to its mediatory function, is also a tool that literally *moves* knowledge – it is a transportation system for the immutable mobiles. In the way that data is moved from site to lab, lab to computer or filing system, we can see that knowledge is constantly moving and changing context. "Space becomes a table chart, the table chart becomes a cabinet, the cabinet becomes a concept, and the concept becomes an institution" (Latour. 1999: 36). Perhaps the scientific laboratory, the chart, the office filing system, can all be thought of as fields

in the way that sites where data are collected are considered 'fields'. As data is collected from research field sites and transported to research bases, labs, institutions, departments and so on, they remain representative of their places of origin, yet they become part of another context. They do not cease to exist but rather transform into specimens of another context. They are the *immutable mobiles*: those aspects of knowledge objects that retain their isolated properties even through movement and shifts in context.

Citing Elizabeth Eisenstein's study of the printing press (1979), Latour notes, "the links between different places in time and space are completely modified by this fantastic acceleration of immutable mobiles which circulate everywhere and in all directions in Europe" (Latour. 1983 [1995?]: 10). In their capacity to capture and spread information technologies like the internet, cellular phones, and even Cybertracker have done, and do very much the same thing as the printing press did so many years ago. As Cybertracker transports immutable mobiles, it functions as somewhat of a diplomatic technology that creates allegiances for and between the trackers, scientists, and their knowledges. These *immutable mobiles* simultaneously exist in the local and the global contexts forming allegiances and building networks. They have local points and are thus local, but they are also mobile and therefore global (Latour. 1996: 117).

For this reason, processes of data capturing, particularly through the use of Cybertracker, are extremely important in thinking about how knowledge is mediated, translated, transformed, and even transported in the WKCC project. Cybertracker is used and acted upon in a variety of 'local' contexts, sometimes even appropriated, translating as it moves data globally. "There are continuous paths that lead from the local to the global, from the circumstantial to the universal, from the contingent to the necessary, only so long as the branch lines are paid for" (Latour, 1996: 117). A pertinent example of this is that the trackers in the WKCC project refer to themselves as 'Cybertrackers' - one of the trackers even refers to his knowledge, or brain, as 'my Cybertracker'. As 'Cybertrackers' in the 'local' context, they become intimately intertwined in the 'global' when they physically move, by way of the data they collect, around the world. Those trackers and their knowledge become global. At the same time, the scientists too are local. All of them are

Botswana nationals. However, as scientists they have been educated in 'western'-like institutions, and sometimes even abroad. Both are 'global' and 'local' at once, though neither purely 'global' nor 'local'.

The data that reaches the office of WKCC and ultimately finds itself in the distribution maps and reports created by the scientists are not merely representative of the distribution of animals in the corridor. They are representations of the animals, the spoor left behind by the animals as they create their trails, the paths and trails of the researchers (scientists and trackers), the trackers, their histories, and their knowledge of animal spoor, their bodies and senses, their identification of the spoor, the input of that identification into the Cybertracker device, the Cybertracker device and how it was developed and created, how the trackers were trained to use Cybertracker, the uploading of the data in Cybertracker into the scientists' computer, the scientists knowledge, their training and experience, the goals of the scientists' research, and the season, the wind, the temperature, and the relationships between all of these things. The representations of these animals go through a complex process of filtering until they finally reach the reports and are portrayed as accurate representations. The resulting immutable mobiles are necessarily connected with the production of knowledge and its translation, as extensions of the individuals who collect data, and the mobility of their knowledge.

Bruno Latour(1999: 24-79) discusses the collection of soil samples by a diverse groups of scientists at the edge of the Amazonian forest to draw out some of these points about data collection, the distance between 'nature' and 'culture', or lack there of, and the production of knowledge. Because specimens are collected and then filed away for scientific reference, Latour asks whether this brings us closer to the forest that is miles away:

> Only a few specimens and representatives that are of interest to the botanist have made it into the collection. So are we, therefore, far from the forest? Let us say we are in between, possessing all of it through these delegates, as if congress held the entire United States; a very economical metonym in science as in politics, by which a tiny part allows the grasping of the immense whole (Latour. 1999: 36).

Similarly, with Cybertratracker, the data decontextualizes the information collected by the trackers, yet it remains representative of what exists in the Kalahari and also of the

knowledge and actions taken by the trackers who collect the data. The primary difference here is that some of the embodied, performative knowledge of the trackers', though largely muted, is partially present as an 'immutable mobile' in this referent and it is not simply the result of scientific procedure. Some argue, as Turnbull points out, that use of devices and programs like Cybertracker have the potential to, "subsume differing spatialities and temporalities into one abstract space-time they also omit the multiplicitous and interactive dimensions of the local and the practical, the stories and the journeys, the spiritual and the experiential." (Turnbull, 2007: 141). With this in mind, it is very important to consider what is lost along the way as knowledges make their journeys. But we cannot just focus on the negatives, as if the trackers lack agency and any capacity to control their own knowledge. It is possible to think about ways in which technologies are appropriated, or domesticated by their users, as instruments of empowerment. Technoscientific developments can be recontextualized– like the trackers who refer to themselves as 'Cybertrackers' - in ways that empower and uplift such knowledges and decentralize scientific dominance. Thus, though the actions of both humans and non-humans, and the various senses and additional elements, do not appear in the data and the reports, they remain active, which is important in making sense of contested ecologies.

Symmetry and Talking at Cross-Purposes

By taking seriously all of the primary actors in the WKCC project - the relationships between humans, knowledge objects, and non-humans - in the production and movement of knowledge we will see them emerge as subject-objects. They become actors in a series of networks. Once one can think of these actors, both humans and non-humans, as subject-objects, it becomes possible to think of individuals as technologies of change. This thereby opens up the scope for considerations of 'mutual influence'. A two-way street of sorts, 'mutual influence' indicates the way in which individuals and technologies, used here as our exemplar, can effect each other as agents of change. Like individuals, technologies are also are agents of change. Cybertracker is appropriated and domesticated by the trackers who use it, people who otherwise have very little access to computer technologies, but who have in the process made this technology their own.

Simultaneously, the trackers initiate change among the scientists and the conservationists through the transfer of their knowledge via an assortment of methods and technologies, Cybertracker being one of them. Cybertracker reveals itself as real and serious actor-agent in a series of networks extending from, to and between trackers, scientists, local and global communities, conservationists, institutions, and even governments.

While certain technologies have done much to silence the senses, they have done just as much to build allies. The line, for example, in the Western sense, has lost its movement and simply become the abstract space between two points, (Ingold, 2007), through which those two points build alliances. In the collection, processing, and movement of data, Cybertracker loses a lot, but at the same time it has some capacity as an allegiance building modality for the trackers, between points, and also along what Tim Ingold (2007) refers to as the "traces and threads" that connect the points. As a GPS device, Cybertracker has the potential to emphasize the "traces and threads", the often forgotten about active and living spaces-times between points.

While a certain degree of loss or silencing of the senses occurs with devices such as Cybertracker - and this will be explored in more depth - it must also be noted that Cybertracker does work to incorporate the senses. Movement is filtered in to an extent, however histories and other senses can be eliminated in much the same way scientific methods emphasize the visual while moving the other senses away from the phenomena it seeks to represent in analyses. In this study, of primary importance is the way that Cybertracker may or may not unsilence what the Western episteme, science and other literate knowledges have silenced. Though the trackers involved in this project are mostly illiterate, or barely literate, Cybertrackers takes steps towards allowing for a symmetry of knowledges through a range of engagements that lead towards creating new 'epistemic communities' (see Haas, 1992; and Jassanoff, 2004).

The knowledge partnerships in the WKCC demonstrate ways in which diverse knowledges are enacted through a series of networks. The goal of Cybertracker as stated by Louis Liebenberg, is not to replace the skills of the tracker with a computer, but to

enhance their highly refined skills. The use of Cybertracker is not intended to decontextualize the knowledge of the trackers, but to resituate it in a context where there is no longer much incentive to continue tracking. With an increase in conservation efforts, hunting and other activities that rely on tracking knowledge have been restricted. Cybertracker uses the tracker's ability to interpret signs to capture information about animal behaviour and ecosystems, so in many ways Cybertracker could very well be bringing together "the multiplicitous and interactive dimensions of the local and the practical, the stories and the journeys, the spiritual and the experiential" (Turnbull, 2007: 141).

Cybertracker, in its capacity to mediate knowledge, provides us an opportunity to observe the ways that knowledge production percolates through networks. In doing so, the important concerns regarding tensions and power imbalances will certainly make themselves visible. Latour warns us about the difficulties of talking at cross-purposes[10]. The problem lies in discussions in which multiple ontologies are engaged that there is little likelihood that either side in communication knows what the other side thinks is under discussion (Latour. 2004b: 450). This point is an important one, and these tensions and inequalities may not be entirely resolved. But, by considering *'natures'* instead of Nature, subject-objects and studying the use of Cybertracker may provide an opportunity for a symmetrical analysis where talking at cross-purposes is not as difficult as we might seem to think when new epistemic communities are created.

