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Digging Droughts: Maasai and Palaeoanthropological Knowledge, Subsistence, and Collaboration in Oldupai Gorge, Tanzania

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Digging Droughts: Maasai and Palaeoanthropological Knowledge, Subsistence, and
Collaboration in Oldupai Gorge, Tanzania

by

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A THESIS

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Abstract

Tanzania's Oldupai Gorge is a flagship human origins research destination, yet less recognised is that the Maasai inhabit the region. This thesis uses actor-network-theory to ethnographically compare palaeoanthropological and Maasai epistemology and ontology in Oldupai, and to understand why collaboration between the groups has been sporadic. Researchers and locals constructed knowledge in equally logical forms, combining established facts and artefacts with novel data to produce new facts and artefacts. Instead of fundamental epistemic disparities, the content of each group's knowledge differed, and this content was tied to subsistence strategies and culture. Scientists and the Maasai acquired resources in non-scientific and non-pastoral worlds to support their respective livelihoods, and multiplied ontologies by enacting composite – yet conflicting – versions of hybrid drought. Even though both groups dug in Oldupai, palaeoanthropological and Maasai subsistence exigencies have precluded meaningful collaboration. However, mutually beneficial partnerships are emerging in the birthplace of humanity.

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Dedication

For Aunt Darlene, Aunt Ruth, Aunt Sandra, and my dog Kahlua.

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List of Abbreviations

ANT	Actor-network-theory
NCA	Ngorongoro Conservation Area
SDS	Stone Tools, Diet, and Sociality
SNP	Serengeti National Park

Chapter 1: Introduction

Careening around tight corners on the narrow road that descends west from the Ngorongoro Crater rim, waving away the dust that funnels into the cab as your quaking 4x4 rumbles over top of each bump, you gaze upon the vast Serengeti as it begins to reveal itself in the distance. To the left, giraffes gracefully plod through acacia trees, and to the right, zebras graze in the dry northern Tanzanian breeze. Before you continue on into what the Maasai call the “endless plains” of the mighty Serengeti, your truck turns and you approach Oldupai Gorge, the Cradle of Humankind where palaeoanthropologists have unearthed myriad archaeological discoveries pertaining to humanity’s shared past.

You come to a halt at a scene buzzing with human activity. Emerging from your 4x4, you see palaeoanthropologists instructing university students in the systematic removal of layers of earth, along with assistants pressing displaced dirt through metal screens. Searching for the source of an unexpected sound not unlike that of a lawnmower engine, you spot a stark white tent hooked up with some sort of mechanical air filtration contraption. A student, capitalising on the shade provided by your truck to take a reprieve from the blistering sun, explains that palaeoanthropologists are excavating various remnants of the deep past to create models of ancient adaptation to drought: a period of fluctuating – and generally increasing – aridity that occurred 1.8 to 1.3 million years ago.

Hoping to see more of this iconic savannah ecosystem, a vista portrayed in films, art, and tourism advertisements, you take an exploratory walk. As you climb further down the slopes of the dried-out Gorge, a chasm bountiful with flowing water during the bygone wet season, you come across a group of people digging. You might assume that you are about to meet some more palaeoanthropologists, yet you get closer and discover

that the local Maasai are digging a hole. Soon, a Maasai youth passes by with a large herd of goats, and before continuing a journey through the blazing midday heat, stops to engage in a discussion with the excavators. To augment their mobile pastoral lifeways in this demanding and metamorphosing terrain, the Maasai must take arduous trips across the relentlessly arid land to dig in the base of the Gorge, thereby ameliorating a present drought by harnessing the buried vestiges of water that was abundant in the recent past.

Oldupai Gorge, located in Tanzania's Ngorongoro Conservation Area, is a flagship destination for research into human evolution. Palaeoanthropologists from around the globe seasonally converge upon the site due to its abundance of fossils and stone tools (Domínguez-Rodrigo et al. 2007:xiii). Less recognised is that the Maasai, an Indigenous pastoral society, inhabit the region. Despite over a century of inquiries into humanity's shared past (Leakey 1978) in the birthplace of humanity, where both groups share in the practice of digging within the Gorge, the Maasai and palaeoanthropologists have rarely affiliated with each other.

Palaeoanthropologists are able to obtain research funding in their home nations, acquire permission from officials to excavate within a space set aside for conservation, and utilise the Gorge's resources to reconstruct past events – such as a multifaceted drought – and thereby secure academic credentials. Notably, this academic credibility assists in acquiring further funding (Latour and Woolgar 1986:187-230), both of which usually remain out of reach for the primarily rural-dwelling Maasai. Simultaneously, well-intentioned conservation measures, such as those that deny the mobile and knowledgeable Maasai access to crucial dry-season water sources that are now within national parks that neighbour the Ngorongoro Conservation Area, are making established

forms of pastoralism impossible in a region where livelihood diversification options for the Maasai are limited (Galaty 2002; Galvin et al. 2008; Nelson 2012). While researchers possess the financial and logistical means to model an ancient drought and practice their scientific livelihoods in the blistering Oldupai heat, the Maasai have been facing a devastating, multifaceted, and livelihood-compromising drought.

I first came across the divide between researchers and Oldupai's locals while I was conducting ethnobotanical research with the Maasai as an undergraduate researcher with the multi-disciplinary and multi-institutional *Stone Tools, Diet, and Sociality* palaeoanthropological partnership. Returning with the partnership the following year, I refocused my master's research on holistically understanding what Oldupai was to each group, and discovering the underpinnings and implications of the similarities and differences between Maasai and palaeoanthropological perceptions and practices in the Gorge. Featuring theories and methods that scholars have developed within the field of science and technology studies, this thesis peels back the curtains on a world-renowned research site, ethnographically compares daily life in the Gorge for the Maasai and palaeoanthropological researchers, and illuminates the dynamics of the puzzling lack of association between the two groups who I observed subsisting in the Cradle of Humankind. It aims to show *why* palaeoanthropology has been excluding the Maasai from research projects in Oldupai Gorge.

Outside of the region, most know my field site as Olduvai Gorge. However, this designation is a vestige of the time when Western colonists occupied East Africa. In 1911, a European researcher who was visiting the Gorge thought that he heard a local say *Olduvai*, and this colonising appellation stuck. Locals refer to the site as *Oldupai Gorge*,

a name based on the Maasai term for a plant that grows through the area (Mehari and Ryano 2016:82; Salazar 2013:684-685), a plant that researchers usually despise for its razor-sharp leaf tips. In line with the 2005 official re-designation of the Gorge with its original Maasai moniker (Barnard 2011:11), I use the term *Oldupai Gorge*. While I am able to do my part in correcting this foundational miscommunication and partition between researchers and the Maasai, many more remain in place.

In this thesis, I explore such communication breakdowns and divisions. The first two chapters following this introduction provide a foundation on which to present the results of my research and a subsequent discussion about the future of the Maasai and palaeoanthropology in Oldupai Gorge. In Chapter Two, I engage in a literature review outlining the historical developments of both Maasai and palaeoanthropological livelihoods in the region. I also explore literature relating to actor-network theory, the overarching theoretical framework that I used to understand the situations that I came across and participated in. Next, in Chapter 3, I outline the methods that I utilised to collect and analyse my ethnographic data.

The results chapter, Chapter 4, features an epistemological and ontological comparison of Maasai and palaeoanthropological experiences of Oldupai Gorge. Despite widespread representations that unfoundedly portray the Maasai as archaic (Galaty 2002; Hodgson 2011:66-68), my research indicates that both researchers and the Maasai constructed knowledge in equally logical *forms*. Each group featured parallel epistemic cultures (Knorr Cetina 2007:363), inside of which they both combined taken-for-granted facts and technologies with novel information in order to settle debates and produce new facts and technologies (Latour 1987; Latour 2005). Since there were no fundamental

cognitive or epistemic disparities between scientists and non-scientists (Latour 1993a:192-236), what differed was the cultural *content* of knowledge-building practices. Such content was often influenced by and related to each group's contextual realities, including their culture and their livelihood practices that had to navigate large political-economic contexts. The Maasai *and* palaeoanthropologists both tactfully obtained essential non-pastoral and non-scientific resources in order to support their valued pastoral and scientific livelihoods, respectively (Latour 1987:45-162). They both created and proliferated reality by enacting composite, yet conflicting, versions (Mol 2002) of drought; one in the present and another in the deep past. These parallel enactments of hybrid (Latour 1993b) drought demonstrated that subsistence exigencies have been impeding collaboration between the groups.

A potential standardized package (Fujimura 1992) might be the key to a future that features sharing of resources, mobilisation of information, inclusive archaeology, peace of mind, and boundless knowledge production. To conclude this thesis, I document a cooperative excavation of a former Maasai homestead, and posit that it could act as a blueprint for a more robust standardized package in the future. This burgeoning interface between the Maasai and researchers may pave the way for additional mutually beneficial collaboration as the Stone Tools, Diet, and Sociality project unfolds in Oldupai over seven years, bridging the chasm that has separated researchers and locals in the Gorge for far too long. Importantly, it may soon be that Maasai experiences of digging no longer entail facing the harsh realities of an unheeded drought, and but rather a future in which *eseriani* – a Maasai term for togetherness, communication, meeting needs, health, and ultimately, peace of mind – truly begins to characterise the birthplace of all humans.

Chapter 2: Background and Literature Review

2.1 Approaching Oldupai: 2015 Pilot Field Season

In 2014, I became a member of the Stone Tools, Diet, and Sociality (SDS) partnership. This multi-disciplinary and multi-institutional project is spearheaded by my co-supervisor at the University of Calgary, Dr. Julio Mercader. In 2015, I travelled to Tanzania with the SDS partnership to participate in their ongoing palaeoanthropological research in Oldupai Gorge. In addition to excavating artefacts, I was in charge of assembling an ethnobotanical collection and working with Maasai individuals to collect small samples of various species. This modern botanical reference collection is critical for identifying residues (Zhang et al. 2011) on the ancient stone tools that SDS unearths, and thus contributes to the team's multi-stranded goal of inferring how humanity's ancestors progressively adapted to a period of growing aridity that transpired 1.8 to 1.3 million years ago. I followed Martin's (2004:8-65, 86-89) systematic ethnobotanical collection methods, which included making these collections in a non-intrusive manner and according to Maasai custom, such as sustaining each plant's utility by collecting only small segments of specimens (Ngaruiya 2015:107). This ethnobotanical endeavour was simultaneously a pilot study in which I explored potential topics for an ethnographic master's project. As a neophyte seeking to engage with and extend existent academic dialogue, I followed the advice of Hammersley and Atkinson (2007:191-192) to complement ethnographic research with a thorough reading of relevant literature.

2.1.1 The Maasai

In the past, the Maasai lived in a vast territory spread across Tanzania and Kenya: scholars posit that a few hundred years ago, people speaking the Maa language moved

from what is now Sudan into East Africa (Hodgson 2011:65). The age-set system is a salient aspect of Maasai society (Spencer 2003:15). Groups of similarly-aged males progress through a series of age-grades together. Young *olayoni* boys become livestock-defending *olmurani* warriors, who always remain in each other's company and share a strong sense of comradery and mutual accountability that transcends clan affiliation. Around 15 years later, members of this *olmurani* age-grade disband to become *ilpayani* elders, and subsequently begin accumulating their own stocks of cattle and build their own families. Polygynous elders wield political authority at home, making decisions on behalf of their wives and children; and in wider society, as elders debate contentious issues until they reach consensus. Women, however, do not progress through this kind of rigid age-set system, and instead gradually move from a relatively powerless state within Maasai communities when young towards establishing wide networks with fellow women as they age. At this point, Maasai women can publicly ridicule and discipline men for social grievances and steadily accrete their own authority and respect (Århem 1989:2; Spencer 2003:15-37).

The Maasai are pastoralists, they follow a livestock-raising livelihood strategy common to areas where uncertain rainfall patterns can preclude steady crop cultivation. To adapt to these conditions, the Maasai migrate their animals to seasonal botanical and water sources; sustainably consume the milk, blood, and meat of their livestock; and abide by a land tenure system in which territory and resources are shared with neighbouring Maasai communities and kin (Fratkin 2001:3-4; Nelson 2012:4). Generally, young boys accompany livestock on short journeys, while warriors move animals to distant resources. Staying in the vicinity of the homestead, Maasai women cook, clean,

care for children, construct homes, and make key decisions regarding the allotment of milk to family members and the larger community (Wangui 2008:369-370). Oldupai Gorge is situated within the Ngorongoro Conservation Area (NCA). The *Game Parks Laws Miscellaneous Amendments Act of 1975* created the Ngorongoro Conservation Area Authority, a governmental organisation that attends to pastoral Maasai concerns while also simultaneously managing wildlife conservation and tourism initiatives within this “multiple land use area” (Galvin et al. 2008:255-261). Ideally, the Ngorongoro Maasai move their animals to highland resources during the dry season. During the wet season, the Maasai return their animals to the lowlands, such as the landscape around Oldupai. This system of mobile transhumance facilitates forage regrowth (Århem 1985:189-194; Galvin et al. 2008:261-264).

Pastoralism is conventionally a viable and sustainable lifeway in arid ecosystems, and does not degrade and desiccate environments (Coughenour et al. 1985). Centuries of ecologically-beneficial pastoralist grazing and controlled burning have contributed to the long-term formation of contemporary East African ecosystems. Within these iconic savannah landscapes that draw tourists from around the globe, the Maasai, their livestock, and Tanzania’s famed wild mammals symbiotically co-exist. Moreover, by actively conserving and sustainably managing access to dry-season grazing areas, pastoralists such as the Maasai actually provide key refuges for wild animals that seasonally migrate out of artificially-imposed national park boundaries (Nelson 2012:1-10).

During Tanzania’s colonial period, the Maasai first began to lose access to rangeland. The British Colonial Government instituted Serengeti National Park (SNP) in 1940, and upon the 1959 separation of a section of SNP that became the NCA, the

Colonial Government evicted the Maasai from the SNP. As a result, the Maasai lost access to essential permanent year-round water sources. As a result of these conservation efforts, wildebeest numbers in the lowlands have increased, which unfortunately also brings fatal diseases to Maasai cattle. Furthermore, many of the water sources that remain in the NCA are primarily harnessed by tourist facilities, or remain off-limits to the Maasai. The highland water sources within the NCA that the Maasai formerly utilised only seasonally are now overcrowded, exacerbating disease-based cattle deaths, all of which combines with a rising human population to make established forms of pastoralism in the region impossible. Furthermore, opportunities for the Maasai to diversify their livelihoods are extremely limited, as evidenced by the prohibition on cultivation in the region and the Maasai's negligible access to the fruits of the tourist industry. To purchase food, many Maasai have begun to sell their cattle on the open market, compounding livestock losses (Galvin et al. 2008). When pastoralists sell livestock in order to temporarily acquire sustenance, the animal-based wealth that usually stays within a circuit of livestock reinvestment is permanently destroyed (Ingold 1980:231).

Among the Maasai, as with a variety of African cultures, people usually recall and convey environmental knowledge *orally*: they anchor their stories to past events (such as the aforementioned historical incidents) and contextually alter them for various means and ends. These shared narratives and dialogues take unique and ephemeral forms that are difficult to inscribe, especially since *written* accounts indicate a sense of ownership (Goldman 2011:97-99). These contextually-bound stories continue to influence contemporary life. While Indigenous knowledge is now often included in public debates, hegemonic Western systems of thought universalise, decontextualise, and objectify this

local knowledge into pieces that researchers study or appropriate. For example, many projects study and extract Indigenous medicinal plants in the pursuit of profits, yet *all* forms of knowledge can only make sense within their source social arrangements and in processual practice, rather than in some sort of objectified and decontextualised configuration (Cruikshank 1998:45-70).

As a novice social and cultural anthropologist, I was interested in all aspects of life in and around the Gorge. However, inspired by my botanical collecting contributions to SDS, I also sought to comprehensively document and explore the multi-purpose plants that the Maasai used. A human ecological approach highlights productive and *adaptive* relationships between groups of humans and their surrounding environment, and cultural ecologists advocate for culture to be conceptualised as a key component of the environment (Greenberg and Park 1994:4-5). In line with these approaches, engaging in ethnobotany – the study of human-plant relationships and associated ecological knowledge – permits theorising into holistic human-environment connections (Martin 2004:xx-xxi). Thus, studying the Maasai's plant-centered ethnomedical system proved to be a lens into life in the region. I found two salient issues impacting on the Maasai's uses and perceptions of their medically active (Chapman et al. 1997; Johns et al. 2000) botanical resources *and* their lives in Oldupai Gorge: an intensifying drought and a long-standing division between the Maasai and palaeoanthropological researchers.

Exacerbating the loss of dry-season water caches, the Maasai faced a multi-year drought. Among many issues, the Maasai needed water to transform raw plants into medicinal soups and concoctions, and participants told me that many species were disappearing due to drought. The local Maasai explained that the drought was an

extended dry season, and incidentally, palaeoanthropological researchers usually orchestrate their studies in Oldupai during this arid period. Many Maasai participants expressed offense over the excavation of ancestral bones, concern over destruction of sacred medicinal plants at dig sites, and confusion about the motives of foreign teams who do not share the tangible benefits and scientific insight that accrues from research. Thus, I became aware of a second issue: a lack of communication and collaboration between the Maasai and palaeoanthropologists.

Masco (2006) uses insights from anthropological fieldwork in the laboratories and testing grounds where scientists have developed, tested, and maintained the American nuclear arsenal to explore the implications of government-backed scientific appropriation of land. Especially for members of Indigenous communities who once occupied a landscape now contaminated with radiation, the American nuclear project has lasting biological and social impacts. Drawing from Masco's (2006) eloquent ethnography and my pilot season of fieldwork with the Maasai, I decided to engage in a comparison of the Oldupai Maasai and the palaeoanthropologists who produce knowledge in Maasai homeland, continuing a line of dialogue that began with Latour and Woolgar's (1986) foundational ethnography of knowledge production in a scientific laboratory.