As knowledge is produced, collected, and archived, Cybertracker acts as an intermediary in the production of knowledge. The trackers possess the knowledge of animal spoors, the skills, and ability to collect and input data into the Cybertrackers that the scientists are seeking. The scientists, on the other hand, plan, analyze, and organize the use of the data for their conservation goals. But Cybertracker alone cannot mediate knowledge: it is a tool that must be complimented by on-going dialogue and sharing of information and ideas between both parties on all levels of fieldwork, data collection, and even analysis. Both the trackers and scientists need to be in constant communication so that all sides

[10] LATOUR. 2004b. Common Knowledge. 10(3): 450.

agree on what is under discussion. In the process the scientists and trackers learn from each other, and shared sets of skills emerge. As a mediatory tool complimented by these social processes, it demonstrates the problem of thinking of knowledge in terms of distinct entities while allowing for diversity and cross-purpose conversations.

Chapter Three: Knowing Animals

Knowledge about tracking animals in central to this project and will be discussed in-depth in this chapter to situate it in the conversation about knowledge diversity, knowledge mediation, and the technological intermediary. Because the elder trackers have the most experience and a wealth of knowledge about tracking, they are the focus of this chapter. !Nate, Karoha, and Nxjouklau, three of the eldest trackers, provided the most insightful and provocative accounts about how they learned to track animals and understand their behavior. The three are close friends and spent a lot of time together during the course of my fieldwork. I often spoke to them as a group about their tracking experiences, and walked with them as much as possible while collecting data for the WKCC project. !Nate is the most outgoing personality and tended to do most of the talking while the other two would confirm his statements. Often times, when Karoha and Nxjouklau began to discuss something !Nate would jump in and elaborate upon the discussion. As a result, many of the quotes from the elder trackers are attributed to !Nate, though they are often also representative of the thoughts and ideas of Karoha and Nxjouklau as well.

Learning to track is as much about learning the behavior of the animals as it is about being able to identify the spoor of a particular animal. "The interpretation of an animal's activities and prediction of its movements is based not only on spoor evidence alone, but also on knowledge of the animal's behavour and the environment" (Liebenberg. 1990: 79). Knowing about animals, their behavior and their tracks has been an important part of !Nate, Karoha, and Nxjouklau's lives since they were children. !Nate explained that his father and uncles taught him to understand the pattern of activity in the tracks. "They taught me what animals the tracks are for, whether it is male or female, what species it was." !Nate says he now looks to see if he can figure out where the animal is going first based on the direction of the tracks, the direction the wind is blowing, and his knowledge of various geographical features in the vicinity such as pans, possible watering holes, vegetation patterns, and so on. Tracking requires a great deal of skill and a wealth of knowledge, not just about animals, but all things present in the environment in relation to

one another. The skills and knowledge are not compartmentalized, but rather the result of a conglomeration of relationships through which patterns emerge and can be recognized.

'My God Told Us What The Animals Do'

Some have written that mental qualities spoken about by trackers of the Kalahari include: alertness, sense, knowledge, cleverness, ingenuity, and problem-solving (Blurton Jones and Konner, 1976; Silberbauer, 1981; Liebenberg, 1990). Liebenberg elaborates that:

> "The art of tracking involves a process of creative problem-solving in which hypotheses are continually tested against spoor evidence, rejecting those which do not stand up and replacing them with better hypotheses. Intuition is important in dealing with complex variables, such as in estimating the age of spoor or interpreting spoor in loose sand. Concentration and memory also play a vital role in tracking" (Liebenberg. 1990: 71).

Though tracking is discussed in the terms of science, and is reliant on a dualism that disembodies the mind, the complexities of tracking are clear. In discussing tracking in such a way, Liebenberg is attempting to demonstrate that tracking may well be the origin of science (1990). Framing tracking this way, while providing a detailed analysis of its complexities, is contingent upon the divisions that are so central to science. The 'hypotheses', for example, are essentialized as constructs of the mind, which, as a result, disembodies the knowledge of the trackers. Instead of relying in the mind-body dualism, the qualities central to tracking and interpretation of spoor, can be discussed in relation to the way tracking, in practice, is performed and acted out through the body, including the mind. For,

> In the hunter-gatherer economy of knowledge…it is as entire persons, not as disembodied minds, that human beings engage with one another and, moreover, with non-human beings as well. They do so as beings *in* a world, not as minds which, excluded from a given reality, find themselves in the common predicament of having to make sense of it" (Ingold 2000: 47).

Reframing tracking with this in mind (and body) will bring the network of environmental actors, human and non-human, and their relationships into the discussion of what it is *to know* in the Kalahari for these trackers.

Walking through the bush for the first time with !Nate and Nxjouklau it was immediately evident that their knowledge was embodied and performed when we encountered animal spoor. From the moment we started walking the performance began in methodical

fashion. Walking in single file with their eyes directed to the ground, they kept silent for the most part. Because animals are wary of people, they did their best to not alert animals to our presence. As we walked they looked for any signs of animals, reading the ground, looking for tracks, while simultaneously scanning the landscape with their peripheral vision for animals. It is important, they later explained, to constantly be aware of all signs, not just tracks, to know ones proximity to animals in order to avoid scaring them off, as well as for reasons of safety.

Part of their approach included walking into the wind as much as possible in order to hide our scent from animals that be have been in front of us. As Tim Ingold writes, hunter-gatherers "attend to the presence of [animals] *in the knowledge that [animals] are attending to them"* (Ingold, 2000: 51). To keep quiet as possible, !Nate and Nxjouklau used an assortment of hand signs to communicate with each other as they assessed their surroundings. They would periodically shake their hands, palms up, from side to side, when there were no signs of animals. On occasion, !Nate and Nxjouklau revealed the meaning of the hand signs to me, especially when there was no immediate evidence of animals to be wary of.

!Nate and Nxjouklau took note of all the plant life we passed, stopping periodically to pick various things to eat, from berries and leaves, saps and roots, wild cucumbers and Kalhari truffles, to a species of worm that lives on the Silver Terminalia bushes. Often we stopped walking when we came to a patch of berry bushes and collected a few snacks for the walk. As we walked, !Nate and Nxjouklau commented on the changing landscape, especially the thickness of the sand, and abundance, or lack, of plant life. The further we walked into the bush the firmer the sand became, as opposed to the soft sand where we began. The soft sand, they mentioned, makes everything more difficult, from walking to identifying tracks, and there is frequently less vegetation. Nxjouklau seemed quite disconcerted when there were no water-bearing plants. "If you get stuck out here," he said, "you can die".

When we came across tracks, !Nate and Nxjouklau shook their hands up and down indicating the freshness of the spoor – the fresher the track the faster they moved their hands [Figure 4]. They then assessed the spoor evidence, walking a few paces around the clusters of tracks to deduce the identity of the animal if it was not obvious immediately[Figure 5]. They identified species, and sex when possible, often indicating this by using hand signs [Figure 6]. When uncertain, they conferred with each other, then walked a bit further on to test against additional spoor evidence until they agreed on the identity of the spoor[Figure 7]. After identifying the animal they indicated the direction it came from to the direction it went [Figure 8], sometimes using this information to make an educated guess as to the direction the wind was blowing when the animals passed. If there were a group of tracks, they would walk a distance counting the various spoor, enter the information into Cybertracker [Figure 9][11], and then carry on.

Figure 4: Indicating fresh tracks

Figure 5: Examining tracks

Figure 6: Signaling male gemsbok

Figure 7: Confirming identification

[11] The two trackers pictured in this series are !Nate and Karoha because I did not capture a photo series of this sort with Nxouklau and !Nate.

Figure 8: Indication direction

Figure 9: Entering data

At first the signs of game were very sparse but as we moved further into the bush the signs became more frequent. We began identifying the more common species such as steenbok and duiker. Along the way, !Nate and Nxjouklau began teaching me how to distinguish between male and female steenbok. At first glance they appear almost identical, but the two trackers were able to differentiate between the sexes easily. Female steenbok, they told me, have narrower, longer hoofs that are separated by a small gap between left and right side of the hoof. Each side of the hoof is almost parallel to the other.

The hoof of the male steenbok, on the other hand, is shorter and comes to a more pronounced point at the front of the end of the hoof. !Nate also showed me how to tell when a Steenbok has been lying down. This required an understanding of the types of marks the antelope's hooves, legs, and underbelly leave in the sand. Another indicator for steenbok are piles of sand that they dig up to cover up their droppings that are used as a kind of territorial marker [Figures 10 and 11].

Figure 10: Digging steenbok dropping

Figure 11: Showing droppings

During the walk we came across a wide variety of spoor of mostly individual animals, including gemsbok, hartebeest, wild dog, wild cat, jackal, bat-eared fox, and the ever

common duiker and steenbok. In addition, we encountered one large group of gemsbok. !Nate and Nxjouklau were immediately excited and began scanning the ground with their hands and eyes counting, rather quickly, twenty-one sets of tracks. A couple of hours later we ran into another group of gemsbok spoor. Again they counted twenty-one. Eventually we found the herd of Gemsbok whose tracks we had been seeing. !Nate noticed them first, pointing them out and then instinctively crouching down as if preparing for a stalk. Nxjouklau spotted the herd a moment later and his body transformed in the same way. They ducked down a bit and stuck their heads straightforward in order to see the animals. As I was lagging behind, tired from hours of walking, they signaled to me to join them so we could approach the herd to get a count. We probably got within 100 meters of the herd before they noticed us and shot off. Both Nxjouklau and !Nate then, at once, stood up, saying happily that they were wrong and that there were far more gemsbok than the twenty-one tracks that they had counted earlier.

Tracking involves an array of integrated mental and sensual processes that enable the trackers to make assessments and predictions about the activities of the animals. !Nate explained that while tracking he mostly uses his eyes and his "typing" or "cybertracker" as he pointed to his temple, referring to his brain, or knowledge. He looks and he thinks, using his past knowledge about animals and the environment to assess the current situation. When asked about the other senses he uses while tracking !Nate said that listening is very important, especially when trapping animals. !Nate explained that he knows the animals well enough that he can estimate what times they will move to certain areas and therefore can guess when they will be trapped. "Normally we will always listen to hear if they have been trapped, so we are always alert. Then when we hear that alert, that is when we go there to kill it. We use sound to know if we have trapped the animals". He does not utilize his sense of smell very much, !Nate explained, because the animals have a better sense of smell, however he does use touch quite frequently to feel the freshness of tracks in the sand and of animals droppings, among other things. To a certain extent, !Nate said that he feels the animals in his body and is acutely aware of an

approaching presence. Perhaps this embodied sense is a reference to intuition, or hunch, generated from subtle peripheral signs that his body instinctively reacts to.

On one occasion I observed three trackers, !Nate, Karoha and one younger tracker, Ipoletseng, simultaneously react to a bodily sense that a dangerous animal was in close proximity. Sitting around a fire on a cold evening, as we waited for our vehicle to cool down[12], all three trackers jumped up and climbed into the Land Cruiser, insisting that we leave. When asked why, they said, "Our bodies are telling us that a lion is near". I asked what they meant by this and they told me that they could feel it in the muscles around their armpits. This 'feeling' is a telltale sign that a lion, and thus danger, is approaching. It could have been an intuitive response to acute sensual details such as the vibrations of a lions roar or grunt or slight movement they subconsciously witnessed in the distance.

There was no opportunity to check if there was indeed a lion, however others confirmed this kind of a hunch (We did not want to wait and see!). Ingold argues that, "the perceptual system of the hunter is attuned to picking up information, critical to the practical conduct of his hunting, to which the unskilled observer simply fails to attend. That information is not in the mind but in the world, and its significance lies in the relational context of the hunter's engagement with the constituents of the world" (Ingold 2000: 55). Though the trackers were not hunting at the time, their experiences allow them to engage with the world in a way that alerted them of the possibility of danger, of which I was completely unaware. Because most predators come out at night, and the darkness makes the people more vulnerable, this kind of engagement is necessary. The scene in the picture below (Figure 12) was a taken a few minutes before the trackers felt the lion. While I was snapping photos and examining the vehicle engine, you can see that !Nate (red hat) and Karoha (Khaki hat, blue pants) are looking away from to fire scanning for signs in the darkness.

[12] Driving in the Kalahari puts a lot strain on a vehicle and overheating is particularly common because the tall, dry grass tends to get stuck in the radiator.

Figure 12: Waiting for engine to cool just before sensing the lion.

Identifying with the Animals

The processes involved in tracking are performed and embodied, involving intuitive and significant emotional responses ranging from excitement and joy to fear and even sorrow. Tracking is a knowledge practice that is acted out using all senses: sight, sound, touch, smell, sometimes taste, and the sense of where their bodies are located in space and time with regard to these other senses. When spoor is of interest to a tracker, they will often follow the spoor and talk about what the animal was doing and even mimic its movements (Liebenberg. 1990: 71). When we saw aardwolf spoor (a small, insect eating wolf) !Nate followed the tracks, then danced around them reenacting what he understood the aardwolf to have been doing. As he danced around the spoor !Nate said, "here he stopped and turned to look around and here he decided to lie down," crouching over and gesturing with his hands. "Then he got up quickly and ran to his house". The actions of the animal were explained as if it were another person whose behavior he could understand.

Later the same day we came across an aardvark den, a big hole in the ground next to a tree or bush where it hunts for ants. !Nate slowly crouched towards the hole, leaned in and gently said "Koko" [Figure 13], a common greeting to see if anyone is home. He

then explained to me that the Aardvark was not home and must have moved on to another den or bush to look for more ants. He then saw that there were hare spoor by the den. !Nate laughed and said, "Aardvark don't like when the hares come and steal their food so they move house."

Figure 13

Liebenberg has suggested that trackers' knowledge of animal behavior essentially has an anthropomorphic nature. "Animal behaviour is perceived as rational and directed by motives based on values (or negation of those values) that are either held by hunter-gatherers themselves or by other people known to them" (1990: 83). Again, though using the western discourse of rationality to describe trackers' understanding of animals, Liebenberg points to a kind of relatedness. In this case we see !Nate acting out the movements of the Aardvark and then his amusement at the animal's frustration with a neighborhood pest. In his assessment of the aardvark's activities, the reconstructed events were embodied in !Nate's performance. Through his embodied performance, and consequent amusement, !Nate demonstrated his recognition of the intentionality of the animal as an individual to whom he can relate.

Identifying oneself with animals is an important aspect of interpreting animal signs for the more experienced trackers like !Nate, Nxjouklau, and Karoha. Animals are viewed as creatures that have the same, or similar, types of social habits as people and their behavior is often predicted with those social habits in mind. "[I]n so doing they must inevitably project their own values onto that of the animal. In tracking, the basic form of information is a sign, and the trackers' knowledge of animal behaviour is used to create a model in terms of which the sign is interpreted" (Liebenberg. 1990: 88). A sign is not

limited to visual clues, but can consist of anything that is evidence of an animal's presence. While observing signs and speculating about their movements and activities, !Nate spoke about animals about as having human-like attributes and possessions such as houses, and husbands or wives, to which the individual tracker can relate in order to reconstruct the events.

Counting animals spoor along a transect with !Nate and Karoha, we heard a bird call. !Nate quickly whistled back to it and said that the bird was talking to him. Usually you first hear this particular bird in August, he said, and it will "tell you when the hot weather is coming". The bird, he went on, "thinks we live here and it is asking us for water, but because we don't live here we can't help it". "How can you speak to birds? Are they like people?" I asked. They both responded, "They are the same!" "Each species," Liebenberg writes, "is perceived to have characteristic behaviour, which is governed by its kxodzi (customs), and each has its particular kxwisa (speech, language). Animals are believed to have acquired special capabilities by means of rational thought" ((Liebenberg. 1990: 83). This is a type of perspectivism in which all things are considered actors in social networks, or to have souls, or a life essence (Viveiros DeCastro, 2004; Willerslev, 2004).

!Nate and Karoha laughed when they explained to me that just like we walked during the day, came back to the car, and then are going to go home, the animals will walk around during the day but always come back to the place "where they sleep". They then showed me gemsbok spoor and said "you see, they were walking back to their house here. They walked that way, and then they went back." By making this correlation between the behavior and habits of people and animals Karoha and !Nate were able to utilize the signs to predict where the gemsbok where moving. Hunter-gatherers "get to know the forest, and plants and animals that dwell therein, in just the same way that one becomes familiar with other people, by spending time with them, investing in one's relations with them the same qualities of care, feeling and attention" (Ingold 2000: 47). These trackers can therefore inspect the signs to project their subjective viewpoints upon the animals as

subjective beings themselves who share similar habitual tendencies, and with whom they have a relationship.

Curious about the statement that "they are the same" and how humans and animals are perceived to embody similar social and habitual characteristics, I asked !Nate how he knows what animals are doing when he sees their tracks. I wanted to know what enabled him to understand animal behavior rather than how he was taught. !Nate responded matter of factly, "Because my people's god told us what the animals do."
"How did your god tell your people?" I asked.
"Our god put us, the Bushmen, into the same bush he put the animals. He put us here and he put the animals here. We have the same god."
!Nate went on to explain that because they have the same god, he, or 'his people', and the animals *know* one another. They have the same god, or gods, and come from the same place, so of course they know each other. Viveiros de Castro has argued, with regard to, Amerindian perspectivism that, "Whatever possesses a soul is capable of having a point of view, and every being to whom a point of view is attributed, is a subject; or better, wherever there is a point of view, there is a 'subject position'" (Viveiros de Castro. 2004: 467). This runs in opposition to the Western epistemological stance that the subject creates the point of view, and the point of view creates the object. This commonality, and recognition of non-human perspectives, allows !Nate to interpret animal signs and behavior in much that same way one can predict human behavior based on their routines, habits, and even individual personalities.

Similarly, Liebenberg has found that "The behaviour of animals is seen by the /Gwi as bound by the natural order of N!adima (God). Such behaviour can be accounted for in terms of knowable regularities, and it is believed to be rational and directed by intelligence" (Liebenberg. 1990: 83). As such, predictions can be made based on the patterns of those regularities. In conjunction with projected human-like qualities of the animals, the trackers often also expressed an emotional connection. !Nate, for instance, said that when he kills an animal he feels sad for it, while Karoha and Nxjouklau expressed their happiness when they saw animals. This strong connection to the animals,

created by their mutual god, or gods, and their shared environs reveals an implicit closeness between "!Nate's people" and the animals in which multiple perspectives are recognized.