2.1.2 Palaeoanthropology and Oldupai Gorge

Latour and Woolgar (1986:43-88) note that scientific researchers highly value and persistently produce written documents – which the authors deem *inscriptions* – and reveal that groups of scientists also boast unique cultural beliefs, productive activities, and mythologies; all of which determine the substance of texts and burgeoning theoretical ideas. Despite a preference for inscriptions, scientists also relay powerful and influential

narratives that are not unlike oral traditions (Moreira 2000), such as tales regarding the near-mythological and heroic great thinkers of the past that lecturers deliver to undergraduate students (Traweek 1988:74-94). Narratives of Western scientists coming to know Africa can serve to silence and delegitimise African voices and narratives of the world (Goldman 2011:95-98).

Leakey (1978:151) writes that Wilhelm Kattwinkel, a German butterfly enthusiast, stumbled across the Gorge's scientific treasures in 1911. Nonetheless, tales of Oldupai's "discovery" often feature a common narrative that spotlights the Leakey family as Oldupai's pioneering palaeoanthropologists. For example, Clark (2001) recounts that upon Louis Leakey's insistence that the origins of humanity would be discovered in East Africa, Mary Leakey's 1959 unearthing of the famed *Zinjanthropus boisei* skull and her subsequent systematic excavations established Oldupai as the flagship locality for palaeoanthropological research and captured the imagination of the non-scientific world. Unlike most narratives (Mehari and Ryano 2016:57), Clark's (2001) detailed hagiography mentions how Mary Leakey navigated the demanding realities of working in an extremely remote locality beset with political contestations, along with how she managed a sizeable team of assistants. Now, Oldupai's celebrated stratigraphy is said to showcase an extremely thorough record of humanity's emergence that remains unmatched, and the Leakeys are the world's most well-known palaeoanthropologists.

When scientists reminisce and construct recollections of instantaneous epiphanies and purely logical reasoning, they efface the highly contextual histories of their scientific breakthroughs (Latour and Woolgar 1986:154-174). Examining the historical *Pasteurization of France*, Latour (1993a) presents the near-mythical story of Louis

Pasteur's calculated and swift victory over microbes – an achievement that changed the course of history and the fabric of society in myriad ways – yet suggests that science does not actually proceed in an ordered and planned manner: while most hope for science that is free of political battling, scientists constantly enlist numerous allies in their cause. The complex and increasingly influential alliances and forces that Pasteur assembled are an example of what Latour (1993a:41-58) declares a primary scientific mechanism, while a second scientific mechanism mysteriously assigns all responsibility to a single actor.

Highlighting that Mary Leakey's near-mythical 1959 discovery has inspired countless researchers to flock to the "hallowed ground" of Oldupai, Dalton (2007:12) outlines contemporary battles between the leaders of two groups of palaeoanthropologists in the Gorge and their struggles to conduct research and produce inscriptions. As an academic discipline, palaeoanthropology is a livelihood in which researchers constantly engage in a cycle of securing funding, conducting research, and generating the academic currency that provides credentials and elicits further funding: publications (Finlay 2014:145-181; Latour and Woolgar 1986:187-230; Rabinow 1996:19-31).

Palaeoanthropological discoveries, and the debate they stir up, can capture the public's attention. A piece published in *The New Yorker* describes Lee Berger's highly publicised discovery of a cache of hominin fossils in a South African cave and Berger's proclamations that the bones represent an undiscovered species in the genus *Homo* that was burying its dead long before modern humans: *Homo naledi*. While critics and rival palaeoanthropologists disparage Berger for what they see as fame-seeking, unscientific, careless, and hasty drives to hypothetical conclusions and to publish in influential

academic journals, Berger's deft storytelling has aroused significant public attention and support for his findings and postulations (Williams 2016).

Palaeoanthropology is an interdisciplinary vocation, and its practitioners seek and analyse the fossilised bones of humanity's ancestors – extinct hominins – and the stone tools that our ancestors manufactured. Using multiple methods and theories from diverse disciplines, palaeoanthropologists also reconstruct the environmental contexts and changes in climates that surrounded and acted as selective forces on hominins, which allows researchers to make inferences into hominin diet, sociality, and life history. Nonetheless, partly due to the scant fossil record of hominin remains, many palaeoanthropological debates rage (Keenleyside and Lazenby 2011:189-193). Among a variety of complementary approaches, one method of reconstructing environments and hominin diets is through the analysis of preserved residues that adhere to a stone tool long after its original use. However, modern contaminants often interfere with identifying ancient residues (Crowther et al. 2014; Mercader et al. 2017), just one of many controversies pertaining to the debate-filled field of lithic residue analysis (Monnier et al. 2012; Monnier et al. 2017; Wadley and Lombard 2007). Researchers also reconstruct ancient environments by investigating preserved plant material called *phytoliths* (Gallagher et al. 2015:1-2; Zhang et al. 2011) and degradation-resistant organic compounds known as *biomarkers* (Eglinton and Eglinton 2008), both of which can be found within the surrounding sediments that were contemporaneous to discarded stone tools, the latter subsequently being slowly buried over long stretches of time in places such as Oldupai Gorge.

In the only ethnographic study conducted in Oldupai to date, Mehari and Ryano (2016:48-66) investigate Maasai *perceptions* of palaeoanthropological research in order to begin addressing the discipline's colonial vestiges: excluding and ignoring the voices of those who inhabit spaces surrounding dig sites. Salient historical issues include the well-established practice, beginning with the famed Leakeys, of researchers hiring non-Maasai labourers and assistants from distant regions; palaeoanthropologists renaming the landscape; contestations over damage to archaeological sites; the Leakeys' poorly-implemented dam projects; and the Maasai's lack of access to water tanks stationed in research camps. Mehari and Ryano's (2016:66-82) ethnographic research reveals that the Oldupai Maasai were either unsure why scientists seek bones and stone tools or felt that palaeoanthropologists acquire wealth by doing so, wealth that never reaches Maasai communities; and that the Maasai expected palaeoanthropologists to employ and assist them as people, rather than focusing purely on archaeology. The Maasai also stated that they wish to be equal partners in knowledge production; that research should benefit the development of their communities, especially in regards to water and education; and a desire to learn palaeoanthropological techniques.

This focus on perspectives is an *epistemological* approach that assumes a singular reality to be known (Goldman et al. 2016:27-28), and epistemology "is *how we know*" (Tennis 2008:103). Knorr Cetina (2007) reveals that while production of knowledge was regarded in the past as a unified undertaking, studies conducted in knowledge-producing localities have yielded the concept of *epistemic cultures*. These cultures are the historically-constituted *practices*, organisations, and processes that comprise "how we know what we know" in an academic discipline (Knorr Cetina 2007:363). *Ontology*, on

the other hand, questions “the nature of reality” (Goertz and Mahoney 2012:207) and is the “branch of metaphysics that concerns itself with what exists” (Blackburn 2008:260). Describing Knorr Cetina’s work, Brosnan (2016:175) explains that people conceptualise and glean insight from specific ontological entities when they harness their means of knowing the world. Epistemology and ontology are thus intimately intertwined in myriad ways. To complement a perspectival/epistemological approach, I am using *actor-network-theory*, which highlights how reality/ontology emerges from various forms of *practice* (Goldman et al. 2016:28). Through practice, reality – and the knowledge tied to it – can become multiple (Goldman et al. 2016:28-32).

2.2 Theoretical Framework for the 2016 Field Season: Actor-Network-Theory

During my time in Oldupai, I immersed myself in the distinct, yet sometimes inverse and parallel, day-to-day activities of palaeoanthropologists and the Maasai. However, the Maasai explicitly stated that they desired to be informed why scientists excavate in the Gorge, and to join research groups in their excavations. Similarly, SDS – a seven-year partnership between palaeoanthropologists, geologists, biologists, environmental specialists, and social scientists from institutions in multiple nations – seeks to end the exclusionary practices that have transpired in Oldupai Gorge for over a century by actively communicating and collaborating with locals.

Emerging from the field of science and technology studies, actor-network-theory (ANT) is a useful theoretical framework for examining these actual and coveted processes of group formation (Finlay 2014; Smart and Smart 2017:37). ANT allows an ethnographer to trace transient networks of associations between heterogeneous entities such as humans, nonhumans, ideas, objects, facts, and abilities. In an ANT framework,

influential spokespeople often forge these linkages and thereby inventively compose groups and discredit others, usually to facilitate action. Some of these associations gain potency and prompt others to act. If the association/actor-network consistently resists *disassociation*, then it manifests as a singular entity in other associations, a process that builds the composition of reality (Latour 1993a:158-236; Latour 2005:1-52, 141-156; Smart and Smart 2017:37).

For example, Latour (1993a:13-152) documents how Louis Pasteur assembled diverse entities – such as an emerging social movement, theories regarding spontaneous variations in disease contagion, and numerous practical laboratory techniques – to produce the notion of an invisible microbe, and as a new entity, the microbe then entered other associations and became a potentially corrupting agent to *all* members of the suddenly transforming and reconstituted social order. In ANT, *all* types of entities within an association/actor-network are deemed *actants*, and ANT uniquely grants nonhuman actants agency, meaning that the actant's properties can resist human intentions and can influence outcomes of associative events and debates (Smart and Smart 2017:29-65).

2.2.1 How We Know: The Practicalities of Epistemology and Science in Action

In a watershed text in science and technology studies and in the development ANT, Latour (1987:1-93) writes that analysts of science must investigate the oft-forgotten realm of *Science in Action*: the messy debates that precede the establishment of orderly taken-for-granted facts and technologies, both of which Latour (1987:1-4) designates as types of *black boxes*. For scientists, the contextual controversies and complex ideas that produced a black box are oftentimes circumstantially irrelevant. In a particular manifestation of the aforementioned process of ANT association, scientists

engage with new and unsettled scientific controversies by associating their novel data with numerous black boxed facts and black boxed technical artefacts. Out of these associations, a process that scientists deem *logical*, fresh debate-settling factual and technological black boxes can emerge that scientists are then able to mobilise into new debates. Whether a proposed fact or new artefact becomes a black box depends on its treatment by scientists. For example, other researchers can attach positive modalities to new ideas when they write their own argumentative research papers, thereby unquestionably treating these proposed facts as black boxes. Such modalities blind readers of scientific research papers to the context and controversy of the original statement's generation. Conversely, negative modalities discredit statements by instead highlighting problematic conditions that surrounded the statement's generation, which can reopen former black boxes and rekindle a previously settled debate.

Based on ethnographic fieldwork in particle physics laboratories in the United States and Japan, Traweek (1988) reveals how a variety of groups of predominantly male researchers abided by idiosyncratic cultural norms, shared certain worldviews, navigated budgetary road blocks, competed with other groups for recognition, taught and guided students, and had to struggle for access to massive accelerators that would fire particles into each groups' unique *detectors* that researchers would interpret in order to reveal the fundamental composition of the world. Traweek (1988:49-73) argues that detectors were a physical manifestation of a group's unique research strategies, yet they were not black boxes that were previously developed in other fields. Instead, detectors were tools, consisting of various other black boxes, that were actively constructed and altered by physicists for each experiment. Once a detector became extremely reliable in this realm,

high energy physicists regarded them as outdated and finally suitable for mass manufacture: they became black boxes. Ultimately, these contemporary realities of conducting laboratory work were in tension with the physicists' goal of understanding "unchanging" truths.

Similarly, Latour and Woolgar (1986:105-179) discuss how scientists regarded a particular association of actants – an association between various laboratory technologies, ideas, and results – to finally settle a long debate over Thyrotropin Releasing Factor's (TRF) chemical composition. These scientists thereby ontologically cemented TRF *as* a specific array of amino acids and as a taken-for-granted tool within other disciplines and networks, despite that TRF might *not* actually be the array of amino acids that scientists *agreed* it to be.

Investigating conventional accounts that portray science as an orderly affair, Latour (1987:93-214) posits that many perceive an eventual scientific comprehension of an always-existing objective nature to be the *reason* why controversies settle. However, nature is a *consequence* of a settled scientific debate. Society is also a product of abated debates; as there exist no discrete distinctions between science, technology, and society; but rather *associations* of varying strength between these realms. Thus, in order to expand a laboratory and its influence, scientists must tactfully secure resources – other actants – in the heterogeneous world *outside* of the laboratory. The multifaceted and expensive scientific "proof race" is not in everyone's reach, and thus takes place within a powerful *network* of influential and dispersed hotspots. While "hard" fact building within scientific networks usually does not conflict with other localised "soft" claims, the former extends its network by displacing the latter when disputes erupt. Since scientists have to

travel beyond the laboratory to acquire resources, any accusations of irrationality or cognitive differences across a “great divide” must be studied as a consequence of the scientist’s displacement from their *own* culture.

“Cycles of accumulation” seem to widen such a great divide: scientists collect and mobilise *inscribed traces* of distant worlds and knowledge, which they then centrally accumulate, compare, and combine into “universal” knowledge. Scientists use resulting familiarity of distant phenomena in subsequent scientific voyages, which steadily produces scientific dominance. Researchers, acting *within* their own localised network-specific culture, extract traces out of moments in time and space, and thereafter construct space-time within laboratories by combining diverse masses of traces into inscriptions – research papers – that are said to represent reality. While abstract theories within “centres of calculation” facilitate and accelerate the mobility of multifarious traces through networks, scientists do not possess unique cognitive attributes. Thinking abstractly is really just examining and combining diverse (re)representations of the world. Such abstractions and their associated machines are not actually universally applicable, as their predictive power only applies to the controlled world contained within expanding and extended scientific networks (Latour 1987:215-254).

In *enkiguenas*, meetings in which the Maasai settle debates, *all* participants are permitted to unconditionally express their own takes on issues. The meeting is only complete when its diverse participants enact a consensus through a stitching of positioned knowledges. While all knowledge is contextual, the *built* and *negotiated* consensus – or truth – that emerges from enkiguenas recognises multiplicity and dissent, unlike the

establishment of scientific truths in which negotiation is effaced and truth is made to appear universal (Goldman 2011:101-104).

2.2.2 *What We Know: The Practicalities of Ontology and Enactment*

ANT emerged from science and technology studies, and facilitates understanding how scientists build facts and nature, yet it is applicable to diverse realms (Latour 1993a:158-236; Latour 2005:87-120). In a landmark and ANT-aligned ethnographic study of disease, Mol (2002:1-48) introduces the concept of *enactment*. Describing the “praxiographies” of two departments within the same Dutch hospital, Mol (2002:1-51) illustrates how diverse practices *enact* multiple objects that may share the same name, which subsequently proliferates reality and ontologies. In the outpatient clinic, doctors temporarily enact atherosclerosis through diagnostic interviews and physical examinations with patients; while in the pathology ward, the same disease is “done” through dissection and microscopy of tissue. Rather than being two subjective *perspectives* on the same objective disease within the body, these exclusive *practices* give rise to different entities that are both called atherosclerosis. Since there are many variations in the way this disease is enacted, even within outpatient clinics, there are nearly limitless multiplicities of reality.

Mol (2002:44-164) explains how various modes of coordination unite the multiple versions of atherosclerosis enacted in a hospital setting. When diagnoses coincide, they can enact an atherosclerosis in partnership, yet when techniques diverge in their diagnoses, the single object can be maintained by finding faults *in* one of these methods. Moreover, rather than abandoning the incongruent results of a diagnostic technique, physicians can compile the different versions of atherosclerosis that emerge, producing a

composite disease. On the other hand, potentially conflicting enactments of atherosclerosis can simultaneously exist by remaining isolated within their respective sites of diagnosis. These *distributions* of reality permit patient-specific treatments, and the word “atherosclerosis” helps to coordinate communication between these place-specific enactments, preventing complete fragmentation. Entities (which in ANT terminology are actants) such as knives, patient records, and corpses all play key roles in the myriad practical enactments of disease, ailments that then become new entities (actants). Methods of diagnosis may come to the forefront if doubts linger, yet such practices can be forgotten if others attribute facticity to the enacted disease (a process comparable to the establishment of a taken-for-granted black box) and treatment follows. Assorted types of medical professionals then bring the enacted disease into new practical associations: treatment(s) in surgery wards that *counteract* the malady (Latour 1987; Mol 2002:44-164).

In an application of Mol’s (2002) enactment concept, Goldman et al. (2016) eschew the epistemological/perspective-based approach, which would assume that there is a lone reality that members of different groups gaze upon and that scientists have unclouded and exclusive access to it (Goldman et al. 2016; Latour 1993b:96-112). Since such a strategy could problematically entail compartmentalising and appropriating the facets of contextual Maasai knowledge that align with scientific visions of a singular climate reality, Goldman et al. (2016) examine how Maasai and scientific *practices* enact what drought ontologically *is* for each group. Paradoxically, climate scientists claimed that a 2010 drought produced the lowest recorded rainfall in recent years, while the

Maasai in Tanzania stated that no drought occurred that year. Conversely, the Maasai proclaimed that a 2009 drought was worst in recent memory.

Judging the conditions of entities (actants) such as forage, water, cattle, and cash within their own actor-network during the dry season of 2009, Kenyan Maasai enacted drought and moved their livestock to Tanzania in search of resources. This practice then created multi-faceted conditions of scarcity within Maasai actor-networks in Tanzania and played into the Tanzanian Maasai's unique enactment of drought, in which they too sought new pastures and had to sell their cattle. These Maasai did not consider the 2010 event a drought, as the 2009 season had decimated herd totals, precluding the need to enact drought and move livestock. Concurrently, climate scientists enacted drought primarily by measuring rainfall. Unfortunately, when enactments are incongruous, affected Maasai who are not within official relief zones can be denied aid. Goldman et al.'s (2016) focus on ontology provides equal legitimacy to non-Western *methods* of knowing, which helps to bring balance to unquestioned ontological hierarchies in which policy makers base their decisions on the assumed supremacy of scientific models.