Processual Learning

!Nate, Karoha, and Njxouklau all expressed that learning about animals and their tracks is a life long process in which they continually get to know, and in many ways, grow closer to the animals and plant life. Even though there are now hunting restrictions and people spend less time wandering the bush, !Nate, Karoha, and Njxouklau talk about how they continue to observe, learn about, and take in the life of the Kalahari. They share a life with the Kalahari and believe that they must know one another in much the same way, as one must when establishing and maintaining a relationship with another person. Both humans and non-humans are active agents immersed in the relationships of everyday life. As non-humans are often perceived as actors, !Nate explains that learning about animal tracks is a lifelong process of getting to know all that is around him:

> I am still learning about tracks, and that is how I have been using my typing [knowledge]. When I go around in the bush I continue to look at and learn about the tracks. When I see the tracks it helps me to remember my skills. I learn because it is my work, it is my life. I have to teach myself because I live it. Anytime you go somewhere you can see something that you don't know so you have to look at it. You have to live it to know it. I was taught that if I have these things [skills] I must not lose them, that is why I keep learning and looking at the tracks when I am in the bush.
> - !Nate

He must engage with anything and everything he comes across because learning is not simply about educating oneself, but living ones life and maintaining ones relationships.

In addition to being a lifelong learning process, tracking knowledge is considered the cumulative result of generational learning. !Nate never gives sole credit to his father and uncles for teaching him to track even though he learned directly from them. Instead, !Nate first references his ancestors before describing the ways in which he was taught. "It comes all the way from the great grandparents. It goes back and back [generations and generations], but I actually learned from my parents." For !Nate, tracking is not a finite skill that he attributes to himself, or even his parents alone. Tracking is a continual

and dynamic process that has no real beginning or final learning point. The relationships extend beyond the present time-space to include past, as well as future generations.

The elder trackers often spoke about how it is their responsibility to remind the younger trackers of this connection and impart their knowledge through their life experiences. Discussing his knowledge of tracking in relation to the younger trackers, !Nate said , "it is the same because they know some of the same things as me. But sometimes it is different, because they only know the big animals. [Our knowledge] must be one." !Nate is concerned about some of the younger trackers reluctance to learn the more in-depth knowledge that develops through an intimate engagement with the bush. While aspects of their knowledge networks overlap, they are not the same. !Nate, Karoha, and Njxouklau often expressed their desire to teach and pass on their knowledge of animals and plant life. Working with, and teaching some of the younger trackers was in fact one of the aspects of the WKCC project that they valued most. Nxjouklau articulated his concerns about younger generations not learning to track: "I want to teach my children to track, but I am sorry for them because they are drinking too much alcohol. It is very important to know how to track because it shows you the bushman culture. They must learn and tell the babies or it will die."

Nxjouklau is concerned about the philosophy and skills of the body when he refers to 'bushman culture'. The use of the word 'culture' is representative of both humans and non-humans, to an extent, and could instead be replaced by the word 'network'. Thinking of 'culture' as 'network', or rather 'network' instead of 'culture', in which difference is not attributed to a bounded assemblage of distinct 'culture ingredients', but rather to variation in philosophy and skills of the body, is helpful in discussing these multiple actors and their respective perspectives. In doing so, the assumptions about the universal constituents of the social can be avoided, while incorporating multiple contexts instead of relying on a single context to make relativist arguments (Latour, 2005). For the elder trackers, the prospect of younger generations not knowing how to track is spoken about with a great deal of sadness because it is indicative of a lack of participation in the relationship building processes of the networks entangled in the Kalahari, and all

the actors, in which those philosophies and skills of the body develop. However, the younger and elder trackers, while operating in the same network, are not entirely in agreement upon what does, *or should*, constitute an appropriate unified 'culture'. Networks allow for the agency of the actors even when, or especially when, they are not in agreement.

Tracking, for !Nate, Karoha, and Nxjouklau is an embodied and performed practice that is emblematic of their involvement in networks through which they traverse on a daily basis. The division between nature and culture is not practical with regard to their tracking knowledge practices for they identify themselves and their knowledge with the plants and animals in the Kalahari, meaning that both 'nature' and 'culture' fall into the same network that is so often referred to as only 'culture'. Viveiros de Castro suggests imagining an ontology he calls "'multinaturalist' so as to set it off from modern 'multiculturalist' ontologies" (Viveiros de Castro. 2004: 466). As opposed to the modern Western way of thinking of natural unity and cultural diversity where nature is the universal, "culture or the subject is the form of the universal , while nature or object is the form of the particular" (Viveiros de Castro. 2004: 466).

!Nate, Karoha, and Nxjouklau essentially share a common nature-culture with all inhabitants of the Kalahari. Nxjouklau's "Bushman culture" does not separate 'nature' and 'culture', but rather includes both within a network of co-existence. They are engaged in an ongoing relationship with the environment of the Kalahari in which they share experiences and are mutually influential upon one another. Discussing his reasons for tracking Nxjouklau said, "I like tracking because when I see the tracks of the animals it will tell me in my heart that I am with life. Because if I see gemsbok spoor my heart will be happy because it means I will be going to my home." 'Nature' is not something that is simply 'out-there' for Nxjouklau, it is around him at all times, but it is also within.

From Points of View to Planes of Perception

Ingold argues that, for hunter-gatherers of the arctic and subarctic, both animals and humans are considered to have points of view. "In other words, for both the world exists

as a meaningful place, constituted in relation to the purposes and capabilities of action of the being in question" (Ingold 2000: 51). The phrase 'point of view', however, so commonly used to describe an individual's perspective is a static, linear, and occular-dominant descriptor – qualities that are a major feature in western/scientific epistemology (Erlmann, Veit, 2004; Ingold, 2007). The notion of a 'point of view' is also at the root of the subject-object demarcations in which the subject's point of view creates the subject and object. But, Ingold makes a good point when he says that "A creature can have a point of view because its action in the world is, at the same time, a process of *attending* to it" (Ingold 2000: 51). With the emphasis on *attending*, movement and thus the relationship of the body to the world through its movement being key, 'point of view' limits the scope of action and attending to the world.

Rather than discussing 'point of view' it may be more useful to speak about 'planes of perception' thereby shifting the emphasis from the discontinuity of a 'point' to a 'plane' that allows for more movement and agility, and from the single visual sense, to 'perceptions', providing contextual recognition in which all of the senses may be utilized with regard to intention. "Interpretive success is directly proportional to the ordinal magnitude of intentionality that the knower is able to attribute to the known" (Viveiros de Castro. 2004: 469). To say that from !Nate's 'point of view' he is in danger when he "feels" a lion in his body is misleading because he had no view of the lion at all, but he does have a range of experiences known to him that he interprets through a variety of senses. In turn, the range of known experiences demonstrate that the individual cannot occupy any single point throughout time. Reconsidering 'point of view' as 'planes of perception' will therefore allow for more flexibility in reconsidering subject-object relations.

Viveiros de Castro discusses Amerindian nondifferentiation between humans and animals as described in mythology and the common context of communicability as "identical to that which defines the present-day intrahuman world" (Viveiros de Castro. 2004: 464). In making this connection, Amerindian perspectivism can provide valuable insights into highly politicized discussions, and any miscommunication that may arise, between and

about people who live in different 'worlds' in showing that disagreements are very much ontological, rather than simple differences of opinion. The recognition of the diverse ways of knowing the world is needed in processes of reciprocal knowledge translation. Simply put, knowledge translation is critical in discussions of the world at large, and that translation must not just be a one-way process in which a dominant ontological, or epistemological model is translated, transplanted, or imposed onto another. Mutual recognition is necessary, which requires mutual translation.

Though the nature-culture divide has been discussed as an artificial one, it can at times be very real when multiple perspectives of individuals are taken into account. Depending on the context in which they are discussed, the trackers may either identify with or dissociate themselves from the animals. This is not dissimilar to what Willerslev has found among Siberian Yukaghir hunters' mimetic hunting practices who relate to animals as persons while engaging in personal, practical dealings with them, but as material entities to be killed or consumed, for instance, when discussed according to market criteria (2007: 116). As perspectives shift from context to context, within and throughout networks, subject-objects can take on different properties.

!Nate, along with some of the trackers, as has been shown, will often discuss the animals as if they are people: the man will be with his wife, or wives, or when it eats it will have energy like when we eat meat, and so on. An animal, however, can at once be identified as a creature endowed with human-like qualities and as material source of sustenance depending on the context. Though hunting has been prohibited and he no longer hunts for subsistence, Karoha once told me "It makes me happy to see the animals because I know my babies will not be hungry," whereas Nxjouklau said that he feels "at home" when he sees animals. Animals are both meat to be eaten by Karoha's babies and members of Nxjouklau's community who make him feel at home. The multiple and shifting perspectives of actors in nature-cultures networks and the relationships that exist between the various actors in the Kalahari networks are key to understanding the knowledge production of the trackers. Multiple perspectives exist, some shared and others not. The younger trackers for example, do not display or speak about the same

sort of closeness to the non-humans actors in the Kalahari. Regarding animals as meat does not strip them of their human-like qualities that some trackers can identify with because a simultaneous closeness to the subject-animal and a distance from the object-animal occurs depending on the context in which the animal is considered. The contextual mobility allows them to be subject-objects, rather than one or the other.

This is a kind of multi-contextual perspectivism in which perspectives shift between contexts while remaining present within the networks through which they move. This idea could provide insights into the possible scope of databasing technology such as Cybertracker that introduce additional, possibly abstract, contexts into networks. It could be argued that Cybertracker decontextualizes the animals, tracking knowledge and conditions involved in the identification of the spoor, silencing the people who track the animals themselves by converting them into data and immersing them into an abstract space-time. However, this does not mean that other perspectives within the networks in which the trackers are involved cannot simultaneously engage with the animals and uphold the contextuality, or function on a level of multi-contextuality. For instance, "animals as data" when input into the Cybertracker may be viewed in a way that is not dissimilar to "animals as meat" when killed for food. In a statement like the one made about the presence of animals preventing his children from being hungry, Karoha said "I like using Cybertracker because it means that what I see [animals] will be safe." 'Animals as data' and 'animals as meat' may both be immutable mobiles that remain present in these multiple and shifting contexts in which planes of perception are engaged.

Chapter Four: Knowledge, Technology and Subject-Object Relations

Discussing tracking knowledge and the use of Cybertracker in the context of the WKCC project requires the consideration of a multitude of perspectives. With multiple planes of perception engaged in the collection and subsequent analysis of data, the meaning of the data, and thus the Cybertracker itself – as the data collecting tool – may be interpreted in a great variety of ways. Essential to these perceptions is the way that individuals interact with and perceive the boundaries between subject and object. This can be seen, for example, in the different ways an animal track may be revealed and interpreted.

Figure 14: Fresh Hartebeest track

Figure 15: Old Hartebeest track

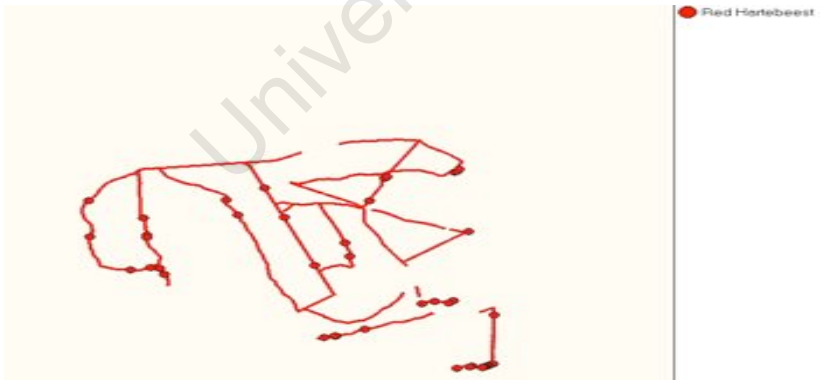

Figure 16: Hartebeest tracks illustrated along path of observation

Date	Time	Latitude	Longitude	Name	Hoof	Observation Type	Number Total
6/13/09	07:06:39	-24.14022	21.41557667	TEST	Red Hartebeest	Spoor	1
6/13/09	08:42:48	-24.33725	21.41476833	TEST	Red Hartebeest	Spoor	4
6/13/09	09:10:45	-24.34369	21.40236167	TEST	Red Hartebeest	Spoor	8

6/13/09	09:19:08	-24.34483	21.39921	TEST	Red Hartebeest	Spoor	1

Figure 17: Hartebeest tracks in database

Figure 18: Trackers examining tracks

Figure 19: Scientist examining tracks in database

Different perceptions of these representations of hartebeest tracks could ultimately lead to difficulties in interactions between diverse knowledge. The track pictured in Figure 14 means something quite different to !Nate, for instance, than does the track presented as a number and point in Figure 17, and those being inspected on the laptop in Figure 19. The subsumption of knowledges occurs when subject-object divisions are assumed universal, because these knowledges, or at least their products, are decontextualized through their objectification, as is often the case in projects that attempt to archive and integrate knowledges (Nadasdy, 2004). However, with the disintegration of subject and object boundaries, even the most decontextualized data may actively engage in multiple contexts without total subsumption. This may be possible by looking at flows of knowledge and considering animism and objectivism as concurrent ways of understanding subject-object relations while operating in networks together.

!Nate and Karoha were key players in the creation of Cybertracker. Louis Liebenberg's ideas about developing Cybertracker came about through his work with !Nate and Karoha while researching the depth of tracking knowledge in the Kalahari. The two, especially Karoha, also played an integral role in its pilot testing. This is tremendously important to the trackers and has major implications in the way that they have incorporated this technology into their lives, to the extent that they have come to consider themselves 'Cybertrackers'. !Nate's account of his contributions to the development of Cybertracker speak to the ways that he views the technology as representative of the interest and value people have in his knowledge, and how the technology is animated in the extension of

networks:

> Louis came to me! He was looking for someone who knows how to track. He wanted me to work with him to so he could make Cybertracker. He found me at Lone Tree, and he learned that I am the chasing guy for the kudus (persistence hunting). He said, "I want you to teach me how to chase the kudu, and give me the knowledge of the tracks for all of the animals." I told him that if he comes with that plan I will see you with that plan. I hunted with him the first time. Hunting the kudu. I came with him. It was 9 o'clock. I was a strong guy, it was before I had babies. My babies took all of my blood. It went eleven o'clock, twelve o'clock, half two, then we were at camp at Lone Tree. We wait and wait and wait, and we talk and he says "!Nate, I want to make Cybertracker". Then we're walking and walking and walking, and I'm teaching him the footprints of the duiker, of cheetah, of all of the animals. Then he went to Cape Town. Then he came back and said "!Nate, I need to work with you." So I worked with him and worked with him and he sees the Cybertracker. He is learning how I walk through the bushes, how you can know all of the animals foot prints. Then Louis he says he's going to make this computer, the Cybertracker, with the knowledge of my father, of my mother, of my mother's mother's mother. They are going to be the knowledge of my uncles! That is how he made Cybertracker.

One of the key points reiterated here is that Louis Liebenberg came to !Nate. This allowed !Nate to assume the position of Louis's teacher. !Nate takes pride in this and is quick to mention it when discussing Cybertracker. The work that they did together led to the development of a technology that utilizes !Nate's knowledge, while also recognizing that of his ancestors. The knowledge trails of his predecessors are present in the very existence of Cybertracker. Though he has had relatively little interaction with computers, he now has computer software designed specifically for his knowledge that is often regarded as an extension of himself (remember !Nate refering to his 'knowledge' as his 'Cybertracker'). Cybertracker owes its very existence to the world of tracking and, to a degree, has been embraced by the trackers as such. During my fieldwork it was immediately evident that all of the trackers take pride in calling themselves 'Cybertrackers'.

Through their work together, networks were extended between !Nate and Louis Liebenberg, and now the WKCC scientists. Nadasdy argues, however, that the integration of "Traditional Ecological Knowledge" (TEK) and science extends the networks of science into local communities rather than melding the two (Nadasdy 2003: 141). Through the data collection, analysis, and resulting reports, the knowledge objects

of the trackers undergo a complex process of filtering that distance it further and further from its initial contexts. As can be seen in the input of data, a number of categorical descriptors are entered that turn plants and animals, or animal signs, into numbers and points on a map. The data decontextualizes the information collected by the trackers as it enters the Cybertracker, yet it remains representative of what exists in the Kalahari and also of the knowledge and actions taken by the trackers to collect the data. However, "the tiny part that allows the grasping of the immense whole (Latour,1999: 36)" does not include the embodied, performative knowledge of the trackers as part of this 'whole'. These aspects need to be considered as part of the referent to the field, not separate from the field (as in the nature-culture divide), and not as data that only results from scientific procedure (as in epistemic distinctions that separate knowledge systems). Thus, in the WKCC project, it is necessary to examine relationships with both Cybertracker, and the data it captures as knowledge flows between the trackers and scientists.

In the milieu of information systems infrastructure, discussing metadata, that is, data about data, and bringing data together, Bowker points out that "there is no such thing as pure data," "that all categories come "under a description", and data comes in a dizzying array of categorical bins. You always have to know some context" (Bowker. 2005: 116). This requires more than just context of place, but also context of lived experiences, knowledges, and movement. The problem of the relationship between mapping and so-called 'indigenous' knowledges is the assumed incommensurability of multiple, incompatible ontologies and perspectives (Turnbull 2007: 40), which result from that other assumption that epistemes are bounded, discrete, and distinct. While the emphasis seems to be placed on incommensurabilities in discussions of these problems, it is the changing contexts that are essential to the formation of knowledge and should remain central.

When non-humans are conceptualized as data objects under the conditions of science, they lose their subjective qualities. To an extent this nullifies the trackers' presence and knowledge of place, while extending the networks of the scientists, thereby increasing their own power (see Nadasdy 2003: 143). In other words, the scientists become the sole controllers of the way in which contexts are represented. The practice of transforming

data objects into words requires traveling, "always through a risky intermediary pathway" (Latour 1999: 40). In order to engage with said objects, "One needs to go back to the field and carefully follow, not only what happens inside collections, but how our friends are collecting data in the forest itself" (ibid). The problem, with regard to the knowledges and practices involved in the process of data capture, is that embodied and embedded ways of knowing run the risk of being silenced as knowledge is treated as a type of quantifiable information or source of data (Nadasdy 2003: 123). The relationships with animals that !Nate, Nxjouklau and Karoha expressed as so important to the formation of knowledge about the data to be captured, for example, do not appear in the final data output. This, however, assumes the one-way extension of the scientific network.