In Goldman et al.'s (2016) research, the Maasai navigated political-economic forces such as nation-state borders that were established during the colonial period, along with the implications of top-down decisions. Congruent with ANT's dissolution of binary distinctions between "nature" and "society" (Latour 1993b), a *political ecological* perspective expands a human ecological approach by holistically conceiving of the environment as simultaneously natural, cultural, and political; and incorporates insights from the production-focused school of *political economy* that examines relationships between production and power (Greenberg and Park 1994:8). However, with an ANT

framework, there are no ever-present and immutable forces or social contexts. Rather, the “social” and “society” are the temporary *associations* between nearly endless varieties of actants that analysts must trace. Much like how scientific associations produce “nature”, these associations *also* create “society” and its corresponding political-economic forces. Nonetheless, if the analyst *recognises* that influential spokespersons create stability by constantly assembling groupings of actants into influential entities/actants, such as salient political-economic forces, then the analyst can explicitly refer to these larger actants. This shorthand nullifies the need to repeatedly describe the contents of assembled forces (Latour 2005:1-93). Thus, I am working theories regarding political-economic forces into my ANT analysis of life in Oldupai Gorge and the various ecological adaptations to its aridity exhibited by the Maasai and researchers.

In a Marxist political-economic examination of the construction of “wilderness”, Cronon (1995) writes that nature has never been fully pristine and uninhabited. Rather, people have culturally transformed “wilderness” from a place of fear into a sacred realm to be preserved and a place to escape the distresses of civilisation. However, these protected spaces are playgrounds for the elite, who remove the people actually subsisting off of these *seemingly* pristine lands. Cronon (1995) argues that there is no such thing as uninhabited space, as humans have always utilised the environment; and that we must learn to sustainably and respectfully engage with a nature that is *always* all around us.

Capitalism and neoliberalism have diffused globally (Blim 2000:27-31; Crewe and Axelby 2013:89-90, 159), and the creation and maintenance of protected spaces and national parks in Tanzania is related to these circumstances. Tourists come from around the world to experience places such as the Serengeti, an ecosystem where the Maasai

protect native animals and have formed the landscape via their pastoral practices. In 2007, revenue from tourism in the region amounted to a \$1.6 billion influx to Tanzania's economy (Nelson 2012). Hodgson (2011:64-75) reveals that prior to Tanzania's independence in 1961, the Colonial Government did not initiate significant development in the rural lands where the Maasai live. In the post-colonial period, the International Monetary Fund and the World Bank's promotion of neoliberalism resulted in reductions in healthcare and education spending and the transformation of rangelands so they could support economic practices perceived as more "modern" and productive than pastoralism (Hodgson 2011:64-75). Like the Maasai, palaeoanthropologists also have to negotiate capitalism and neoliberalism, but primarily in their home institutions. Due to decreases in public post-secondary funding, university researchers must engage in competitive struggles for external grants in order to support their research goals (Ylijoki 2003:307-310).

Palaeoanthropology is a type of archaeology. Abu El-Haj (2001:1-20) writes that all archaeologists share the practice of excavating, and in doing so, selectively remove and thereby *produce* specific kinds of evidence that they can use to materially reveal conceptions of the past. In materially and symbolically (re)making place, Israeli archaeology legitimised occupation of a new homeland in the 20th Century by rendering an ancient presence visible and effacing other existences in the same physical landscape. Thus, archaeological practice can make possible, stabilise, extend, and naturalise political discourse, interests, and truths. For example, Costopoulos (2018) posits that palaeoanthropology retains outmoded models of biological determinism in which humans are placed in a ranking according to limits set by their inherited biological makeup, while

Staniforth (2009) reveals how the post-independence Tanzanian state has utilised the famous and iconic *Zinjanthropus boisei* skull unearthed at Oldupai Gorge to strengthen nationalistic sentiments across the country. Abu El-Haj (2001:20-21) differentiates her theoretical framework from those derived from studies of “universal” natural science by noting that archaeological practice, as a science situated in the *field*, always occurs in specific temporal and spatial landscapes. Archaeology can never be removed from the social, political, and institutional contexts in which it exists and reconstitutes, and other groups often make claims to the landscape and the traces that influential archaeologists seek.

Looking further back, colonial-era archaeology supplanted local populations by appropriating cultural heritage and projecting images of backwardness on Indigenous societies. Echoing these past colonial practices, contemporary archaeological research in Africa is still largely carried out by foreign teams who displace Africans from their own countries’ archaeological heritage. For the most part, researchers have failed to inspire and attract African scholars to the discipline, and have neglected to meaningfully engage local communities (Killick 2015:245-247; Murimbika and Moyo 2010:87-100; Ndlovu 2009; Pikirayi 2015:531-536; Segobye 2005: 81-82; Shepherd 2002:205; Trigger 1984:358-368; Wadley 2014:209; Willoughby 1991:74-84).

2.2.3 Collaboration: The Practicalities of Translation and Working with Others

Within an ANT framework, influential spokespeople promote action by enlisting actants into their actor-networks (Latour 1993a:192-211; Smart and Smart 2017:37). For these leaders to enrol actants – deemed *allies* during the enrolment process, allies that can include nonhuman conceptual and technological resources – the spokesperson must

translate the interests of others in such a way that the allies consent to furthering the leader's goals. Once a spokesperson's initially-disputable proposition – such as those developed by scientists – becomes a black box, and all other parties must approach the spokesperson in order to harness their essential products or ideas (further sealing such black boxes), the leader becomes *indispensable* and no longer needs to concentrate on translating others' interests (Latour 1987:63-132).

Callon (1986) breaks down this progression and explains that there are four moments of translation in which leaders define and delimit the identities and interactions of other actants. The first is *problematization*, where select actants attempt to establish themselves as new *obligatory points of passage* by enlisting heterogeneous actants – including theories, scientists, non-scientists, animals, and objects – in a newly constructed network of associations. The enlister defines the interests of these allies in such a way that the enlisted actants can only achieve their new goals if they advance the enlister's vision. The second stage is *interessement*, in which these spokespeople put the theoretical definitions of the first phase through “trials of strength” that serve to cement allies. Enlisted actants either resist in furthering the leader's goals, or they submit and permit previous associations to be severed and agree to have their identities redefined. The third stage, *enrolment*, entails the negotiation and definition of each actant's role within the association. Oftentimes achieved via various concessions, enrolment prevents actants from forming alliances with others outside of the new associative network. In the final *mobilization of allies*, a small quantity of actants, in their emergent relationship with the prime enlister, become representative of a larger mass. The enlister then comes to

represent each of the enlisted groups, resulting in a solidified network. However, when a controversy over representation erupts, the enlisted actants/allies may dissent.

Strauss (1978:119-122) explains that individuals are members of various *social worlds*, which feature organised groupings of people who partake in shared activities, specific locations where such action occurs, and technologies that contribute in some way to making activities possible. Addressing the dually cooperative and heterogeneous characteristics of science, Star and Griesemer (1989:387-391) write that the requirement to produce sound information usable by different groups can come into tension with the differing outlooks of such groups who inhabit divergent social worlds. Requiring communication to produce knowledge when engaged in collaborative work, scientists must negotiate semiotic discrepancies. The authors expand Callon's (1986) notion of translation to develop an ecological model capable of incorporating the diverse interests of members of multiple social worlds, along with many obligatory points of passage. Each of the translators concurrently convert each other's interests, yet must also permit the interests of the others to remain, or risk losing key allies. Star and Griesemer (1989:391-412) thus propound *boundary objects*: entities that emerge *during* collaboration and assist translation by existing within numerous and overlapping social worlds, yet are used by each group for their own ends. Boundary objects are fluid, as they emanate alternative meanings each time a group uses them in a context-specific arrangement; and robust, since they are simultaneously identifiable across social boundaries and in cooperative situations.

Fujimura (1992:168-176) posits that the ambiguousness and mobility of boundary objects, while facilitating the coordination of practices between researchers in different

social worlds, can result in scientists producing incongruent scientific claims. Thus, Fujimura (1992:168-192) expounds a concept that amalgamates Star and Griesemer's (1989) boundary objects with Latour's (1987) process of scientific fact stabilisation. Examining the strategies of two researchers who were able to translate the interests of other groups and thereby strengthen their emergent construction of oncogene cancer theory, yet also promote mutually beneficial interest translation between each group involved, Fujimura (1992:176-192) explains that the standardized package that facilitated this collective work consisted not *only* of a theory. Featuring multiple boundary objects, *standardized packages* attach an abstract and emerging scientific theory – a theory that can be co-developed and pursued by researchers in different social worlds – to standardised methods and technologies. These novel theory-method combinations dictate the practices of collaborators and ensure continuity among social worlds by acting as interfaces that transmit multifarious resources, such as shareable data.

Saj et al. (2006) present a standardized package that anchored the social worlds that intersected and overlapped at a Ghanaian monkey sanctuary, where a shared notion of primate guardianship that was tied to a set of specific methodological practices still permitted scientists to pursue their interest of using social institutions to protect and isolate nature while simultaneously allowing local villagers to pursue their respective interest of harnessing the natural realm to safeguard the social order; while Finlay (2014) uses ANT to investigate the negotiation of a particular *association*: a multi-disciplinary and geographically dispersed health research partnership in which collaborators navigated the divergent expectations and practices of the numerous researchers, research users, and funders involved. Likewise, members of the SDS partnership seek to establish

another new *association* in Oldupai: collaboration with the local – and often disparaged – Maasai. Latour (1993a:208-217) stresses that what is deemed “pure science” is just one of many networks of associations, controlled by a small number of human actants engaged in particular practices, yet that scientists often state that they practice a unique brand of pure reasoning. However, Latour (1993a:208-217) pleads that sustaining the idea that “modernity” is unique in any way only provides further *potency* to the powerful, and writes that we are *all* politicians, creatively enrolling allies and co-constituting the world through patchwork associations.

Despite the benefits that Maasai pastoralism delivers to Tanzania’s famed ecosystems and the nation’s tourism industry, a widespread perception that pastoralism inherently involves ignorant overgrazing led to the initial eviction of the Maasai from protected spaces, and this inaccurate notion still informs some policy decisions (Nelson 2012). Various parties have appropriated pastoralist pastures that *appear* unused, and have continually attempted to coerce the Maasai into activities that are regarded as more productive than pastoralism. These incitements have been coupled with messages that deprecate pastoralism as obsolete. In lucrative tourist memorabilia, the Maasai are portrayed as archaic icons of East Africa, and these representations conceal that historical events have produced the issues that the Maasai face (Hodgson 2011:64-70). Galaty (2002) writes that these iconic images both embody and promulgate rigid assumptions of Maasai identities and destinies, including that the Maasai are incapable of “modernising” and will be crushed by a wave of civilisation, and that their livelihoods damage the environment. Galaty (2002) posits that some policy makers regulate the Maasai based on

these two stereotypes, and consequently, actual Maasai perspectives and concerns remain unheeded.

Many writers, artists, and promoters portray Maasai pastoralists as people who are timeless and archaic, a depiction that verges on painting the Maasai as *premodern*. Latour (1993b:13-48) proclaims that humans have never been “modern”. *Every* arm of humanity constructs hybrid entities and networks of associations that consist of both “natural” and “social” actants. It is only the people of so-called “modern” societies that definitively seek to purify the world into strictly natural and social realms, a practice that hides and denies their own construction of hybrid networks. A great example of such a “modern” hybrid is the hole in the ozone layer that is at once scientific, political, global, local, economic, and natural (Latour 1993b:1-12). Latour (1993b:35-112) explains that modernity has given rise to two groundless “Great Divides” between the “West” and the rest: an internal divide in which moderns – in particular, post-Enlightenment scientists — separate true nature from social factors, and an external divide that conglomerates “premoderns” based on their practice of archaically blending elements. Writing that we must focus on our similarities, Latour (1993b:90-144) espouses that practicing *symmetrical anthropology* permits making comparisons between all of the world’s networked associations, and calls for a truly democratic arena for diverse interests and representatives to openly converge and formulate a better future. While many people tautologically grant authority to “scientific” knowledge, and assume that scientists have privileged access to “nature”, Latour (1993a:230-236; 1993b:13-112) pleads that we stop unjustly stratifying knowledges: we *all* “know” by building various heterogeneous – yet

irrefutable – associations between “social” and “natural” actants which are themselves simultaneously social *and* natural.

To annul the policy-informing representations and narratives of the Maasai as archaic and premodern, Galaty (2002:360-362) suggests presenting counter-narratives that recognise and normalise the Maasai as fellow humans with human needs and desires; acknowledge that the Maasai do oftentimes desire the fruits of “modernity”, yet have been excluded from them; and admit that like all of us, the Maasai are proud of their cultural practices and thus retain them. May and Ikayo (2007) write that the Maasai also creatively and instrumentally wear their iconic *illkarash* robes while seeking urban employment as night-watchmen, capitalising on common depictions of the Maasai as vicious warriors in order to purchase cattle and resume their increasingly-compromised rural pastoral lifeways.

Rosaldo (1980:1-28) asserts that ethnographers must take history into account. To an anthropologist with a short field season, societies can appear timeless and seem to feature rigid social structures that reappear across generations and constrain the activities of the people within them. Such researchers may assume that the societies they encounter are isolated, and soon to be doomed by an inevitable tide of civilisation. Nonetheless, anthropologists must begin to conceptualise the lives of the historically-constituted and creative “other” with as much acclaim as we do of our own *seemingly* more dynamic societies, as all societies are intimately tied to historical contingencies and events.

Writing that studies of science and technology explore how the “social” world and technoscientific production mutually influence and *coproduce* one another, TallBear (2013:1-17) illustrates how scientists and Native Americans each boast expertise in two

complex types of knowledge that are beginning to become intertwined. Instead of a mere facile look at Native (mis)perceptions of DNA research, the author “studies up” and shifts her ethnographic inquiry onto the scientists who examine DNA, which is an object that reshuffles Native American strategies for identity and resource claims in the wake of colonial dispossession. While many research projects superficially “collaborate” with Indigenous communities, TallBear (2013:17-19) forecasts that more respectful and collaborative practices are beginning to emerge in a scientific world characterised by increasingly diverse researchers, which may become common practice in the future.

Chapter 3: Methods

3.1 Data Collection

Guided by the direction of my ethnographic co-supervisor at the University of Calgary, Dr. Charles Mather, I returned to Oldupai in 2016 to collect data for this thesis. I conducted all research under the approval of our University's Conjoint Faculties Research Ethics Board and obtained all Tanzanian permits required to do so. To ensure privacy, I stored my notebooks in locked locations, acquired fully informed consent from all participants, and encouraged collaborators to anonymise their identities.

Initially facing a massive language barrier when I confronted my first task, which was documenting and exploring unheard Maasai perceptions and practices in Oldupai Gorge, I studied Mol's (1995) comprehensive guidebook and began intensive daily Maa language training. Upon arriving in Oldupai, I collaborated with Samson Koromo, a local Maasai man who assisted not only in translation issues. Samson also graciously provided countless hours of his own insight and clearly communicated my study's protocol and objectives to participants.

Extending amicable relationships established during my pilot study, I continued to collaborate with key informants. Mr. Koromo facilitated snowball sampling, which encouraged the involvement of any Maasai who desired to contribute. Research direction and involvement was primarily guided by community member interest and their takes on representativeness, not my own a priori assumptions of sampling authoritative representatives (Cohen 1984:223-225; Hammersley and Atkinson 2007:104-106).

Researchers and their collaborators may possess vastly different worldviews, and expect divergent outcomes of research (McIntosh 2004). To mend neocolonial practices,

TallBear (2013:13-15) recommends acknowledging “research assistants” with co-authorship and academic credit. While a significant portion of my research was mediated through Mr. Koromo, Samson and I regularly convened to discuss our research goals and progress, ensuring that Mr. Koromo was not merely a *translator* whose own personal motives could potentially serve to filter and misrepresent the views of the Oldupai Maasai. Samson was rather an active co-creator of this situated ethnographic knowledge.

In Maasai culture, an emphasis on family integrity that supersedes individuality produces a form of collective autonomy (Sharif and Bugo 2015:631-633). I thus gathered members of participating Maasai homesteads, which are organised by familial structures (McCabe et al. 2010:323-324), and utilised Buzinde et al.’s (2014:26) technique of using focus groups to learn how people in Maasai communities conceptualise life in Oldupai Gorge. In total, I facilitated 9 focus groups that featured both females and males; and Maasai participants from youth, warrior, and elder age-sets.

Semi-structured “reflexive” interviews, in which an outline of topics to be discussed partially directs a natural progression of dialogue, permitted individual interviewees to speak for themselves and facilitated my own exploration of emergent analytical ideas (Hammersley and Atkinson 2007:117-120). These one-on-one discussions produced insight into the topic at hand and the overall perspective of the interviewee (Hammersley and Atkinson 2007:97-99), and provided a more individual-based contrast to collective focus groups. I used interviews to discover how Oldupai experiences differed according to salient Maasai social categories, such as age-set and gender (Buzinde et al. 2014:26). I ensured to note whenever Samson was answering my questions, rather than the interviewee, instances that I later incorporated into my coding

schema. In all, I conducted 15 individual interviews, representing a wide range of local social categories: youth, warriors, elders, age-set leaders, prophets, women, mothers, and Maasai working with researchers.

I also engaged in participant observation in order to understand life in the Gorge more contextually than what interviews and focus groups allow (Camfield et al. 2009:11). Participant observation is a classic ethnographic practice of balancing participating in and observing a culture for a prolonged period of time in an attempt to understand the world from the point of view of its members, which can highlight nuances between what people *say* in interviews and what they *do* (Hammersley and Atkinson 2007:3, 85, 170-171). However, there are longstanding debates regarding the partiality of ethnographic accounts and the possibility of objectivity (Clifford 1986; Geertz 1973).