The political dimensions and power relations in which diverse knowledges are employed together are often overlooked as emphasis is placed on the more technical difficulties of knowledge integration. Doing so only serves to reinforce cultural biases that inhibit local people's involvement in local resource management (Nadasdy 2003: 117). In fact, some of the biggest concerns, and/or frustrations expressed by the trackers were to this effect. Towards the end of my fieldwork, Kebogile, the youngest tracker, approached me and asked, "Where does all the data go? What is the purpose of our work, for us?" After discussing the various ways that the data will be used by WKCC, as I understood them, Kebogile reiterated his concerns, this time expressing that he wanted to know more about how and when he will be able to see and enjoy the benefits of the project. Kebogile told me, and demonstrated, that he is very interested in conservation and enjoys working for the project but after nearly two years he is now starting to wonder what kind of impact it will have, if any at all. For him, this is really an issue of scale – the scale of time at which the project is moving and when he will be able to see change – because all of the data that is collected remains exclusively in the hands of the WKCC scientists. Kebogile has no way of seeing how it is progressing other than the updates he is presented with, and has even less control over the pace at which the data moves in a way that will impact his life.

Kebogile's concerns are justified, for these processes concentrate power in the centers of calculation. There is no doubt that Cybertracker, and the subsequent movement of data, inserts aspects of the trackers knowledge into global conversations about conservation in terms of scientific research in which the trackers themselves barely feature. But this is not the only effect of Cybertracker, for the very development of Cybertracker, and the employment of trackers from within the corridor demonstrates a multi-contextuality in which a variety of simultaneous interpretations constitute various networks.

The trails we made were archived and saved by the GPS function in the Cybertracker as we walked and drove through the bush but the experiences, the emotions, the senses, the knowledges, and histories that were utilized to make those trails are not exhibited in the resulting data. The scientists retrieve the data they require, but the trackers only show up in the peripherals. However, when the multi-contextual planes of perceptions discussed in the previous chapter are taken into consideration, it is necessary to see that the networks extend both ways from the trackers and from the scientists, overlapping to form new networks and perhaps even new epistemic communities. The trails themselves and the data input into the Cybertracker as subject-objects are the immutable mobiles, the pieces that make their way through the various stages of data processing and analysis, and into the final reports. If those tracks and trails are pure objects, they would remain muted and immobile in the Kalahari.

Animation of Technology

Animism is usually discussed with regard to the way that all living organisms are considered actors in shared social spheres, endowed with shared, or similar, social qualities (usually spoken of as human-like). The relatedness that trackers use to describe their understanding of animals may transcend conventional western assumptions of about the subject-object divide and even extend towards knowledge objects such as data, and even Cybertracker itself. Cybertracker is a technology that has come to exhibit animate qualities in the way it has been embraced by the trackers. But, if life is to be the prerequisite for personhood, how can we account for the ways in which objects display agency? Fetishism is the term usually used to describe the animation of objects (Hornborg 2006). Objects, can, it seems, be animated as extensions of living beings, so

perhaps animism is still the more appropriate term. Cybertracker is spoken about as if it has taken on a life of its own as an extension of the self. This is evident in statement like "I am Cybertracker" and "Cybertracker is the knowledge of my uncles". Furthermore, it negotiates relationships between other subject-objects (tracks, trails, animals, and data) in its use by the trackers. Through these relationships they establish a presence as actors in the everyday. Not necessarily neutral, these subject-objects, including Cybertracker, help shape and redirect the extension of actor networks.

The concept of networks, in conjunction with animism, allows for a conversation that incorporates more than just human actors. The key to understanding the animation of objects is to not rely on the old division between subject and object. "Now Western thought, as is well known, drives an absolute division between the contrary conditions of humanity and animality, a division that is aligned with a series of others such as between subjects and objects, persons and things, morality and physicality, reason and instinct, and, above all, society and nature" (Ingold 2000: 48). Subject-object relations are but one of many that must thus be contested in thinking through these divisions. "The new technologies and networks prove to be not objects but what Latour calls 'quasi-objects': part Nature, part Society, and brimming with agency" (Hornborg 2006: 22-23). Objects may simultaneously be subjects, and visa versa, as agents that establish their presence and extend networks through their relationships with humans and other non-humans. For the modernist project, animism is the antithesis of the nature-culture divide and the objectifying modernist stance (Hornborg 2006: 21). However, Hornborg suggests, objectivism, animism, and fetishism can be seen as alternatives to making sense of, and drawing boundaries, between persons and things (Hornborg 2006:29).

A similarity found in the work of both Latour and Ingold is that they are preoccupied with the modernists' distinctions, between person and object, and Nature and Culture, recognizing that "this distinction is paradoxically itself cultural, and both keep returning to the phenomenon of technology as an arena where the distinction becomes blurred or at least problematic" (Hornborg 2006: 23). Though technology and data-basing have been critiqued for decontextualizing knowledge, it may be possible to frame this conversation

in such a way that shows how data takes on different meanings in different contexts through the agency that both data and the Cybertracker display rather than simply eliminating specific contexts. The example of 'animals as data' and then by extension, 'data as meat' or food security, and even 'data as an extension of self' for the trackers, demonstrates a way to grapple with issues of the relatedness between subject-objects in multiple contexts. Cybertracker technology, through its animation and concurrent objectification, illustrates a de- and then re-contextualization of knowledge practices that approach the boundaries between persons and things in different ways.

Our modernist skill of objectifying, Hornborg argues, is itself contextual. He uses the example of the commercial logger who also carefully tends to his garden at home to make his point (2006: 24). The trees to be culled by the logger are perceived objectively, while his home garden is sensed subjectively. This is not very different from the hunter who has a relationship with the animal he or she kills, but also discusses the resulting meat as a commodity. Hornborg continues, "it may not so much be an incapacity to relate as such that distinguishes us from the animists, as the incapacity to exercise such 'relatedness' within the discursive and technical constraints of the professional subcultures which organize the most significant share of our social agency. Science and technology does not so much make us into robots, as make specific parts of our behaviour robot-like." (Hornborg: 24). The trackers of WKCC demonstrate an ability to exercise 'relatedness' in multiple contexts, like the commercial logger, however, contrary to 'us', science and technology have not so much made them into robots or parts of their behavior robot-like, as the trackers may have made science and technology more human-like. Engaged in conservation science data collection themselves, the trackers may be blurring the boundaries between subject and object throughout the network making the data and technology more human-like for the scientists too.

If objects themselves have subjective qualities, and therefore agency (Latour 2004; Hornborg 2006), it does not take a great leap of faith to consider 'data as animal'. In doing so, the agency of both the data and the animal, are recognized as representations of each other. The trackers consider themselves 'Cybertrackers' and the device itself, a

product of their, and their ancestors' knowledge. Cybertracker, too, is a subject-object software and device that is animated in the extension of self, embedded in relationships with other subject-objects. As such, both the technology and the individual are identified with one another (both are considered "Cybertrackers"). When Cybertracker is reconsidered in this way, the data is brought back to life by the trackers. Thus, despite decontextualization, relationships can be maintained through this process of animation.

Technology as an Extension of Self

Empowered by their role as data collectors, Cybertracker is a domesticated technology for the trackers of WKCC. It has become their own rather than just a tool of appropriation through the extension of a scientific and resource management network. As a tool that utilizes the knowledge of the trackers, it allows them to continue learning at a time when there would otherwise be little opportunity exert the their skills to such a degree. Karoha said, "I like Cybertracker because I am learning a lot. I like using the technology. I like that I can use it to track animals."

In addition, the trackers find security in that fact that Cybertracker stores the information they observe. Nxjouklau told me that he likes using the Cybertracker because "if I have it in my hand I know the information will go to the people." Kebogile's concerns about what happens to the data after analysis and how it will impact his life correlate directly to the value he sees in using Cybertracker:

> The importance of Cybertraker is that it keeps it in a safe place so that people can use the information. If we did not have Cybertracker we would not have a place to keep that information. Only I would have the information: there would be no way to share it. Also, if you see something very interesting you can type that into the Cybertracker, so it is a way of storing important information.

!Nate elaborated on this point:

> One thing that I like is that it helps me capture the information. I like that what I see is being stored in the Cybertracker. I know that what I am doing will not disappear. If I don't have the Cybertracker there is no way I can store the tracks, but with it I can save the information.

Through the data collection, the trackers extend their network. As problematic as the decontextualization of knowledge may be, it is evident that the trackers themselves consider the data-archiving component extremely important. This, I would argue, is largely due to the way that they engage with subject-objects. For hunter-gatherers,

Ingold argues, "the relations that human beings have with one another form just one part of the total field of relations embracing all living things (Ingold 2000: 59). That their observations are 'saved' is of value to them in the maintenance of the total field of relations. And, this is how the connection between 'animals as meat' and 'animals as data' is made. From the perspective of trackers like !Nate, Karoha, and Nxjouklau, the relationships with the non-humans of the Kalahari, in the context of their everyday interactions with the bush, are expressed in the data and even as possible future food security. It was in relation to using Cybertracker that Karoha said, "It makes me happy to see the animals because I know my babies will not be hungry." Non-humans as data are also non-humans as food. Though their experiences and relationships with the non-humans may not be captured, the non-humans are made present in multiple, co-existing, and co-functioning contexts. This allows for the 'animals as data' to be considered a means to support future relationships with these animals: they are brought into the total field of relations, along with Cybertracker. This, in turn, could prove useful in not only maintaining those relationships, but also in ensuring the safety of the non-humans.