I thus followed DeWalt and DeWalt's (2011:160-170) suggestions by continually recording observations in "jot notes" that I inscribed in a portable pocket notebook, and by expanding such notes into highly detailed and sufficiently-objective field notes each and every night. I kept personal fieldwork reflections in a separate journal, producing nuanced data sources. It must be recognised, however, that analysis does not only begin upon returning home (DeWalt and DeWalt 2011:170), but in the field, as well. Therefore, I kept emergent analysis separate from descriptive observation by creating large margins in my notes, leaving spaces for analytic ideas to blossom (Ely et al. 1990:69-79).

Over the course of fieldwork, I realised that oral traditions were extremely important to my Maasai collaborators, and I began to pursue the implications of these narratives. Maasai livelihoods are enmeshed with seasonality, and while I conducted two seasons of research, these were confined to Oldupai's dry season. Acknowledging and

examining societal dynamism (such as the historical impact of a century of excavations) can seem unfeasible if one's field season is brief, yet by recognising that culturally-specific stories represent and shape visions of the past and future for those who tell them, anthropologists can systematically examine narratives to take a diachronic approach that many have deemed incongruent with short field seasons (Rosaldo 1980:1-21).

Finally, I partook in further ethnobotanical collection walks with the Maasai. This method was also the key bridge between my research and Dr. Mercader's, as it produced ethnographic and palaeoanthropological insight. However, as a social and cultural anthropologist, I was keen to understand both Maasai and palaeoanthropological culture in Oldupai. Adopting nuanced standpoints foregrounds the various trajectories of exclusion and advantage that have influenced knowledge production in the past, and brings to light the consequences that scientific research can have on marginalised communities (TallBear 2013:16-19). Thus, understanding Oldupai Gorge meant critically reflecting on the impact that palaeoanthropological inquiries, such as SDS's, have on the Maasai. While I did not require language translation for my second task, which was studying palaeoanthropology, I harnessed the methods that I employed with the Maasai in my effort to "study up" power gradients (TallBear 2013:12) and understand palaeoanthropological perceptions and practices in Oldupai Gorge. I engaged in participant observation at the research camp where researchers lodged, conducted experiments, and delivered nightly lectures to field school students. Furthermore, I joined numerous palaeoanthropological excavations, and recorded my observations and insights in the manner outlined above.

3.2 Data Analysis

Upon returning to Calgary, I possessed hand-written notebooks containing over 130 000 words obtained from focus groups, interviews, and participant observation; which I later digitally transcribed. Facing a potentially overwhelming array of inscribed observations, I had to construct an explanatory order (Latour and Woolgar 1986:18-37). Hammersley and Atkinson (2007:20-29, 158-168) explain that the theoretically-guided analysis of data assists in assembling unique and abstract theoretical models that provide an explanatory order to concrete social phenomena. Known as grounded theorizing, a continual interplay between data and theory is a hallmark of ethnographic inquiry. Since anthropological research usually entails developing theories, rather than testing them (Hammersley and Atkinson 2007:21), this thesis is extending the theoretical dialogue outlined in the previous chapter.

ANT is not just a theory; it is also a method. A network is a tool that an analyst uses for conceptualising unstable assemblages and associations. Instead of assuming the existence of preordained social contexts, analysts must trace associations between nearly endless varieties of actants, associations that can also gain strength and elicit others to act. A guiding principle is *empirical metaphysics*: heeding informants' justifications for their actions and those of others. Since connections are only observable when *new* associations are forged, analysts must record the groupings that actants establish during periods of controversial world-making. A researcher must not intervene when actants settle controversies about the world's constituents. Intervention can only come later, by presenting resulting texts to participants. Utilising a text as a laboratory, in which associations observed in the field are *re-traced* and *re-assembled*, produces objectivity. A

thorough description is thus an explanation of why things are (Latour 1993a:158-236; Latour 2005:1-27, 42-86, 121-164). Using ANT spotlights the social underpinnings of scientific research and how groups of Maasai and researchers do or do not collaboratively work with others who have interests in the same phenomena or resources.

In employing empirical metaphysics, I had to sort my informants' accounts of why they and others acted (Latour 2005:42-52). To code and analyse my notes, I utilised Ryan and Bernard's (2003) methodical, holistic, and interdisciplinary aggregation of techniques to identify expressions in texts that typify – and acquire meaning from – larger cultural themes. This type of thematic analysis perfectly complements an ANT approach, as Ryan and Bernard (2003) explain that themes catalyse action or influence the conduct of members of a culture. Data analysis can be guided by a priori theoretical constructs, a process also known as theoretical sensitivity (Ryan and Bernard 2003:88). I thus categorised my field notes by referring to expressions in my text that relate to ANT concepts such as inscriptions, boundary objects, standardized packages, enactment, actants, collaboration, and translation; narratives and oral traditions; and the political-economic factors that may influence subsistence and ecological adaptation. However, thematic analysis can also proceed by pure induction, in which an analyst examines her textual data to discover novel themes and coding schemata (Ryan and Bernard 2003).

When generating analytical concepts, it is absolutely crucial to be familiar with one's dataset. Coding data, along with illuminating insightful relationships within it, can only proceed if the ethnographer constantly re-reads her field notes (Hammersley and Atkinson 2007:158-163). While in the field, I repeatedly read my notebooks as a part of the grounded theory process, and my digital transcription upon returning home served as

another thorough re-reading. I progressively became more familiar with all of my data by continually re-examining and coding my field notes. While coding, I used the *constant comparative method*, which entails comparing the similarities and differences between data placed within preliminary categories, permitting the formation of more clearly defined analytical concepts and subcategories (Hammersley and Atkinson 2007:165-166). I triangulated the validity (Hammersley and Atkinson 2007:165; 183-185) of my account of perceptions and associative practices in Oldupai by coding and analysing my data through my own inductively-generated concepts, and through ANT, narrative, and ecology concepts and theories.

I began the coding process by implementing the ANT dictum to follow controversies and debates over new associations (Latour 2005:19-27), which in tandem with my literature review, allowed me to gain a broad understanding of the salient connections between the activities and groupings I observed in Oldupai. Based on this initial coding, I produced a rough outline of my ideas for this thesis, and wrote and defended a data analysis proposal. Receiving feedback from my committee, I reviewed additional literature, the ideas from which I incorporated into another re-reading and coding of my field notes. Using the “comment” feature in Microsoft Word, I continued to code my data. Whenever appropriate, I ensured to be symmetrical by developing parallel and comparable codes for each group in Oldupai Gorge. For example, I developed codes such as “PA Allies/BB” (referring to actants, allies, and black boxes harnessed by palaeoanthropologists) and “MA Allies/BB” (Maasai actants, allies, and black boxes), which facilitated comparisons between and within each group’s practices.

To begin the constant comparative process, I exported these comments using MS Word's *Microsoft Word XPS Document Writer* feature, resulting in a document that listed each code's date of entry and location in my notes. I transposed this information into Microsoft Excel and removed all redundancies, which revealed that I developed 71 code types: 32 PA codes and 39 MA. Next, I cut each chunk of my field notes that I coded in a specific way, such as "PA Allies/BB", into new word documents. Analysing these palaeoanthropological actants, I developed sub-categories, such as "PA Allies/BB – Camp Supplies" and "PA Allies/BB – Theories". I mapped connections to other categories that I developed, since actants do not exist in isolation: the Maasai and palaeoanthropologists mobilised and remobilised actants into numerous and interconnected actor-networks.

Anthropological symmetry applies not only to studying both Maasai and scientific actor-networks (Latour 1993b:90-96, 124-129). While I followed my collaborators' justifications for their actions and associations (Latour 2005:42-52), Callon (1986) expounds the need for *generalized symmetry*, which necessitates documenting all entities – conventionally designated natural or social – with a unified, researcher-developed descriptive vocabulary. For example, I refer to the various entities pertinent to Maasai and to palaeoanthropological actor-networks as actants, allies, and black boxes. However, Miettinen (1999:190-192) writes that a singular vocabulary effaces localised cultural vocabularies, and that these unique lexicons have a context-specific history and interact with other vocabularies when different speakers converse. Heeding these two recommendations, I oscillate between emic and etic analysis by examining the dynamics of my informants' unique verbal exchanges, yet also using ANT vocabulary. In doing so,

I strive to prevent the reification of any false distinctions between the Maasai and scientists or the natural and social world (Latour 1993b:96-112).

Ethnographic texts are themselves actants that may impact the lives of those studied. Analysts such as myself can thus become relevant by using ANT to delicately illuminate the current collective's limitations *and* the vast sea of potentialities, allowing the dynamic participants of this study, to whom I am eternally indebted, to compose a common world in which we can *all* comfortably live (Latour 2005:121-140, 247-262).

Destructive foreign-led research is widespread across Africa (Shepherd 2002). As it stands, the Maasai and researchers both subsist in the Gorge, yet simultaneously occupy different practical worlds. Knowledge translation between archaeologists and Indigenous communities can reduce site damage, enrich collaboration, and foster development; beneficial prospects for all involved (Murimbika and Moyo 2010:96-103). When pursuing scientific research that can impact on Indigenous communities, TallBear (2013:11-15) espouses that researchers have to listen to local aspirations and must produce research that can be an asset to the community, rather than research solely guided to producing publications and other academic assets. Along such lines, Canadian Inuit have collaborated with scientists, involving themselves with locally-guided scientific research that can provide immediate and elusive economic opportunities in a remote landscape (Cruikshank 1998:63-68).

Emphasising that Indigenous participation in research often disappears from records, Palmer (2016) uses ANT to explore a rare example of a sustainable collaborative effort in knowledge production between an Indigenous society and scientists. Unfortunately, the Maasai have throughout history been the *subjects* of scientific

research. By hypothetically adapting the structure of the Maasai's dispute-resolving and consensus-enacting enkiguena gatherings, Goldman (2011:104-114) weaves together various views and expertise that she documented during her fieldwork with the Maasai and other environmental specialists, ideas that she brings into active dialogue and places onto equal footing. In the pages that follow, I hope to lay the foundations for establishing an actual ongoing dialogue and interface between the Maasai and researchers in Oldupai Gorge by exploring *both* groups' sophisticated perspectives, practices, needs, and skills.

Chapter 4: Results

4.1 Epistemology

4.1.1 *Palaeoanthropological Science in Action*

Having earned a degree in the interdisciplinary field of social and cultural anthropology, I took a wide variety of courses during my undergraduate career, including multiple palaeoanthropology classes. Thus, I approached Oldupai Gorge with a broad understanding of the vocabulary and the various theories, methods, and conceptions of the deep past that palaeoanthropologists espouse. However, being *at* a “hallowed ground” (Dalton 2007:12) where palaeoanthropologists produce knowledge, I desired to observe for myself the process of science in action in which researchers crusade to abate long-standing palaeoanthropological debates, assemble new technological implements, and establish pristine facts about humanity’s shared past (Latour 1987:1-17).

Arriving at Oldupai for the season after a three-hour drive from the nearest town, Karatu, our team’s vehicle shook as our expert driver took it down one embankment of the Gorge. Upon reaching the desiccated river bed, our navigator guided the truck back up to the other side, taking a dusty path formed by the constant oscillation of 4x4 vehicles between the myriad archaeologically-rich sites around Oldupai. Winding through the barbed vegetation that is able to survive in this dry landscape, we reached the summit and parked at a research camp that was overlooking the Gorge, another research camp, and the mighty Serengeti in the distance. This remote home base, powered nightly by a gas-burning generator, was shared by other scientists conducting research at Oldupai. Here, scientists camped in cabins or in tents, ate meals at a communal dining shelter, conducted experiments in a field laboratory, and delivered nightly lectures to field school students.

During our time at the camp, Samson and I heard the *perspectives* of palaeoanthropologists towards Oldupai and the work that they were doing there, especially that the Gorge held the keys to unlocking and understanding the emergence of humanity. In order to strengthen ideas regarding ancient hominin behaviours, researchers emphasised that experimental and practical methodologies and controls had to be explicitly described to others, and many stated that it is beneficial to conduct interdisciplinary and collaborative research with scientists in complementary fields. Ultimately, reconstructing the past was on everybody's minds and took top priority. Nonetheless, I sought to go beyond an epistemological and perspective-centred approach, which assumes a singular reality upon which various groups gaze and which scientists have exclusive access to. Since such a tactic can unknowingly support the ontological hierarchies in which scientific conceptions of the world are afforded primary legitimacy, I went to palaeoanthropological dig sites to understand how *practice* enacts various *versions* of reality (Goldman et al. 2016; Latour 1993b:96-112; Mol 2002).

Jumping into a 4x4 vehicle with a crew of palaeoanthropologists and hired hands, I journeyed on multiple occasions to various dig sites around Oldupai Gorge to assist the SDS team in erecting a mobile clean laboratory that they had designed. We set up the laboratory over top of spots that scientists had selected based on theoretical models of the Oldupai landscape that predicted where traces of the past – stone tools, in particular – were buried. The pit, which was soon to be excavated underneath a large white tent, had to align with a plotting system previously established at the site. To begin construction, we arranged a metal frame around the excavation pit, affixed a bright white canvas cover using thick elastic bands, and installed a HEPA filtration system to the rear of the

laboratory. Due to the remote and undeveloped qualities of this rural Tanzanian landscape (Hodgson 2011:64-75), SDS had brought all three of these pieces of equipment with them from Canada, yet had acquired other components of the laboratory from the major Tanzanian urban centres of Dar es Salaam and Arusha. We installed Taiwanese air conditioner units – crucial for cooling the heat-absorbing tent and making excavations safe – and a Japanese generator that provided power to the air conditioning and filtration systems. With nails and rope, we set up a three metre by three metre excavation grid, and scraped away the top layer of earth. Next, we scrubbed every laboratory surface with caustic soda, and furnished a separate gowning area with disposable and sterilised scrubs, hair nets, face masks, gloves, and foot covers. Within this changing room, researchers would change out of the clothes that they had worn at camp. Finally, we tested the entire system by starting the generator and powering up the HEPA filtration system and air conditioners.

When the team was ready to begin digging, I took every opportunity to join in. Inside the mobile clean laboratory, one person would dig in each corner of the excavation pit, systematically removing the uppermost layer – known as a *spit* – of each partitioned and uniquely-numbered section – *square* – of the grid. The digger would use tools that another team member had recently swabbed with caustic soda, and place excavated dirt into buckets that had received the same treatment. Whenever someone dug a square to a specified depth, a fifth team member known as a *satellite* would haul the bucket of dirt, along with associated digging tools, to the door of the clean laboratory. At the same time, a sixth researcher placed sterilised tags, displaying a spit and square number, with each new bucket and set of tools that the satellite subsequently brought inside. Upon discovery

of a stone, this sixth person acquired a fresh set of gloves and placed the stone into a sterile sample bag, upon which the researcher recorded the stone's sequential number of discovery and its spatial position within the grid.

I also partook in the tasks that occurred outside of the laboratory, activities that made the interior work possible. One person, donned in safety equipment, brought the filled buckets over to one of two wooden-framed screens, known as *sieves*. Upon pouring the contents into a screen, this person cleaned the buckets and equipment with caustic soda, and brought them back to the laboratory's entrance. The sieve operators then pressed the dirt through the screens, recovering any small fragmentary pieces of stone or bone that had been scooped into buckets, and placing such pieces and their corresponding descriptive tags into bags. One sweltering morning, the generator made a strange noise and shut off, making continued excavation in the torrid laboratory unsafe. Thus, the entire production stopped, and researchers had to drive three hours to Karatu to seek repairs.

At first glance, this almost ritualistic obsession with clean tools might seem incomprehensible, and one might assume that conducting excavations under a large white tent is a product of reticent researchers striving for secrecy while also staying out of the scorching sun. However, SDS researchers were seeking to understand the emergence of humanity by elucidating connections between an ancient drought that transformed the African landscape from 1.8 to 1.3 million years ago, changes in the stone tool industries during this period, and the diets of the hominins who created and utilised such tools. To reconstruct ancient environmental conditions and dietary adaptations to them, researchers can combine interdependent strategies. One of SDS's approaches was analysing preserved plant and animal residues that stuck to stone tools after hominins had used

them for processing food. However, residue analysis is contentious (Monnier et al. 2012; Monnier et al. 2017; Wadley and Lombard 2007). One of many debates stems from the idea that modern contaminants, such as starches originating from breakfast at the research camp that adhere to clothing and thereafter settle on stone tools, can make identifying *ancient* residues impossible (Crowther et al. 2014; Mercader et al. 2017).

Latour's (1987:1-93) characterisation of *Science in Action* entails researchers associating together various black boxes while settling scientific debates and subsequently producing new taken-for-granted black boxes – facts and technologies – that researchers can mobilise in other controversies. This technique can be seen as a specific manifestation and a predecessor to ANT's conceptualisation of spokespeople forging irrefutable associations between heterogeneous actants, a process that ANT theorists have clarified over time (Latour 1993a:158-236; Latour 2005). While a groundbreaking approach, the laboratory was a grouping and *association* between established methodologies, technologies, and ideas; a combination designed to curb contaminant debates and become a customary method in residue research. Analogous to Traweek's (1988:49-73) particle physics detectors, the mobile clean laboratory featured multiple taken-for-granted black boxes (Latour 1987:1-17) that were all products of previously-settled scientific discussions. There were technological black boxes, such as the power generator, the air conditioners, the archaeological digging tools, the contaminant-free and sterile clothing and sample bags, and the positive pressure-blowing HEPA filtration system that worked in tandem with the canvas laboratory walls to keep wind-blown contaminants at bay. Other black boxes were factual: conceptions of standard excavation

procedures, models of the Oldupai Gorge landscape, residue analysis contamination theories, and the idea that caustic soda neutralises modern starch.

The entire laboratory was not *yet* itself a black box. One of its component black boxes – the generator – temporarily prevented the entire association of black boxes from working together in this remote landscape. In ANT vocabulary, this black box (or actant) had agency: its properties resisted researcher intentions and produced consequences (Smart and Smart 2017:29-65). For the laboratory to become a taken-for-granted and sealed black box instead of being constantly reopened, such contextual kinks had to be worked out and made irrelevant, which SDS successfully achieved by repairing the generator. Now, other researchers must embrace the mobile laboratory. To aid this process, SDS published a peer-reviewed article documenting that scientists must adhere to the principles and procedures observed in the laboratory if they would like to eliminate the possibility of residue contamination. The laboratory will become a technological black box if other scientists attach positive modalities to the statements in this paper, thereby settling some debates associated with residue analysis (Latour 1987:21-44; Mercader et al. 2017).