The total field of relations can incorporate data when Cybertracker is understood as an extension of self. "Through the practical activities of hunting and gathering, the environment – including the landscape with its flora and fauna – enters directly into the constitution of persons, not only as a source of nourishment but also as a source of knowledge" (Ingold 2000: 57). The practical data gathering activities of the Cybertrackers (the men not the computer) resemble those of hunting and gathering. As such, Cybertracker (the computer) has the potential to facilitate the constitution of self whereby its use provides a practical application that accesses a source of knowledge. Moses described some of the ways he sees Cybertracker utilizing their knowledge,

> For some of them, it is more like a hunting experience. They go out and find various tracks and find it interesting that maybe a cheetah was chasing a steenbok. Because, when they are at home they have things like drought relief programs and they don't go out of home very much to gather veld products. So, they don't interact very much with the wild, but with Cybertracker it sort of brings them back to experiencing the wildlife…to them it is refreshing, it is something they enjoy. Even though they are working but it is also relaxing, being back to nature.

They, the trackers, are 'Cybertrackers' by virtue of their engagement with the bush and the technology as an extension of self, which too enters directly into the constitution of persons as a source of knowledge and livelihood, or nourishment.

The development, implementation, and use of Cybertracker shows ways that technology can draw on the experiences of existing communities in the Kalahari without yielding entirely to the modernist narrative. To use the language of the narrative, it could feasibly be turned on its head by demonstrating that tracking skills are 'modern' and technology is 'indigenous' in this context. Moses hinted towards this, though again using the language of the modernist narrative, when he said, "I think we are waking up from this idea that science is only about technology that forgets about the traditional way of living."

Cybertracker, as a domesticated technology can function as a means of re-assembling knowledge. Though it does not capture certain intangibles, through its use and action, the intangibles, and thus tracking knowledge, continues. As such, while the scientific monitoring of WKCC does much to decontextualize, it also works to perpetuate knowledge of tracking in ways that have embraced technology not simply as a decontextualizing tool, but as tool that can recontextualize and be used to maintain relationships. Furthermore, the knowledge of tracking perpetuates the in-depth collection of data required for scientific monitoring.

Conclusions

When applied in practice, the subject-object dualism provides evidence of its own invalidity (Hornborg, 2006). As a socio-technological application, Cybertracker displays the qualities of a quasi-object. It is itself a knowledge object, but it also functions as a subjective extension of the trackers' selves. This is not to say that it is perfectly aligned with either the scientists or the trackers' knowledges, or that the sciences and tracking knowledge are perfectly aligned through Cybertracker. It is not as if Cybertracker can replace tracking knowledge, and it cannot mediate knowledge on its own. But Cybertracker is itself brimming with agency in its relations to the trackers and scientists. Its agency is not just evident in the way it is animated through its embrace as an

extension of self by the trackers, but also in the way that it produces the very data that is negotiated by the scientists. As an agentive quasi-object, its agency does not simply project in one direction. But it is by no means perfect, nor does it facilitate perfectly symmetrical relations. It does allow for some degree of subsumption through both the embrace of the trackers and the scientific analysis of data, thus relationships must be carefully negotiated.

A less science-centric approach will show that immutable mobility requires a co-extension of networks that is not entirely subsuming. Subsumption of knowledges is highly political and partially a product of discussions that rely on the centrality of western epistemology to address notions of marginality thereby assuming at least some lack of agency in the 'marginalized' designation. There is a lot of merit to these discussions because they emphasize an imbalance of power and asymmetrical relations. A symmetrical analysis, however, while considering these issues, takes the role of all actors in networks seriously, and therefore attempts to talk at cross-purposes. Through the relationships established in the extension of networks in the WKCC project, both the trackers and scientists were able to mention ways that they are learning, and therefore benefiting, from one another. A mutual appreciation and respect of knowledge has developed through their co-production of knowledge.

Discussing the project, Nxjouklau said, "We have lots of knowledge about tracking. We can teach Moses and he teaches us. It is very easy to learn from each other. *We want to know how he knows*." At the same time, Moses discussed how much he is learning from the trackers. While these words offer an example about the desire to learn from one another, the last statement brings up a central issue of how knowledge is embodied as it is generated. Nxjouklau does not just want to know *what* Moses knows, but *how* he knows it. He is hinting towards a sense of the *way in which one knows* (i.e. a way of thinking), or the processes of knowing. One of the ways that this occurs, as demonstrated in the WKCC project, is through the body on one level, but also crossing and conjoining of multiple networks, and the interaction of different actors within those networks.

Throughout the course of my fieldwork this was a recurring theme. Both the project coordinator and the trackers alike recognized that knowledge is not a compartmentalized function of the human brain and limited to specific contexts, but something that is continually produced through experience, movement, and performance. In discussing why the trackers and their knowledge is so important to the project, Moses stated:

> There is a lot of ecological knowledge with these guys, and we may start to wonder how they have it. They may not have an elaborative way of explaining how these things are but their understanding of the ecology and how they interact with it, you'll be amazed. And then I think now the modern technology, like Cybertracker, and then also CBNRM [Community Based Natural Resource Management], it is sort of appreciative of that man and nature are one thing. You understand nature more when you interact with it.

The trackers are influencing the scientist's understanding of how to engage with the world and approach conservation. The trackers know things about the wildlife and have the practical skills to identify those things because of their experiences in the Kalahari that the scientists cannot. They offer WKCC a means through which they can have a much more in-depth and accurate data collection process. For this data to be of any use to the scientists it must take on the subject-object qualities established in their relationships with the trackers. They interact with and animate objects in different ways, whether or not they know that they are doing so. Reliant on the divide that separates nature and culture, subject and object, the scientists hope that they can gain valuable data from the knowledge of the trackers. The trackers knowledge, expressed in the relatedness of subject-objects is not as reliant on the divide. This divide too becomes blurred for the scientists through their interaction with the subject-object data that the trackers collect. The trackers make the data more subjective, or 'human-like' rather than 'robot-like' for the scientists.

Nadasdy shows that while many of the difficulties involved with knowledge integration, and archiving of this sort are largely considered technical, the greatest obstacles to such efforts are political and have to do with issues of power. "[R]ather than being holistic, oral, qualitative, and intuitive, TEK artifacts tend to be categorized, written, quantitative, and analytical" (Nadasdy 2003: 129). They end up resembling scientific artifacts more than those of TEK and, thus, are largely useless to the people who produced them. The knowledge is compartmentalized, under the assumption that the social context is a given.

Instead, this assumption renders the contexts non-existent, or at best, irrelevant. Scientists and researchers then set the terms through which TEK may be utilized, or 'distilled', thus controlling the process through and through (Nadasdy 2003: 130). However, this argument works under its own assumption that 'place' denotes a single context and does not consider the engagement of multiple perspectives where boundaries are much less sedentary.

There is not simply a one sided extension of the scientific network imposed on the local communities. 'Local communities' are not bounded, but constantly changing and negotiating their networks, and the very use of the term compromises the symmetry of relations. Contextualization and distillation are rather a matter of scales and considering the different contexts and nodes in networks in which the data is interpreted. On the local level, through the technology (as it is their own) and the interaction with the wildlife biologists (who have interest in their knowledge), the trackers are too extending their own networks in which they have control of what the scientists learn. The scientists are not simply taking from the trackers and imposing their networks upon the communities in the corridor. Although the flow of information may appear imbalanced when discussed in terms of global and local scales, because the local is always smaller than the global, they are not entirely distinct, and information does flow both ways and have significant local implications.

Analytically, 'nature' as distinct from subjects must be acknowledged in conjunction with animistic practices. Cybertracker analytically extracts the 'natural' from the 'cultural' while also activating or conspiring with various agentive qualities, both of its own, and of those of the so-called 'natural phenomena'. Nowhere is this more evident than with the most primary 'object of study' for WKCC: the tracks of animals. The tracks themselves are not permanent. They are temporary and immobile, vulnerable to being blown away with the wind, or washed away by the rain. While signifying the presence and movement of the animals, they are muted and immobile. But Cybertracker and knowledge, of both the scientists and trackers, together activate the mobility and agency of the tracks. They are recorded as quasi-objects, representing the tracks as objects, the animals as both subjects and objects, as well as the knowledge of the trackers and scientists.

Cybertacker becomes a means through which the trackers exercise their own agency, or the agency of their knowledge, and the agency of the animals, but only as much as the scope of and conditions of the conservation and scientific research allow. The tracks are at once animated and objectified. This is where tensions between diverse ways of knowing emerge, particularly in how boundaries between persons and things are perceived. Empowering, but controlled, the extent of agency is distorted by a co-operation on multiple contextual and perceptual levels in which issues of power abound.