SDS researchers mobilised clean laboratory techniques and theories into a long-standing palaeoanthropological debate over hominin diets, combining them with other black boxes. These black boxes included explanations as to how residues can preserve over millennia, evolutionary theory, previous evidence for a primarily meat-based diet spurring human development, palaeoenvironment reconstructions, evidence for a long-term drought that transpired 1.8 to 1.3 million years ago, numerous laboratory techniques and technologies to identify residues, stone tool use-wear analysis, comparisons with

collections of contemporary vegetation, and procedures for controls such as the analysis of the sediments that surrounded unearthed stone tools. In a soon to be published manuscript that outlines the team's analysis of an Acheulean hand axe, SDS brought their new and novel data into association with these established black boxes and announced that they had found direct evidence of hominins processing plants that had previously remained elusive. In the paper, SDS researchers explained that the presence of fossilised plant matter indicated omnivorous diets and provided a clarification of how hominins altered the design of stone tools to address a changing environment. Once other researchers attach positive modalities to this paper's statements, debates will be forgotten and these proposed facts will become black boxed facts, available for mobilisation in other scientific debates (Latour 1987:1-93; Latour and Woolgar 1986:105-149).

Palaeoanthropological black boxes primarily *informed researchers about the past*. To understand these bygone times and substantiate new facts, SDS palaeoanthropologists were engaging in a cycle of accumulation: gathering traces of Oldupai, such as stones, ancient residues, and concomitant inscribed/textual data. By temporarily transporting these traces to a centre of calculation – a university – to be accumulated, compared, and *associated* into palaeoanthropological knowledge, SDS researchers developed a further familiarity of the spatially-distant Gorge and its temporally-distant deep past. This is a past that existed within research facilities, including the mobile laboratory, which was an extension of the immaculate laboratory conditions crafted in the Tropical Archaeology Laboratory at the University of Calgary (Latour 1987:215-254; Latour 1993a:84-93). For example, SDS researchers spent months methodically tracking, plotting, and photographing residues within the stationary clean laboratory in Calgary. These scientists

convened to collectively compare inscriptions, particularly their microscope images of residues. Discussing the theoretical implications of the residues, SDS devised strategies for writing sound publications and conducting other kinds of past-informing analysis.

The SDS partnership features a robust knowledge mobilisation component, which includes collaborating with Tanzanian museums and establishing mobile exhibits at Oldupai. These venues are a means to convey new facts and ideas to a more general audience, beyond strictly palaeoanthropological circles. Black boxes are further sealed when palaeoanthropologists display facts in an enduring form, and when more people – such as tourists and locals who may have divergent interests – acknowledge facts with positive modalities (Latour 1987:21-62, 132-140; Staniforth 2009). Furthermore, these displays can provide researchers with even more grant-enabling credentials (Finlay 2014:145-181; Latour and Woolgar 1986:187-230).

Despite the myriad *associations* that researchers forge in making their milestone contributions to science, hagiographers usually assign sole responsibility and credit to influential leaders such as Louis Pasteur and the Leakeys (Latour 1993a:41-58; Mehari and Ryano 2016:55-66). However, palaeoanthropologists often share publication co-authorship with *all* of the collaborators who contributed to a project. Thus, once other researchers adopt SDS's new discovery relating to hominin diets and the proposed fact becomes a black box, the credit-sharing nature of palaeoanthropological research means that the entire team will be remain visible.

At the same time, SDS researchers were becoming indispensable obligatory points of passage by progressively ensuring that other researchers – if they seek to conduct up-to-date and sound palaeoanthropological research – would have to embrace

SDS's new technological and factual black boxes: the mobile laboratory setup and emergent insight into hominin behaviour, respectively (Callon 1986; Latour 1987:68-132). To acquire allies, accredited and influential SDS researchers promulgated these black boxes to others. One such strategy, besides writing peer-reviewed publications, was giving academic talks – orally-conveyed research papers – at palaeoanthropological conferences. Another strategy was delivering multiple pre-dinner lectures, while still in Oldupai, to field school students at the research camp. The information that scientific spokespeople relayed to neophytes during these talks included tales outlining how Oldupai held the as-of-yet undiscovered keys to fully unlocking the mysteries of humanity's collective origins, along with well-established stories of the Gorge's long-term geological formation. Researchers brought these tales into association with their emergent text-based discoveries and insights, producing new continuities between the past and the present (Moreira 2000:424-437). However, palaeoanthropologists were not the only people telling instrumental stories in the Gorge.

4.1.2 Maasai Science in Action

To explore the dynamics between palaeoanthropologists and the Maasai in the Cradle of Humankind, Samson and I would set out on foot into the blistering sun to speak with the Oldupai Maasai. One bright morning, after ducking into a thick patch of sharp acacia trees as trucks loaded with palaeoanthropological research teams - and the excavators they had hired from surrounding regions - rumbled past us, we approached an *enkang*. Outside of this Maasai homestead, we stopped to gaze at a giraffe using its gracile tongue to get at the leaves growing between the massive thorns emanating from acacia branches. A middle-aged man waved us over to the fence, made of tree branches,

that was surrounding his family's houses. As Samson relayed our goal of understanding life in the area, the man proclaimed that he wanted to speak with us and that we should return when he and his large family had completed their morning duties. When Samson and I returned two hours later, we were warmly welcomed into the homestead. Upon sitting down on some stools in the central goat pen, we began to discuss life in Oldupai.

During such discussions, the Maasai told me their *perspectives* on many issues. These locals would often explain that researchers have not communicated the reasons that they are so interested in digging in the Gorge, that the Maasai see no benefits nor no detriments to archaeological research, and that they had also received countless broken promises regarding development that was to be instituted in this remote and grueling environment. The Maasai would decry that researchers were not hiring them, but were instead bringing in assistants from neighbouring regions. I was told that oral traditions made it clear that the Maasai were the absolute first human inhabitants in the region. My Maasai collaborators would explain that since foreign researchers were *rumoured* to be seeking the “first man”, this first man must have been Maasai. As a consequence, some locals declared that they were offended that palaeoanthropologists were exhuming the bodies of direct Maasai ancestors.

Science and technology studies have neglected to examine Indigenous world views (Palmer 2016:13-15). Since I had been experiencing the epistemic culture of palaeoanthropologists and the active creation of palaeoanthropological knowledge, I also sought to understand what knowledge was to the Maasai, and to document the practices that facilitated its creation (Knorr Cetina 2007:363). Talking with Oldupai's locals, oral traditions consistently came to the forefront of our discussions. To most of my inquiries, I

heard statements such as “the knowledge of Maasai we get through the oral traditions: history of the elders, fathers, and grandfathers, grandmothers who have already died... all the knowledge we get from elders”. When my Maasai collaborators would recall the past, their accounts would often begin with “according to oral traditions”, or another similar preface. A proclivity for passed-down tales of bygone times, rather than scientific textual inscriptions (Latour and Woolgar 1986:43-88), may initially seem incongruent with “rational” and “objective” scientific endeavours. However, a close investigation reveals that the Maasai were not merely illogical holders of subjective beliefs (Latour 1987:179-185; Latour 1993a:212-236). The process of Maasai fact production proceeded in a parallel and equally logical *form* as science, and all that differed was the cultural *content* of Maasai black boxes.

The Maasai told me many oral traditions during my time in Oldupai, of which there seemed to be numerous varieties. Whereas researchers delivered pre-dinner tales to young field school students, Maasai elders would tell oral traditions to youth during a special time reserved *after* the evening meal. In general, within oral traditions, there were instructions that outlined and guided Maasai customs, such as age-set categories and the activities that are to accompany transitions between them. These unquestioned and mutually-reinforcing oral traditions and cultural practices were comparable to Latour’s (1987:1-132) factual and technological black boxes, respectively. For a youth to question – reopen – these black boxes, they would be challenging established customs and the influential elders (Spencer 2003:15-37) who expound oral traditions. In an illustrative example of the interdependence between oral traditions and cultural practices, a local told me that youth learn which medically-active plants to add to medicinal soups by listening

to oral traditions, *and* by attending soup and meat-feasting camps known as *orpul*. At the same time, other oral traditions prominently emphasised the necessity of these encampments.

Another variety of black boxed oral tradition recalled the Maasai's history. I heard, on multiple occasions, a narrative that brought to life the Maasai's migration to East Africa from a North African homeland known as "Keryo" due to a drought that had decimated Maasai cattle there in the deep past. This oral tradition emphasised that the Maasai were the first to settle the area around Oldupai Gorge. Such narratives seemed to colour contemporary cultural practices, as when a local *laibon* prophet reflected on the drought that had recently been devastating Oldupai, he stated that "we have only one way... to find somewhere else. To find water". A large contingent of Maasai from the Oldupai area negotiated this drought – largely an extended dry season combined with a lack of access to formerly available water sources now located in adjacent national parks – by traveling to a neighbouring Maasai community for water. This led to a large and sometimes violent conflict over resources between two Maasai sections, a rare occurrence.

My Maasai collaborators usually placed blame on a councillor who interfered in the matter. Accredited elders and age-set leaders known as *laiguenanis* subsequently journeyed to the source of the conflict to settle it, as I learned that such spokespeople were the only figureheads authorised to do so, possessing more authority in Maasai culture than government councillors. The elders were seeking to restore highly-valued *eseriani*, a peaceful feeling that results from communication, love, unity, daily cooperation, addressing needs, health, celebrating life, listening, and togetherness. Like

SDS's issues with the generator, a cultural practice (a more material black box than oral traditions, roughly analogous to a technological black box), in which Maasai provide to others if able to, did not operate as it was supposed to. The reopening of this taken-for-granted black box prevented the entire association of black boxes from working in concert, affecting *eseriani*.

In other history-centred oral traditions, I learned of the relationships between the Maasai and the British Colonial Government. These relationships – which included the British instituting a few infrastructure developments in the area in exchange for Maasai cattle – were portrayed as relatively amicable and peaceful compared to the challenges that the Maasai faced in the post-independence period, during which the state was sometimes headed by members of other Tanzanian populations that the Maasai had long contested with. These oral traditions emphasised the growing distance between the Maasai and other groups in Tanzania (Hodgson 2011:64-75): “... if you see the fire which burns dry grasses of lowland, how to avoid the fire from burning your village? Maasai say they burn the grass around the village... [this is] an example of how to avoid these guys”. This same oral tradition illustrates that established customs do *not* endlessly re-manifest and perpetually constrain the actions of seemingly timeless peoples, as in reality, historical events contour and alter *all* societies (Rosaldo 1980:1-28). The narrative featured a laibon prophet who – while addressing the approaching post-British era – proclaimed that “in coming days, we will change from the way of dressing, the place for houses, to be *modern* [emphasis added]... people will get education, new attitude. After independence, Serengeti will be taken ... will face regulations. So send your children to school so they know their rights”. This oral tradition was particularly

relevant to the situations I experienced during the 2016 field season, including my Maasai collaborators' vehement disapproval of palaeoanthropologists hiring non-Maasai excavators and the Maasai's explicit desire to work with research teams from around the world.

Finally, there were riddle-like stories called *engatini* and *iloyetia* that imparted and tested knowledge of Maasai lifeways. Elders relayed fear-inducing and allegorical oral traditions called *oloongukuuni* to youth. One such example, in which a variety of humans and animals only granted favours if they received something in return, imparted in listeners that they must avoid corruption, and must obey and respect elders. Thus, this narrative bolstered the authority of elders and the black boxes that they conferred. This oral tradition also taught that one must always assist others if able to, a black box that the councillor's interference in Maasai matters ended up reopening during the 2016 water conflict. Another *oloongukuuni* regarding a visitor from "nowhere" who turned out to be a murderous cannibal taught that "we have to know, to meet someone for the first time, we have to ask them where they are from, and where they are going. You must know very well before working together. How can you work with someone if you don't know what kind of human they are?"

As these examples demonstrate, unlike palaeoanthropological black boxes that illuminated the past, *Maasai black boxed oral traditions, which were often about the past, served to guide the present.* The cannibal narrative promulgated the importance of *ilomon*, a dialogue that the Maasai of Oldupai Gorge would engage in upon first greeting one another each day. Long-standing and newfound acquaintances would exchange information regarding what they had recently seen, heard, and experienced; along with

whether they had enough to eat, and where they were headed. The Maasai stated that all information exchanged in ilomon was the absolute truth. Until the Maasai's widespread embrace of mobile phones, ilomon was the only means to spread news between distant lands.

Comparable to a scientific debate or controversy, ilomon was a discussion in which the Maasai would sort out and amalgamate fresh reports (in essence, new data) about what had recently transpired: "when people meet, maybe some might talk about stories. I might say, I came for breakfast, sat down with Patrick". In ilomon, the Maasai would bring these new events into relation with various established black boxed oral traditions/facts about what had happened in a place in the past, such as "when I was young, a warrior, I killed a lion [that was threatening my livestock] here". The Maasai also used ilomon to associate emergent reports with established and black boxed cultural practices, as exemplified by an exchange in which two participants had an animated discussion over the unacceptable behaviours – particularly, *eseriani*-compromising miscommunication – that had accompanied and contributed to the recent water conflict.

Once reports had been sorted, a single tale could then be told to younger generations. Out of a debate/ilomon came fresh oral traditions: "so I tell my children that I was here, working with somebody named Patrick. It becomes history. Right now it is not. Maybe these bones and stones we are digging here. It was a long time ago. But now, it becomes history, *because people are talking* [emphasis added]". Thus, just like the facts that palaeoanthropologists proposed, whether the amalgamation of accounts produced in an ilomon exchange became a black box depended on whether others adopted the narrative as the truth: a taken-for-granted fact that could be mobilised in

future ilomon discussions. Likewise, the Maasai proposed new cultural practices – which were characteristically more material than factual oral traditions and thus analogous to technological black boxes – that others had to adopt in order for the practices to solidify as taken-for-granted black boxes (Latour 1987:21-62): “if you hear a story about somebody doing something bad, you will not do that. You follow which is good, and not that which is bad. The councillor who caused the conflict. Maasai will teach their young generation to not follow him – it destroys *eseriani*. Peace”.

My research activities from the previous field season seemed to be part of new and shared verbal accounts of Oldupai’s past. Most Maasai that I spoke to were aware of my prior ethnobotanical project, in which I had emphasised that I sought to promote their medicinal plants’ importance in this underserved region. Maasai from all around the area would laugh upon recalling that during that same pilot research season, I had accidentally startled some Maasai donkeys as a woman and man made their way to the dried-out bottom of the Gorge to dig for buried water, resulting in the animals galloping into the distance. Only two people had originally witnessed my now-comical faux pas.

Parallel to palaeoanthropological black box construction, this production of potential Maasai black boxes took place within a culture-specific centre of calculation, as participants who were participating in ilomon convened at temporary information-sharing spaces that were distinct and removed from daily subsistence. In such a space, the Maasai accumulated, compared, and combined *verbal* accounts of distant lands, rather than the inscribed written traces concomitant with scientific endeavours. By extracting traces – narratives – out of moments in space and time, which were (re)representations of the world, the Maasai gained familiarity of distant phenomena and constructed “universal”

knowledge by combining these diverse traces into new practices and oral accounts that they said represented reality. However, oral traditions only held true within Maasai communication networks (Latour 1987:215-254), as guests to this land often did not know of these tales about the dire water situation and the primacy of Maasai settlement in Oldupai: to researchers, the first humans in the area were extinct hominins.

Nonetheless, the resulting cultural practices and oral traditions were still peer-reviewed, just like scientific technologies and publications. Within myriad ilomon centres of calculation, Maasai distant from one another progressively and collectively established new truths. The Maasai language has no written component, so these black boxes often took an ephemeral oral form (Goldman 2011:97-99). It was only the influential elders, especially the laiguenani leaders of elder age-sets, who were able to become indispensable obligatory points of passage by imparting peer-reviewed oral traditions to youth. Less influential Maasai had to approach these leaders – leaders who did not have to concertedly translate the interests of others in order to gain their patronage – to harness the leaders’ essential oral traditions and practical knowledge (Callon 1986; Latour 1987:68-132).

Like influential palaeoanthropologists seeking to further seal black boxes by displaying their new facts in museums, Maasai elders had venues in which to effortlessly convey narratives, in an enduring form, to a wide audience. The Maasai provided names to physical places based on events that occurred there in the past. The name of a mountain near the Gorge reflected narratives of airplanes that had crashed into it. Youth, who may have had divergent interests, nonetheless acknowledged oral traditions with positive modalities when they unquestionably repeated these place designations (Latour

1987:21-62, 132-140). The Maasai referred to the Gorge simply as *Emarti Oldupai*, the literal translation of “Oldupai Gorge” in the Maa language, as no significant events were associated with it yet.

While negotiation and contestation is forgotten upon the establishment of scientific truths, Maasai knowledge accepts dissent and multiplicity (Goldman 2011:101-104). Palaeoanthropologists have contested while conducting research in Oldupai Gorge (Dalton 2007:12). The Maasai told me narratives that outlined the history of palaeoanthropologists arriving in the area, along with these research groups’ periodic disagreements with each other. Parallel to the Maasai water conflict, these contestations were related to accessing key *subsistence* resources, such as stone tools and fossils. Thus, Indigenous knowledge is contextual (Cruikshank 1998:45-51), yet so is *seemingly* universal and unique scientific knowledge (Latour 1987:247-257).

As demonstrated, both Maasai and palaeoanthropological knowledge was intimately tied to practicalities of its production. This analysis is not intended to be a demonstration of how Maasai knowledge can be compartmentalised and appropriated to align with scientific knowledge (Goldman et al. 2016). Rather, my goal is simply to show how *both* scientists and the Maasai were using a variety of previously-established ideas and artefacts to build new ones, a process that scientists consider logical: associating together novel information, factual black boxes, and material black boxes while engaging in debates and discussions, out of which potential new – and debate-settling – black boxes emerge (Latour 1987). These ingredient black boxes, which were nonhuman, sometimes displayed agency: their properties provided resistance to the intentions of the humans who mobilised them, disrupting and influencing the production of fresh black

boxes (Smart and Smart 2017:29-65). If these setbacks were ironed out and other people accepted and adopted emergent black boxes as givens, proposed facts and artefacts could become sealed black boxes. Conversely, if others critiqued or did not recognise these new arrangements of ideas and objects, they could be reopened, disassembled, and nullified. Both groups were both exhibiting *Science in Action* (Latour 1987), yet the associations that both sides forged went beyond the making of black boxes.

4.2 Ontology

In an ANT framework, *everyone* builds knowledge by assembling irrefutable associations between diverse actants (Latour 1993a:230-236; Latour 1993b:13-96). Any claims of epistemic disparities are a consequence of an individual's displacement from their *own* culture (Latour 1987:210-213). While Maasai and palaeoanthropological black box construction proceeded in equally logical *forms*, these assemblages differed in cultural *content*: within both parallel epistemic cultures (Knorr Cetina 2007:363), members produced unique facts and technologies by harnessing distinct ontological entities (Brosnan 2016:175) – including established black boxes – that were specific and pertinent to each group's culture. These entities, or *actants* in more general ANT terminology (Smart and Smart 2017:37), were often relevant to each group's equally contextual and culturally-specific subsistence practices. Such livelihood strategies also had to allow effective navigation of the exigencies and necessities that larger sociocultural, political, and economic contexts and ontological realities conferred onto each group. These contexts influenced the content of each parallel epistemic culture, as well. For example, established cultural customs ensured that palaeoanthropological

knowledge was usually inscribed, while Maasai knowledge construction was primarily oral.

The following case study elucidates the *practicalities* behind the surprising lack of association between the Maasai and palaeoanthropologists, who nonetheless curiously shared in the practice of *digging* within Oldupai Gorge as part of their unique and parallel enactments of drought. To subsist, *both* groups were constructing networks of associations that consisted of actants that members of “modern” societies conventionally and mistakenly characterise as purely “natural” or “social”. Through this process, researchers and the Maasai were proliferating reality by producing and enacting other *hybrids*: multiple versions of drought that were simultaneously social and natural (Latour 1993b; Mol 2002).

4.2.1 Palaeoanthropological Drought

Inside of laboratories, scientists assemble *associations* between data and black boxes in their quest to produce facts and technologies, all the while striving to make their research indispensable to others. At the same time, researchers diplomatically acquire resources in the “non-scientific” world beyond laboratory walls (Latour 1987:45-162), where they must navigate cultural, economic, and political contexts that are themselves assemblages of actants (Latour 2005). Within the mobile clean laboratory at Oldupai Gorge and the Tropical Archaeology Laboratory in Canada, SDS researchers were abiding by proper and established scientific practices and protocols, yet this “pure” science also depended on the support of *associations* with countless varieties of extra-laboratory actants.

Surrounded in all four directions by vast tracts of seasonally-desiccated backcountry, SDS palaeoanthropologists needed to bring a wide variety of items with them in order to conduct the archaeological activities at the mobile clean laboratory. Such implements included trowels, screwdrivers, hammers, permanent markers, sieving screens, GPS devices, tape measures, a power generator, a HEPA air filtration system, air conditioners, starch-free clothing, nails, rope, pins, tape, starch traps, rags, thermometers, computers, cameras, notebooks, and sample bags. With no access to Wi-Fi nor to a library, archaeologists relied on excavation skills and theoretical knowledge that they had previously obtained. These and other researchers also required assistance from a wider variety of items and people. For example, at dig sites, archaeological assistants utilised generator-powered jackhammers, shovels, and wheelbarrows to remove large chunks of the ground. Once they had exposed sought-after layers, researchers could then begin to systematically search for bones, stone tools, and other coveted traces of the past.

Archaeology is field-based; it is a science that always occurs in unique *spatial* and *temporal* contexts (Abu El-Haj 2001:20-21). Since researchers needed to use their 4x4 vehicles to transport pieces of archaeological equipment to and from dig sites, Samson and I would walk back to camp from Maasai villages, just as the brilliant red sun was setting over the Serengeti plains to the west of the research station. To effectively respond to Oldupai's harsh and unforgiving landscape, palaeoanthropologists had constructed a camp that featured tents and cement-walled rooms, a shower that was available every third day, a communal meal pavilion, an outdoor cooking pit, a place to park 4x4 vehicles, two latrines, a storage building, and a laboratory; all of which featured generator-induced electricity during select morning and dusk hours. The camp harboured

bottles of water, food, plates and cutlery, and generator fuel. At breakfast, lunch, and dinner, campers convened at the meal pavilion, oftentimes sharing reports of the day's digs in a decidedly ilomon-like fashion. Prior to each evening meal, researchers, students, and assistants shared freshly-popped corn while attentively listening to a daily-rotating cast of lecturers deliver scholarly presentations with the assistance of a laptop and projector. The camp's hired attendants prepared meals while researchers and their assistants were away at excavation sites, swept the sand that the ever-present warm breeze constantly blew into the meal pavilion, and guarded the area from potential intruders. Nonhumans assisted in this latter task, as dogs protected the camp from hyenas and ostriches during the twilight hours, seemingly in exchange for table scraps.

Camp supplies had to be periodically restocked. I participated in a supply run to the nearest settlement to Oldupai Gorge, located 71 kilometres east of the camp. With a local driver, and assisted by research permits that allowed us to travel through the Ngorongoro gates, we traversed rutted dirt roads and arrived in Karatu. With cash in pocket and a list of scientific and subsistence items in hand, we hopped between roadside kiosks, gas stations, a gated water outlet, and a central market. At this chaotic and confusing marketplace, I wandered through countless rows of small kiosks, each featuring a vendor offering food items that had to be bargained for. Not knowing standard prices nor effective bargaining techniques, I fortunately found a friend of the chef who worked at our research camp. This friendly woman borrowed my shopping list and gathered each item on my behalf, saving our team countless hours and significant amounts of money. Her expertise was thus an irreplaceable asset to conducting research in the mobile clean laboratory. On our journey back to Oldupai, the driver and I had to

briefly stop on the rural highway to inspect our vehicle. A group of *spolio* Maasai youth who had recently been initiated and were soon to be members of the warrior age-set, wearing brilliant and intricate white pigment on their faces and stark black illkarash robes, approached and desperately asked for one of the bottles of water that were visibly stuffed into the vehicle's storage compartment.

In an ANT framework (Callon 1986; Latour 1987:68-132; Latour 1993a:158-236; Latour 2005; Smart and Smart 2017:37), the distinguished leaders of palaeoanthropological research teams coordinated and forged temporary networks of associations between multifarious actants, including humans, nonhumans, ideas, theories, objects, and abilities. Such networks were transient, as scientists conducted field research only during their institutions' summer months, a period that coincided with Tanzania's dry season. These influential spokespeople translated the interests of each actant and facilitated a certain kind of action: enabling scientific work in a remote, undeveloped, and grueling location. As the SDS partnership progresses over seven years, its spokespeople will have to create stability by periodically re-coordinating these associations and assemblages of actants. In the field, researchers produced inscriptions that served as accounting devices. Some of these documents kept counts of the large quantity of actants that researchers had assembled, while others kept track a specific kind of actant: money.

Being a field-based science, archaeology also occurs in – and can reconstitute – specific *social* and *political* contexts (Abu El-Haj 2001:20-21). Many of the actants that supported the pure science within the Gorge were quite costly and had to be paid for. In a world characterised by capitalism, neoliberalism, and reduced public expenditures on higher education (Blim 2000:27-31; Crewe and Axelby 2013:89-90, 159; Ylijoki

2003:307-310), palaeoanthropologists had to engage in a cycle common to academic disciplines: obtaining funding, conducting research, and producing publications that bestow credentials and thereby secure continued funds (Finlay 2014:145-181; Latour and Woolgar 1986:187-230; Rabinow 1996:19-31). During the summer, researchers were able to escape the rigours of academic funding cycles that prevailed in their home institutions (Rabinow 1996:19-31), and used funding to acquire items such as research permits. These documents allowed palaeoanthropologists to conduct excavations at specified sites in the Gorge, which is located in the *seemingly* pristine NCA. Like its neighbouring national parks – which harbour important dry season water sources that the Maasai can no longer access – the NCA is not fully “natural”. Rather, the NCA is a *created* piece of wilderness that attracts tourists and cash in the same capitalistic world economy that researchers had to navigate. The NCA is a social-natural hybrid (Blim 2000:27-31; Crewe and Axelby 2013:89-90, 159; Cronon 1995; Galvin et al. 2008; Hodgson 2011:64-75; Latour 1993b; Nelson 2012).

The ANT dictum of empirical metaphysics means documenting the reasons that people provide for their actions in light of the myriad forces and agencies that combine to influence their decisions, forces that such people may not always be fully cognisant of (Latour 2005:42-52). Field researchers verbally espoused engaging in *good science*: abiding by established protocols and models, explicitly stating the methodologies and controls that supported each scientific endeavour designed to elucidate hominin behaviours, developing sound and credible data, collaborating with complementary scientific fields, and not jumping to wild conclusions. Various teams of scientists would stay at the camp for only a few weeks at a time, highlighting that researchers had a

relatively short timeframe in which to conduct their livelihood-securing field research. Combined with the significant costs associated with necessities such as archaeological supplies, camp items, research permits, and transportation across the planet; scientists focused their energies on methodically reconstructing the past. Even after a long day in the hot East African sun, researchers spent the comfortably cool evening hours analysing the day's data, conducting experiments, and delivering academic lectures to field school students; teaching these palaeoanthropologists-in-training the proper methods and theories of systematically understanding the past.

Ultimately, researchers excavated traces of the past as a means to publish peer-reviewed academic publications. Writing papers not only served to establish new black boxed facts and technologies, but was also a critical component of palaeoanthropological subsistence. On most teams, female and male researchers equally carried out excavations and wrote inscriptions. One of SDS's mandates was to address a disproportionate quantity of African scholars excavating and publishing in the field of palaeoanthropology, a discipline largely controlled by Western researchers (Shepherd 2002:205; Wadley 2014:209). Upon returning home, palaeoanthropologists continued to practice good science by writing articles that featured overt *scientific* accounting: detailed and lengthy methodology sections. Papers became publications if they successfully stood up to the intense scrutiny of the peer-review process, and palaeoanthropologists listed as a co-author every researcher who had contributed to a particular project. Each contributor then shared in the all-important credentials that the act of publication conferred (Finlay 2014:145-181; Latour and Woolgar 1986:187-230), yet this inscription also immortalised and extended some of the temporary associations – the associations between scientists in

complementary fields, in particular – that the spokespeople of research groups forged while in Oldupai.

SDS researchers sought to illuminate the forces that drove the emergence of humanity, and their baseline was modeling a period of fluctuating – and generally increasing – aridity that transpired in the Oldupai region 1.8 to 1.3 million years ago. Palaeoanthropologists were seeking to understand connections between this long-term drought and how ancient hominins began producing a new variety of stone tools called the Acheulean, how hominins used such stone tools for processing food, and how carnivore-free patches of vegetation and water within a gradually opening and formerly forested landscape might have inspired new social arrangements and behaviours among hominins. A researcher eloquently underlined the centrality of this holistically-conceived drought that altered countless facets of hominin livelihoods: “It is not just archaeology that we are interested in, but the total environmental change”.

Engaging in what palaeoanthropologists called a “multi-proxy approach”, researchers examined an amalgamation of various traces of the past – such as biomarkers and phytoliths – in order to clarify the environmental conditions that may have influenced hominins to change their patterns of behaviour and to develop the Acheulean stone tool industry roughly a million and a half years ago. Lipid *biomarkers*, such as normal (*n*-) alkanes, are organic compounds that are chemically inert and resist biodegradation in sediments over extremely large stretches of time, and analysing the isotopic values of biomarkers that are found in the sediments that surround buried stone tools can reveal changes in past plant composition and availability of water (Eglinton and Eglinton 2008). Research that SDS scientists conducted confirmed a drying and warming trend at an

Oldupai Gorge site, and demonstrated that the site was likely a riverine forest surrounded by a mosaic-like landscape that featured both heavily treed areas and more open environments (Patalano et al. 2017). Another trace of the past are *phytoliths*, which begin to form when live plants absorb silica and the silica subsequently fills cell spaces. While plants eventually die, these silica casts of plant cells can preserve for millennia, allowing researchers to compare the shape of such phytoliths to those from reference collections of contemporary vegetation in order to understand the types of plants and environments that existed in the deep past (Gallagher et al. 2015:1-2; Zhang et al. 2011). SDS researchers analysed phytoliths that they collected at three other Oldupai sites and revealed that they indicated a diverse, gradually opening, and progressively drying landscape (Itambu et al. 2017).

This long-term drought became the ancient environmental context in which SDS scientists explored and investigated a variety of connections and associations between tool types, tool use, and hominin diet and social behaviours over a 500 000 year timespan. Establishing and corroborating the existence of this drought allowed these scientists to establish new black boxed facts, such as hominins using Acheulean stone tools to process plants. Through various practices, SDS was *enacting* (Mol 2002) a drought that occurred in the deep past. In an ANT framework, the researchers harnessing biomarkers and the scientists using phytoliths each made particular associations between heterogeneous actants – such as theories, methodologies, laboratory techniques, and the countless supplies and relationships that made possible excavations at particular sites in Oldupai Gorge – to enact this drought. Illustrating how actants need not be material, researchers mobilised the *idea* of this ancient drought into new associations, including

those associations that allowed SDS to establish new scientific facts about prehistoric hominins (Latour 1993a:158-236; Latour 2005:1-52, 141-156; Mol 2002:44-164; Smart and Smart 2017:37).

Thus, abiding by the “multi-proxy” approach, researchers enacted (Mol 2002:1-51) drought by establishing different arrays of associations, such as those associated with either biomarkers or phytoliths. Rather than discovering a singular nature, researchers used these particular practices to enact two different versions of the same bygone drought period, multiplying reality and ontologies. However, much like a *composite* disease diagnosis (Mol 2002:53-117), SDS researchers could compile these site-specific practical enactments, thereby turning the composite drought into a foundation in which to explore other as-of-yet unclarified connections between tools, the landscape, and ancient diets. Nonetheless, researchers referred to this fluctuating and drying period as a singular event, preventing complete fragmentation of the enacted drought(s).

This drought, as an actant that was itself a stabilised association between diverse actants (Latour 2005:205-218; Smart and Smart 2017:54), was a social/natural *hybrid* (Latour 1993b). While largely a non-material theoretical reconstruction of the “natural” world that played host to humanity’s ancestors, palaeoanthropologists brought this drought into being by investigating various physical traces of the past that had remained preserved in the ground. These physical traces only meant anything if researchers interpreted them in light of other theories and subjected them to socially-established methodological protocols, and these scientific endeavours had to conform to the long-standing cultural tradition of practicing good science. Excavations were only possible if researchers made productive associations and navigated demanding social, economic, and

political contexts, such as the large political-economic forces associated with global capitalism and neoliberalism. However, there are no enduring social contexts or immutable forces; other spokespeople had to renegotiate and reassemble the existence of such potent and influential assemblages of heterogeneous actants (Latour 2005:1-93) on a massive scale (Latour 1993b:96-124). Furthermore, the enactment of this seemingly “natural” period of past drought had practical implications, such as providing researchers with a background in which to produce new facts, technologies, and subsistence-ensuring publications. Other implications only become apparent upon an investigation of what drought was to the Maasai.

Members of so-called “modern” societies visualise massive permanent shifts from archaisms, such as the seemingly anachronistic “premodern” practice of making associations between the “natural” and “social” realms. Members of “modern” societies – especially post-Enlightenment scientists – strive to progressively sort out immutable nature from the polluting subjectivity of society, a practice that fuels these assumed breaks from the past. This purification hides and downplays a “modern” society’s own construction of indispensable hybrid networks that are actually comprised of myriad actants that “moderns” may themselves define as variably primitive or contemporary, objective or subjective (Latour 1993b:35-129). In line with these “modern” practices, palaeoanthropologists still sought to purify their hybrid networks into strictly “natural” and “social” realms. Researchers constructed vast and heterogeneous associations and networks in order to effectively conduct research in a desiccated landscape that was exposed to the relentless sun. However, they would often purify the world into purely natural domains, specifically being interested in the lives of our not-quite-human

ancestors; and social realms, the oftentimes challenging, yet essential, associations that researchers would have to forge to make human evolution research possible.

Despite the notion that “modern” scientists enjoy a privileged and unclouded understanding of the natural world (Latour 1993b), researchers had to adjust to the fact that they could not master the forces of “nature” while conducting this research in the field, requiring these palaeoanthropologists to forge other new associations in response. Tree roots at the nearby Laetoli site had recently caused damage to the famed footprints of hominins that volcanic ash had preserved, a goat trudged through an Oldupai dig site and upended the rope and nail excavation grid, and a cap-like layer of dirt ended up being much thicker and more time consuming to remove than a model of the Oldupai landscape had predicted. Nonhuman actants exhibited agency, as their properties worked to alter the plans and actions of archaeologists, further blurring any distinctions between the natural and the social domains (Smart and Smart 2017:29-65).