Processes of knowledge integration and data collection controlled in scientific research will decontextualize aspects of knowledges. However, technology as an extension of self brings the self into global discourse at the same time as emphasizing locality. This is especially true with GIS and GPS technologies like Cybertracker that specify locales in global images. Small scale implications, however, are not entirely contingent upon the large scale. As it can be perceived from different contexts, there can be no single meaning for technology, and Cybertracker can be neither entirely disempowering nor entirely empowering. Moving through conjoined networks and animated locally, or localized, technology is not just fetishized on the terrain of science, though it is consumed globally by the world of science and conservation. Meanings of data, subsequently vary from context to context. On the small, or local scale, technology can be appropriated and become an empowering part of the person. Simultaneously, it can exist in the large, or global scale, in which the person is removed from both the technology and the data, but never entirely. The immutable mobiles are always active. They maintain their presence and are at least partially responsible for the connecting of networks and exerting the presence of various localities.

Chapter Five: Conclusion

> Mudongo [a wildlife biologist from the Department of Wildlife and National Parks] navigated, constantly checking the Cybertracker map to help make sure we stayed on course, directing me left and right as he assisted me in scanning the bush for the best possible path. I fought with the bush, white knuckled as I clutched the steering wheel, driving through, on, and around trees, bushes, holes, and heavy sand. My eyes were focused not on a road, but on the not-so-distant horizon and what lay immediately in front of the car. My ears were alert, as I needed to hear the occasional shouts from the trackers in the back of the Land Cruiser warning us of tree stumps that could puncture my tires and big holes dug up by aardvarks. Needless to say, driving was slow going even with ten sets of eyes, a GPS system, and a more than capable 4x4. Creating our own trail was extremely tedious and even stressful. It required complete focus and immense patience. Not only are there many physical obstacles, but finding your way and keeping your bearings is mentally strenuous.
>
> Driving on a barely visible and seldom used track can make driving exponentially easier. A bit more than halfway across the transect we came upon the track that Mudongo and Moses left during the last round of fieldwork, and followed it the rest of the way. Though the driving still involved a lot of thick bush and swerving around trees, it was much less strenuous, allowing me to relax my grip on the steering wheel and the senses I tried so hard to focus. Following a pre-existing trail made moving much less mentally taxing. We no longer had to worry about making sure that we were maintaining an accurate course and could now just follow the previous track. In addition, because the track had been driven on before, the sand was firmer from the previous compaction. In other words, we were on sturdier ground and had a relatively clear path. Though we were contributing to and building upon the path, thereby making it our own, it was much more difficult blazing an entirely new trail ourselves. Except from fieldnotes-21, June 2009

Through this experience I learned about, and felt, some of the complexities involved in creating trails, whether they be physical trails, knowledge trails, or trails of data. A multitude of sensory experiences combined with the shifting contexts and histories of the landscape moved through space creating a new and unique trail. The trail came to life, so to speak. And then, in the same way that driving through the bush is much easier, and in fact even much more possible, when a trail already exists, I realized how developing one's thinking and what one knows depends largely on, and can progress much more swiftly with the knowledge histories and trails that have been laid before. As I sit here now, trying to produce my own knowledge artifact, I find myself enmeshed in a myriad of memories and experiences, contexts and perspectives, histories, presents and futures, all of which are entangled in the networks through which I move. If my anthropological predecessors, and scholars such as Latour, Ingold, Turnbull, and my supervisor Lesley Green, had not developed their thinking and created trails before me, I would move much

more slowly through my field of study as I navigate my way through my observations and material, avoiding holes, stumps, getting stuck in the sand, all the while trying to keep my bearings. Luckily there were trails that came before me upon which I can expand as I lay down my own tracks, and those that my fellow anthropology students, and many others, are creating alongside me, guiding me, and helping me keep my bearings. I have relationships with all of these things and they inform my movement.

Latour writes that,"[t]o know is not simply to explore, but rather to be able to make your way back over your own footsteps, following the path you have just marked out" (Latour. 1999: 74). However, in creating a path of discovery one must also be able to recognize flaws in that path and be willing create new paths back if necessary. If knowledge is performed, no single performance is ever an exact replication of another. On a different occasion in the field, I found it immensely easier to find my own way through the open bush than to spend all of my time and energy scanning the ground for an old, once used, and now barely visible track. On the way to our destination I followed the old track, losing it often, and spent a lot of time trying to find it again before being able to proceed. On the way back, however, guided by the trackers using the Cybertracker GPS, we crashed straight through the bush instead, and found our way back to the starting point much more quickly and with greater ease. In this case, it was easier to bush crash than follow an old or barely used track. This to me was like wading through slightly related, barely read material in the library, that can sometimes be useful, but can also slow your progress as you search for relevance, following existing trails that do not help find your direction. Relationships are established, some built upon, while others become secondary.

The role of movement is central to the multiple contexts of knowledge production in this project. The life of a trail helps in illuminating the connection between knowledge production and the agency of subject-objects. Thinking about my own frustrations driving through the rough terrain of the Kalahari bush, a few sentences from Tim Ingold helped ease my anxiety about these difficulties, and showed me that these difficulties were quite central to my study. "It is precisely because perfect transport is impossible – because all travel is movement in real time - " he writes, "that places do not just have

locations but histories. Since, moreover, no one can be everywhere at once, it is not possible to wholly detach the dynamics of movement from the formation of knowledge, as though they lay on orthogonal axes running respectively laterally and vertically, across and upwards" (Ingold, 2007: 102). While driving, I at first approached the bush as an objectified obstacle. But, when I came to reconsider the dynamics movement and histories I started to engage *with*, rather than act *on* the bush. These trails, or lack thereof, demonstrate their own agency in the way that they influence movement.

This type of engagement and relatedness only become possible when the great divides are uncovered. The movement and embodiment of knowledge shows that knowledges cannot be held as distinct systems as they are far too dynamic and flows of knowledge are enmeshed in networks of constant engagement. We need look no further than our own experiences to see this, however, the WKCC project provides a space in which the interaction of diverse knowledges and the use of technology make this abundantly evident. Networks encompass shifting and changing contexts in which multiple perspectives and perceptions engage with one another. They are not bounded, or separate from one another. The trackers in WKCC demonstrated ways that the breakdown of the nature-culture divide increases the capacity for relatedness, making the case for considering subject-objects instead of exclusively distinct entities. Subject-objects are not only actors within these networks, but essential to their formation.

Multi-contextual planes of perceptions reveal tensions that too are embodied, both within the subject objects and throughout the networks. Expressed in the networks, scale and power can conceal diverse planes of perceptions, however as actors within networks this does not simply result in subsumption and decontextualization of knowledges. Mutual influence and knowledge exchanges are what make up these networks. Deemphasizing ocular dependency and objectification within these networks clears the way for more symmetrical analyses. One network cannot simply extend its influence onto another without itself feeling some effect, and through the utilization of all senses and the embodiment of knowledge this can be recognized. Though conservation scientists may be essentializing wildlife as data objects they cannot help but incorporate some of the subjective qualities impressed on the data by the trackers. Furthermore, the data itself

exhibits its own agency in the way it embodies the tracks, trails, animals, the knowledge of the trackers, and the Kalahari to inform the scientists. The data does not require subjective projections from the trackers to gain agency, this is just one of the ways that it is most demonstrable in the WKCC project. Their agency is part and parcel of their involvement in the networks of the trackers, the scientists, and the Western Kgalagadi.

Western technologies that are thought to decontextulaize data, only do so on the terms of the West. It makes sense that relatedness would not be limited to the context of the 'local', embedded only in those 'communities', but as method of engagement that reverberates throughout networks, extending to include what are often considered Western objects. When these objects are reconceptualized as subject-objects they become much more than tools of decontextualization. Cybertracker demonstrates ways in which this occurs through its embodiment as an extension of self for the trackers, and how perceptions of data can take on multiple meanings.

Cybertrackers, both the people and the computers, in the collection of data, can transform the muted, immobile, and temporary tracks of animals in the Kalahari into immutable mobiles thereby furthering the reach of networks of the Kalahari. Animals that embody real movements, activities, and even relationships with the trackers in WKCC, are brought to life in the data through the trails that they leave behind. Though the tracks themselves are stationary, they represent the life and movement of the animals. In their relationships with the trackers, and the use of Cybertracker, they move beyond the Kalahari and become entangled within networks shared by the conservation scientists and trackers. As data they are vulnerable to objectification, but in the dynamism of their movement, the movement of the data itself, throughout networks in which multiple planes of perception are engaged, they exude agency.

Subsumption requires knowledges be perceived as bound, discrete and systematic. However, embodied and performed throughout networks, knowledges cannot be as isolated and static as this would imply. The movement, agency, and relatedness demonstrated by 'knowledge objects' shows that the complexities involve a continual exchange of influence in which knowledges are always changing, incorporating and

excluding ideas and practices in the way that they are embodied. The presence of diverse knowledges, expressed in both their relatedness and their tensions, are evident in their very movement in these networks as actors and the interwoven trails they leave behind. Like the trails that revealed their presence as I fought with the bush, and the bush that encouraged me to create new trails, the dynamics of knowledge production are experiential, based upon histories of interaction and relations, and under different conditions simultaneously encompass a variety of perceptions and contexts.

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