Researchers were digging in Oldupai Gorge to excavate traces of the deep past that would allow them to model and enact a hybrid drought that had existed 1.8 to 1.3 million years ago. This drought had profound effects on humanity’s shared past in Oldupai yet allowed contemporary scientists to continue making palaeoanthropological discoveries. Due to relative brevity of the field season, the costs associated with conducting field research in a place distant from their homes, the need to conduct sound and credibility-granting science while in a flagship research locality, and the desire to focus on the fascinating “natural” past while simultaneously escaping the frustrations of “social” negotiations, palaeoanthropologists spent their energies exploring bygone times. Navigating such exigencies, along with possessing the financial and logistical means to

bring bottles of drinking water and tanks of cooking water to the research camp, meant that a contemporary drought – one affecting the Oldupai of today and the people who live within and around it throughout the year – more often than not remained peripheral to enacting the past.

Nevertheless, there is no such thing as the “modern” and “premodern” worlds; everyone constructs social/natural hybrids (Latour 1993b:13-31, 43-48). This acknowledgement even pertains to the process of combining new data, established technologies, and socially agreed-upon facts about the “natural” world in order to establish new black boxes (Latour 1987), which is itself an early version and science-centred example of the broader and more recently-theorised ANT process in which spokespeople forge associations between diverse types of actants (Latour 1993a:158-236; Latour 2005). In the first section of this chapter, I demonstrated how both the Maasai and researchers built black boxes in equally logical forms. However, many still unjustly portray the Maasai as archaic (Galaty 2002; Hodgson 2011:66-68). Parallel to palaeoanthropologists, the Maasai were digging in the Gorge to extract a subsistence item that differed from that of researchers: the vestiges of water that was abundant in the recent past. In doing so, the Maasai were ameliorating a different – yet still hybrid – version of enacted drought.

4.2.2 Maasai Drought

One sunny afternoon, right in the midst of the hottest portion of one of my first days in the field, I was walking towards *David's Site* so that I could participate in a palaeoanthropological dig for traces of the past. According to stories that researchers told me while at the research camp, the site was the most recently discovered and excavated

locality in Oldupai Gorge. A few years prior, a geologist found some stone tools alongside the bumpy road that led to camp. The next season, the thoroughfare was diverted so that palaeoanthropologists could excavate the stone tools and hominin bones that had for decades been underneath a path hewn by 4x4 vehicles. Since researchers had on that afternoon taken the trucks to more distant locations in the Gorge, I was walking with a few other palaeoanthropologists and a local Maasai warrior to David's Site, the site located closest to the research camp. Our route through the sharp acacias and Oldupai plants took us down the walls of the Gorge and through its dried-out basalt base.

Upon reaching the parched bedrock, the warrior who was showing us the way through this dangerous and animal-filled terrain that was all too easy to get lost in – a landscape in which I had on a separate occasion spotted two cheetahs less than 50 metres from my tent – took me aside as the others continued on to David's Site. My friend showed me a massive hole, a metre deep and two metres wide in each direction, surrounded by an impenetrable fence of barbed acacia tree branches that kept wild animals at bay. Underneath the shade of a large acacia tree, this hole harboured traces of water. Being the first time I had been exposed to what I later learned to be an increasingly desperate situation, I made note to understand what these distinct Maasai excavations, which were contemporaneous with palaeoanthropological digs in the Gorge, signified.

A few days later, Samson and I were going for a walk with a different Maasai man, this time a young elder. We eventually found ourselves meandering through the bottom of the Gorge, and came across two young Maasai girls who were crouched beside another hole in the ground. The girls seemed to offer me a glass of water. After politely declining due to having a bottle of water in my backpack, I noticed that these girls had a

donkey with them, along with two large jugs that could be filled with water. A little further on, we passed a pool of water that was surfacing before our eyes. A young girl soon emerged from the acacias and allowed her goats drink from the pool. My Maasai friend explained that this water was fairly salty, making it unfit for human consumption, yet that humans could bathe in this pond that was surrounded by rings of crystallised salt. Using a shovel to dig a small hole, the local man proclaimed that buried water was more drinkable. We walked for a little while longer and my friend pointed out an embankment showcasing four distinct stratigraphic layers. The man pointed to a bone that had fallen out of this wall, explaining that “they say previous years ago, this was a lake, and living things died inside”.

Maasai tactics to support their livelihoods were not unlike that of scientists, who tactfully and expertly secure a motley assortment of essential resources in the “social” world outside the confines of their laboratories in order to support the “real” or “pure” science within (Latour 1987:45-175), and thus come face to face with influential cultural, economic, and political contexts and forces (Latour 2005). However, other authoritative spokespeople repeatedly assemble actants to create these potent social and political-economic forces, thereby crafting what appears to be enduring contexts. These assembled political-economic forces can impact on other actor-networks (Latour 1993a:158-236; Latour 2005:1-93). Furthermore, stable actor-networks can dissolve, leaving formerly assembled actants unassociated (Smart and Smart 2017:54).

The Maasai’s established brand of pastoralism, which they have practiced in East Africa for hundreds of years (Hodgson 2011:65-70), depends on unobstructed access to communal resources (Galvin et al. 2008:274) and making associations with a wide

variety of actants. During my time in Oldupai, I joined the Maasai as they acquired water for their own consumption, for their livestock, and for medicinal soups and other curative concoctions. These soups contained a mixture of numerous medically-active plants (Chapman et al. 1997; Johns et al. 2000) that the Maasai obtained from the Oldupai region, along with plants acquired from long-distance trade with Maasai living in different ecosystems. The Maasai would explain that their ethnomedical resources were absolutely vital, since biomedical facilities were located nowhere near Oldupai Gorge. My Maasai collaborators placed the blood and meat of their livestock into these soups, and at other times drank the fresh milk that their animals produced.

Established cultural practices influenced how the Oldupai Maasai distributed and consumed these animal products. Members of each age-set received different cuts of meat, as exemplified by the following statement: “when the Maasai slaughter meat, sheep, they give to ilayiono [male youth] the chest of the sheep. Nobody else can eat this portion. If there is cattle, they are given the waist and sometimes the ribs. For the goat, they have no portion, unless the elders decide to give a portion”. The authority of elders, who relayed present-guiding oral traditions about the past, allowed them to teach the young about the gendered roles associated with pastoralism and Maasai age-sets. For example, a local explained to me that younger boys were required to herd calves, sheep, and goats to pastures. Upon graduating into the warrior age-set, males “have to be more than one and have to be aware anytime because you are security of society”, while “the activities [of Maasai girls] are to help mothers inside homes, to fetch water, to collect firewood, cook, and to milk cattle, goats, sheep”.

During the transition from youth to warrior-hood, liminal spolio acquired a certain variety of white stone, used other stones to crush it, and mixed the white powder with water so that they could create intricate facial ornamentations. During the transition from the dry season to the wet season, women and a few male elders would travel to a volcano called Oldonio Lengai, or to a dune known as Shifting Sands that originated at Oldonio Lengai and slowly moves due to the ever-present wind in the region. At these sacred sites, if expected rain had yet to arrive, the migrant Maasai would pray for the rains to begin falling on their homes. Within Maasai homesteads, dogs alerted and awoke humans if dangerous wild animals, such as hyenas, were attempting to burrow under the surrounding barbed acacia fences in order to attack Maasai livestock. Thus, in their customary pastoral livelihoods, the Maasai had absolutely no qualms about making overt, informed, and sophisticated associations between actants that members of “modern” societies would partition into purely “natural/objective” or “social/subjective” categories (Latour 1993b:30-43).

To support their scientific livelihoods in Oldupai and at home, palaeoanthropologists navigated large forces – such as the consequences of global capitalism and neoliberalism – and forged a wide variety of associations. In a comparable fashion, large political-economic forces and well-intentioned conservation measures – also tied to the spread of capitalism and neoliberalism around the planet – have carved out natural/social hybrid landscapes and have compromised the above brand of established pastoralism in the NCA by fragmenting rangelands, restricting the Maasai’s access to dry season water sources, and proliferating incidences of cattle disease (Blim 2000:27-31; Crewe and Axelby 2013:89-90, 159; Cronon 1995; Galvin et al. 2008;

Hodgson 2011:64-75; Latour 1993b; Nelson 2012). A related force is the lingering idea – despite evidence demonstrating how pastoralism is ecologically beneficial – that the Maasai’s livelihood is damaging to Tanzania’s famed protected spaces that tourists come to see (Nelson 2012). This notion that downplays Maasai perspectives and concerns (Galaty 2002) is a powerful actant that the Maasai must navigate, and is made of other actants such as tourist memorabilia that paints the Maasai as archaic and timeless (Hodgson 2011:64-70). While modernity does not exist according to the qualifications established by “modern” societies, in which humans completely separate natural entities from the social (Latour 1993b:67-90), the *idea* of modernity remains a powerful and influential force.

These various top-down forces – assemblages of actants that are constraining the Maasai and making established forms of pastoralism nonviable – have dissolved what were relatively stable Maasai actor-networks. For example, actants essential to pastoralism, such as crucial dry season water sources, lay in national parks that are next to the NCA and inaccessible to the Maasai. Comparable to scientists acquiring key non-scientific resources to support their scientific livelihoods (Latour 1987:145-162), I documented the Maasai of Oldupai making multiple types of ventures *out* into the non-pastoral world, forging novel associations and obtaining heterogeneous resources/actants that could support their proud livestock-keeping livelihoods *within*. Social structures do not perpetually reappear generation after generation (Rosaldo 1980:1-28); the Maasai had to renegotiate and reassemble the existence (Latour 2005) of their pastoral actor-network.

To employ empirical metaphysics with the Maasai, I explored the justifications they lent to their actions, considering the sometimes unidentified forces and agencies that

may lay beyond an individual's *immediate* consciousness and that could sway their conduct (Latour 2005:42-52). The Maasai consistently stated that they abided by the lessons, practices, and knowledge passed down through oral traditions. For example, they would often explain that they were staying in the challenging NCA region partly because it was their home, an idea cemented by the oral tradition outlining the primacy of their settlement in the region. On countless occasions, I heard proclamations of "this is our land", yet one local's qualification that "this is our land... we must be free" hinted at the issues that the Maasai faced.

Other reasons that my Maasai collaborators gave for continuing to practice pastoralism in the area was due to the fact that unlike cattle, goats and sheep could thrive in extremely arid conditions, and because the region's saline water was beneficial to their animals' health. In a focus group consisting of elders, women, and children, one respected patriarch explained that "we like it here because of the goodness of our pastoralism, especially for our goats and sheep. The plain is good for the sheep and goats". I was told that these small stock animals would die from diseases and frigid temperatures if herded to the highlands, yet also that since it was the ever-lengthening dry season, a significant proportion of warriors had left these permanent villages around Oldupai to take cattle to more mountainous regions. In one of many types of divergences from established forms of "pure" pastoralism, similar to scientists enabling "pure" laboratory science by acquiring extra-laboratory resources (Latour 1987:45-175), the Oldupai Maasai forged new associations and acquired key resources by making adjustments to prevailing gendered social roles (Wangui 2008:369-370): whenever there

were no males around to herd remaining livestock to forage and water, women and girls stepped in to fill this role.

However, the Maasai would most often explain that they were staying in the Oldupai region because they had no other options and had nowhere else to go, as exemplified by statements such as “it is hot, hard, and no water, but we don’t know where to go”. The Maasai would outline their frustrations of having to constantly deal with a variety of top-down decisions and political-economic forces, and emphasised that their isolated rural homeland was lacking in infrastructure and social services such as water, schools, and hospitals. While the Maasai placed great value on their ethnobotanical medicines and espoused the dangers of mixing them with biomedicine, they also desired access to hospitals, often proclaiming that both medical systems were key to prosperity. If the Maasai needed to go to a hospital, they would have to sell their livestock in order to raise the requisite funds for a journey to medical facilities. The closest of such facilities were located in Endulen, over 60 kilometres from Oldupai Gorge. Furthermore, massive distances to clinics that stocked anti-venom ensured that snake bites were oftentimes fatal. In interviews, the Maasai repeatedly stated that various groups have promised to develop services and infrastructure in the area, yet have never delivered on these pledges. Many Maasai also felt as though they were not permitted to have what the Maasai deemed “modern” developments because tourists arrive in the region looking to encounter wilderness. These travellers bring large quantities of capital into Tanzania’s economy (Nelson 2012), yet the Maasai have largely been unable to access tourism revenue (Galvin et al. 2008:260-261). The Maasai were seeking to acquire

new resources, actants that were not components of their established pastoral practices, in order to support this animal husbandry.

In Oldupai, I discovered that the local Maasai used to acquire food by trading with agriculturalists located in the NCA's higher grounds to the east, but a 2005 ban on cultivation within the Conservation Area has made it extremely difficult for the Maasai to access items such as maize. Around the same time, tourists introduced cash into the area. In sync with the multiple arrivals and departures of researchers at the camp throughout the day, I witnessed Maasai women acquiring money by vending exquisitely crafted beaded bracelets and necklaces to scientists. Capitalising on the efficiency of 4x4 vehicles that transported researchers to and from the camp and distant urban centres, the Maasai would sometimes take rides around the Gorge.

A Maasai collaborator discussed how other Maasai, pursuing elusive cash, have begun selling their cattle at nearby markets or migrating to unfamiliar urban areas. While in Zanzibar, I encountered Maasai warriors who had migrated there to sell beaded goods to tourists or to perform dances in luxury hotels, hoping to acquire enough money to repurchase liquidated cattle stocks. These migrants were also likely capitalising on the widespread representation of the Maasai as timeless and exotic (Galaty 2002; Hodgson 2011:66-68; May and Ikayo 2007). In Dar es Salaam, I observed Maasai women vending beaded jewelry, along with warriors selling medicinal plants that had originated in rural areas. These Maasai were making new associations to continue their pastoral ways, yet males who had attended a certain coming-of-age ceremony were not supposed to interact with those who had not. Demonstrating how all societies are dynamic and adjust to historical happenings (Rosaldo 1980:1-28), the Maasai around Oldupai have begun

initiating youth at a younger age than they had been in the past. As a result, when these youth temporarily migrated to cities, they were able to interact and share resources with older Maasai, which strengthened support networks while away from the NCA. Nonetheless, a Maasai elder explained that such migrants lacked the knowledge to properly prepare medicines, wisdom that could only be obtained from elders and from attending orpul camps in the rural lands that various parties and actors have continued to fragment.

The top-down partitioning of formerly open landscapes and an associated lack of access to dry season water caches was just one facet of the increasingly desperate water situation for the Maasai living in and around Oldupai Gorge. Parallel to palaeoanthropologists, the Maasai were enacting (Mol 2002) a hybrid drought (Latour 1993b). Similar to how multi-faceted conditions of scarcity within their actor-networks in 2009 led the Maasai to declare and enact drought and subsequently move to other regions, despite influential climate scientists using simplistic rainfall measurements to instead declare 2010 to be the more severe drought year (Goldman et al. 2016), my Maasai collaborators gauged the conditions of multiple factors and actants in order to announce the arrival of drought.

A decrease in rainfall – a seemingly fully natural reduction in water – was a part of the enactment in Oldupai. While I was in the field only during dry seasons, I was told that the Gorge is a river that flows with bountiful water during the rainy season, yet that it unfortunately dries up completely as the arid season annually sets in. The terminus of the transient Oldupai River was a saline lake called Olbalbal, located fifteen kilometres east of the research camp, which also completely vanished as this challenging season wore on.

In decades prior, rain could begin falling as early as September, and while there was a brief dry period occurring in April, the rains would cease around June. Recently, the wet season has become significantly shorter and seems to only persist from December until April. Some Maasai collaborators could not explain this seasonal metamorphosis, yet others attributed it to global climate change, which is itself a hybrid actant; a product of natural, social, economic, political, objective, and theoretical factors. Global climate change will continue to make unpredictable impacts on East African ecosystems (Galvin et al. 2008:273-274).

However, other members of the Oldupai Maasai community explained that this period of thirst was also a product of increases in cattle and sheep in the area, animals that consume water. Rangeland fragmentation and well-intentioned conservation efforts have created situations of overcrowding and a concomitant amplification in cattle disease (Galvin et al. 2008), and a collaborator told me that because of a higher prevalence of livestock diseases, many local Maasai are now apprehensive of consuming their animals' milk and blood. In a related fashion, I discovered that reduced water availability negatively impacted the Maasai's nutrition, as the lack of grass and forage associated with the extended dry season meant that livestock either perished or became emaciated, resulting in diminished quantities of meat and milk available for human consumption. When I asked a focus group if the Maasai ever stray from their famed diet of milk, blood, and meat, one Maasai man stated that "yes, some of us eat [agricultural foods], because we learn about them. The only way to take care of our children. It has come the time with no milk and meat, have to buy [agricultural foods] for children". Such products were produced outside of the Conservation Area and could be purchased in settlements that

were distant to Oldupai, such as Endulen, Olbalbal, and even Karatu, the latter of which being situated on the opposite side of the NCA's boundaries. However, transport to these places was exceedingly challenging, and agricultural goods could also be acquired from temporary Maasai markets and small trading kiosks located throughout the NCA.

The dearth of water meant that the Maasai were having issues preparing preventative and curative soups. The Maasai explained that they absolutely required water in order to transform medicinal plants, which they said were vital in the rural and undeveloped Oldupai region, into effective treatments. One local man scoffed and laughed when I asked if he could use these ethnobotanical resources without water. Furthermore, along with forage, medicinal plants were also disappearing. The Maasai said that this botanical exodus was tied to drought. For example, wild animals were overconsuming a beloved water-harboring species during the dry season.

Not unlike the palaeoanthropological “multi-proxy” approach to modelling an ancient drought, these Maasai brought their concept of drought into being by making associations between the conditions of multiple different actants throughout the region. The Maasai assembled “natural” and “social” elements – the inability to enter neighbouring national parks, a shorter wet season, climate change, overcrowding, livestock diseases, lack of food, and disappearing botanical resources – in order to create a social/natural hybrid (Latour 1993b). Reflecting on oral traditions he had heard about research camps, one of my Maasai collaborators even compared palaeoanthropological access to water to that of the Maasai's in his assessment of the situation: “since 2001, I know the water *they* [emphasis added] drink there in Oldupai”. This hybrid drought was also a composite enactment (Mol 2002:53-117): the drought consisted of the various

aforementioned indicators, each a distinct practical enactment of drought, which created multiple versions. For example, the Maasai enacted the specific version of drought that related to the disappearance of botanical resources by making astute associations between a wide variety of plant and tree actants and their own theoretical knowledge regarding such resources' conventional viability and availability. The Maasai coordinated and prevented the complete fragmentation of this composite drought, which like a diagnosed disease “appears to be more than one – without being fragmented into many” (Mol 2002:151), by collectively referring to it as *alamei*. This term translated to “drought” or “dry season”, an ever-extending and increasingly complex period of thirst. Once enacted, the Maasai mobilised the all-encompassing drought into novel associations with other actants, becoming a foundation for further action.

Beyond seeking new pastures after evaluating multi-faceted conditions of scarcity amongst Maasai actor-networks (Goldman et al. 2016), my collaborators in Oldupai presented multiple responses to the enacted drought. One option *was* to move on, as some said that they would have no choice but to leave their homes in Oldupai and seek life-sustaining water elsewhere. The Maasai could bring the idea of cutting ties with the region to acquire water in distant lands into association with the oral tradition that brought to life the devastating drought that had ravaged the Maasai's North African homeland and had catalysed their eventual migration into East Africa. In 2016, the cohort of Oldupai Maasai who traveled to a neighbouring Maasai community in pursuit of water became involved in a sometimes violent – and rare – conflict between Maasai communities. I learned that many more Oldupai Maasai were planning to take the rest of their livestock to this same adjacent territory as the dry season progressed, a situation that

had the potential to explode into further conflict. Other local Maasai responded to the drought, particularly the associated reduction in forage, by selling their livestock as a means to alleviate competition for dwindling resources or to purchase food that originates in other regions.

The most common response to this drought – a truly multifaceted phenomenon consisting of a diminution in access to resources – for those who remained in the area seemed to be unearthing the remnants of water that had previously flowed through the Gorge, a river during rainy months. Maasai males dug the gaping holes in the basalt floor of Oldupai, which exposed water that livestock could consume on the spot. Females scooped the water into plastic jugs, loaded these containers onto donkeys, and brought the water to their homes. For each three hour journey to these water caches and back, the Maasai were usually able to transport ten litres to their villages, which were located at the top of the Gorge. Unfortunately, ten litres was a quantity that the Maasai deemed insufficient for carrying out routine tasks. This water’s quality was also questionable, since it was oftentimes saline and potentially unsafe: the Maasai discussed how the lack of medical facilities and transportation in the area meant that children who had to drink “dead water” were suffering from brucellosis and were unable to acquire treatment in distant hospitals. One local, reflecting on the presence of salty water, lamented that “[there is] no way out, we have to drink it”. Each excavation only remained viable for two or three days before it ran dry, and as the dry season progressed, this buried water completely disappeared.

Palaeoanthropological enactment of drought facilitated the productive subsistence of researchers. *Prior* to enacting drought, scientists *dug* in the Gorge for myriad traces of

the past in order to assemble and corroborate the idea of an ancient period of desiccation. The scientists then turned the concept of the drought into a backdrop – a contemporary actant – in which to engage in the present-day practice of exploring emerging ideas about the past, which they later published. Conversely, once the Maasai enacted drought and corroborated its objective existence, they sought to *counteract* it, actions analogous to the numerous practices that various types of doctor harness to intervene with and treat an enacted disease (Mol 2002:87-117). The Maasai had three such remedial practices: moving on to new territories, selling cattle, or digging for water, all of which supported their productive pastoral subsistence in different ways. Outcomes of these actions, upon being widely discussed in ilomon exchanges, will likely become part of oral traditions that elders pass down to youth in the future. The most common of the three responses, *digging* in the floor of Oldupai Gorge for traces of water that was abundant in the recent past, came *after* the enactment of the drought ravaging Oldupai Gorge in the present day. Facing such pressing issues and troubles, palaeoanthropological information about the deep past was irrelevant to the Maasai.

The Maasai and palaeoanthropologists each enacted multiple versions of drought, multiplying reality and ontologies, yet these enactments hung together in two composite forms of drought (Mol 2002). Each group's composite – and hybrid – drought was quite different, however: scientists *desired* a bygone drought that was crucial to their subsistence, while the Maasai *detested* a contemporary drought that was compromising their subsistence. Ultimately, these conflicting enactments of drought could not be scaled according to temporal existence nor size (Mol 2002:119-142): they were actants that coexisted side-by-side via the spatial *distribution* of reality (Mol 2002:87-117).

Palaeoanthropological practices, such as digging within various specific archaeological sites throughout the Gorge and conducting experiments and research within laboratory settings, gave rise to a composite drought. Concurrent Maasai practices in other spots around the Oldupai region, such as judging and evaluating rainfall patterns, livestock numbers and viability, food and water availability, and the condition of medicinal plants, enacted a drought divergent from that of researchers. A different site-specific practice, digging in the base of the Gorge, was geared towards ameliorating such thirst.

As *created* pieces of “wilderness” where tourists and scientists can temporarily escape their lives at home, the multi-land use NCA and the uninhabited national parks near to it are not actually pristine and untouched lands. Various top-down decisions – often linked to the global spread of capitalism and neoliberalism – have continued to displace and disrupt the Maasai, making established forms of pastoralism in these lands impossible. Unbeknownst to many, the Maasai have *sustainably* subsisted within and formed these hybrid landscapes for generations (Blim 2000:27-31; Crewe and Axelby 2013:89-90, 159; Cronon 1995; Galvin et al. 2008; Hodgson 2011:64-75; Latour 1993b; Nelson 2012).

As I came to understand life in the region, the Maasai repeatedly foregrounded their proud claims to be the original inhabitants of the area encompassing Oldupai Gorge. Archaeological practice can reconstitute the social, political, and economic contexts in which it operates, especially by extending official discourse (Abu El-Haj 2001:1-21). In the case of Oldupai, such discourse has been well-intentioned. By enacting an ancient drought and by excavating hominin bones and stone tools, palaeoanthropologists were retrieving evidence of a shared human past in the region. This common past is a message

that many organisations have promoted to tourists, who make massive contributions to Tanzania's economy. Helping to refashion and remake the Gorge as a place to uncover scientifically and economically valuable discoveries – findings that illustrate the commonality of all humans in an all-too-divisive world – may have inadvertently contributed to effacing Maasai existence in the Oldupai region (Abu El-Haj 2001:1-21; Nelson 2012; Staniforth 2009:167-169). While regulations permit the Maasai to *physically* exist in the area around the Gorge (Galvin et al. 2008:261-265), Maasai *voices* and *issues* have remained unrecognised and unheeded (Galaty 2002:355), especially those pertaining to the devastating drought.

The Maasai officially and constitutionally possess rights to the land contained within the NCA (Galvin et al. 2008:261-264), and my Maasai collaborators gave names to physical places based on significant events that had occurred there in the past. Since no significant events were associated with the Gorge, the Maasai simply referred to it with the Maa term for “gorge”. However, palaeoanthropologists saw the Gorge as a flagship location for research that could elucidate the emergency of humanity, and palaeoanthropological practice was arguably overwriting Maasai spatial appellations. Many of the excavation sites around Oldupai bore the name of the foreign researchers who had conducted digs there. Nonetheless, the Maasai seemed to be striking back with claims to this territory. On countless occasions, members of Maasai communities emphasised to me that no other populations inhabited the area before their ancestors had, claims that were repeatedly buttressed with statements such as “this is our land”.

If policy makers assume that scientists have a privileged perspectival access to nature (Latour 1993a:215-236; Latour 1993b:13-112) and provide legitimacy solely to

scientific ontologies and entities by basing decisions *only* on scientific models, there can be profound consequences for underrepresented and voiceless communities (Goldman et al. 2016). Numerous organisations, including academic publishing firms, funding agencies, and various governments and universities, have legitimised the pursuit of palaeoanthropological drought. While this has been a scientifically significant and well-intentioned endeavour, Maasai drought has simultaneously gone unnoticed and unaddressed. Late in the 2016 field season and at the height of the local dry season, I experienced a cooperative dig that may have provided a foundation for a future in which the Maasai and palaeoanthropologists can establish collaborations of mutual benefit, thereby making *both* droughts into things of the past.

4.3 Eseriani

Since SDS researchers sought to begin working with the Maasai of Oldupai Gorge, I explored the history and impact of excavations in this landscape, along with Maasai interest in engaging with palaeoanthropology. On one of my first days back in Oldupai during the 2016 season, Samson and I were walking with a Maasai man whom I had befriended the year prior. In a large field of yellowed grass, halfway between his home and our team's temporary home at the research camp, he opened up to me and began an unprompted critique of how research has been carried out in the past:

“This is our land, we see skulls and bones found here. It becomes the benefit for us for another time. Nowadays, Maasai understand anthropologists, research has been conducted here for a long time. The Maasai are very interested in research. We are willing to work together. We know how to do this work. For example, we dig for water, very far away, can find bones. But people are not interested in employing us, we are not

employed. We know the importance of anthropology. Maasai are the first to find things here. Have experience. If you want success, work with people who live here”.

SDS was striving to end the division that has oftentimes characterised research in the region. They were also seeking recently buried stones to serve as additional comparative controls when analysing the stones tools that the team unearthed in the mobile laboratory, so SDS’s spokespeople proposed the possibility of a unique collaborative excavation of a former Maasai enkang homestead. The Maasai often discussed *eseriani*, the sought-after peace of mind that communication, love, unity, daily cooperation, addressing needs, health, celebrating life, listening, and togetherness could deliver. Reflecting on *eseriani*, a young Maasai elder explained that people “must be united, cooperate together for activities in daily life. When [the Maasai and researchers] are together, we feel peaceful”. He then stated that water affects *eseriani*: “because the time when it comes dry, we have no peace. There is no water. How can I live without water?”

Both groups had vested interests in joining forces and explicitly sought to do so. Early one morning, Samson and I approached the enkang of the regional leader of the influential elder age-set. To accommodate his growing family, this *laiguenani* had moved and enlarged his homestead about a decade prior. Engaging in *ilomon*, we discussed with him the idea of working together to excavate control stones where the former homestead once stood. The *laiguenani* was interested and explained that he would select three more local Maasai to conduct the dig.

After a few rounds of productive dialogue between this Maasai spokesperson and SDS representatives, and once other members of SDS had met with the *laiguenani* – a

practice that an oral tradition emphasised to be a key part of beginning to work with new people – we set up the 10 metre by 10 metre excavation grid. A few days later, Samson and I returned with shovels, trowels, buckets, and a backpack full of sterile sample bags and gloves. Upon meeting with the laiguenani and his three students, Samson translated and conveyed the protocol. Together, we were to excavate 50 stones that were completely buried, yet were located no more than 10 centimetres under the surface. The goal was a random sampling of the massive grid, so the excavators chose plots of their liking. Once they came across a stone, I would rush over with a fresh sample bag and set of gloves, and carefully pack the stone away while documenting its location.

I would usually be in the middle of delicately placing a stone into a sample bag when I would hear “o-soit!” - the Maasai term for “stone” – and have to quickly jump to another excavated plot. Enthusiastically and jovially, our new team uncovered stones that were not only critical to understanding humanity’s shared past in Oldupai Gorge, but also symbolised both the first excavation completely conducted by Oldupai Maasai and a commitment to eseriani-boosting collectivity and communication going forward. Looking towards a nearby hill, I reflected on a miscommunication that had occurred during the previous field season, in which we set up an experimental transect in order to accurately measure the quantity and quality of residues that may attach to stones exposed to the elements and to the constant arid Oldupai breeze. Incidentally, this same hill was also the location of a Maasai marketplace that occurred each and every Wednesday, a gathering that saw Maasai from disparate regions come together to trade countless varieties of information, news, goods, and good cheer. When our team returned to pick up the transect measurement devices, we discovered that hundreds – if not thousands – of

Maasai and their livestock had passed through the area in order to set up their mercantile kiosks. This communication breakdown necessitated a reformulation of the experiment.

Each group's knowledge-building epistemic culture (Knorr Cetina 2007:363), which were parallel and equally logical in form but different in cultural content, was a component of their activity-centred social world (Strauss 1978:119-122). The Maasai and scientific researchers each pursue group-specific goals within their own distinct social worlds, the as-of-yet unaffiliated milieus that have bestowed each group with unique exigencies and needs to meet. In order to finally collaborate, palaeoanthropologists and the Maasai must be able to effectively communicate (Star and Griesemer 1989:387-405) by eliminating cultural miscommunication between the members of each collaborating social world (Finlay 2014:12-22). Boundary objects – entities that transcend and unite social worlds yet still maintain unique significance within each – can facilitate such collaboration by being recognisable inside of each newly overlapping social world and by expediting communication between them. At the same time, each group simultaneously still uses boundary objects to address distinct ends (Finlay 2014:12-22; Star and Griesemer 1989:391-414).

There were many actants in Oldupai Gorge that both groups harnessed prior to the homestead excavation, entities that had the potential to become boundary objects, the communication-enriching anchors between social worlds. Researchers used pieces of quartzite stone from around the Gorge in their practice of residue analysis, while Maasai prophets interpreted certain stones in order to foresee future events and younger Maasai used stones to prepare facial pigments that facilitated their transition into the next age-set. Researchers used plants to build reference collections, while the Maasai used them in a

variety of ways, particularly as medicines. Both groups enacted (Mol 2002) complex assemblages called drought, and each dug in the Gorge as part of such enactments. For researchers, digging to understand the past was the essence of palaeoanthropological practice, while to the Maasai, digging symbolised the heartbreak and desperation associated with seeking to ameliorate drought.

However, boundary objects emerge *during* the process of collaboration (Star and Griesemer 1989:408-412), and despite enriching communication between the social worlds respective to each group of collaborators, their potentially divergent meanings to different people can interfere with collective fact building by allowing competing claims and facts to emerge. Standardized packages dually facilitate fact stabilisation *and* collaboration between science-related social worlds by assembling together an emerging theoretical idea, standardised methodologies and technologies, and multiple communication-enhancing boundary objects, all of which acts as an interface that transmits myriad resources and encourages specific types of action for all collaborators. Furthermore, while one spokesperson may initially promote the components that comprise a standardized package, such packages can also feature mutual translations of interest between the spokespeople of the newly connected social worlds. With a standardized package, collaborators can continue their previously-established and valued work practices in a novel and more integrated way, leading to unification a formerly multifarious conceptual ideas (Fujimura 1992). The homestead excavation featured a fresh standardized package that acted as an interface between groups, and these groups included the multitude of complementary scientific disciplines involved with the SDS partnership. Uniquely, this collaboration extended to members of another social world

not conventionally deemed “scientific” (Latour 1993a:192-236): the local inhabitants of a research site.

Rather than a manifestation of an established standardized package, the homestead excavation could serve as an early example of a package that SDS can concretise in the future. The abstract theory component of this new standardized package was SDS’s drive to gradually discover connections between an ancient drought and how populations of human ancestors began making Acheulean stone tools, how these hominins used stones to process food, and how predator-free patches of water and vegetation within an opening environment might have been key factors in the arrival of new social arrangements. These are abstract ideas that the team has only just begun to explore. SDS researchers coupled this abstract concept to specific methodological protocols, yet unlike an established standardized package (Fujimura 1992:178-179), these methods were not yet common practice. Once other people adopt the specific techniques and protocols associated with mobile clean laboratory and thereby transform it into a widely-used technological black box (Latour 1987), SDS’s standardized package will become more robust. At the homestead excavation, both I and the Maasai guiding and conducting the excavation were upholding stringent protocols that would prevent unwanted contemporary contaminants from settling on freshly excavated stones, which allowed researchers to confidently explore emerging abstract theories.

I also documented some emerging boundary objects. While digging has had wildly divergent implications for the Maasai and for researchers, new collaborative forms of digging – as exemplified by the homestead dig – can forge new associations for those involved. Rather than digging to counteract drought, the Maasai can begin to also

associate the act of excavation with exploring the implications of the ancient Oldupai drought. The idea of drought can also then become a *mutually* sought-after and communication-enhancing boundary object, through which researchers and the Maasai *both* meet distinct needs (Star and Griesemer 1989:412-414) by enacting an ancient hybrid drought *and* precluding the need to enact and subsequently counteract – via moving to new territory, digging for salty (and likely unclean) water, or selling cattle – a contemporary hybrid drought. Attached to a standardized package, competing claims, such as mutually incomprehensible and conflicting versions of enacted (Mol 2002) drought, can become unified (Fujimura 1992). These collaborations boost *eseriani* through the communication and unity that they bring, and simultaneously reduce the negative impact on *eseriani* that drought has ushered into present-day Oldupai. For example, one revered elder explained that Maasai life is all about celebrations, yet another revealed that the region's aridity has resulted in more migrations and thus fewer *eseriani*-fostering community celebrations.

Like palaeoanthropological drought, the despised contemporary drought can also become a drought of the *past*. This initial collaborative effort and emergent standardized package was an interface that transmitted resources (Fujimura 1992), such as cash that has remained elusive to the Maasai. Regardless of one's stance regarding the global spread of capitalism and neoliberalism (Blim 2000:27-31; Crewe and Axelby 2013:89-90, 159), a Maasai man revealed that cash is becoming a vital resource to the Maasai: “[it is] all about the money”. Moreover, palaeoanthropologists have had much greater access to this key actant. One young warrior stated that “what we hate is when we do not get a job, when this is our land”, and I heard many similar views. Women proclaimed that they

enjoy sieving at excavation sites and washing dishes at research camps, while men said that they relish guarding and protecting excavations and important sites. SDS began to hire the Maasai for the latter during 2015, and in 2016, a Maasai man stated that “what we like – the first time last year, we saw you employed Maasai guards”. A laiguenani negotiated this involvement, ensuring no Maasai would guard sites alone, and a few days after, I was told that warriors “have to be more than one”. SDS later expanded these endeavours, hiring an entire team of Maasai women and men at excavations and at their camp.

Over the course of the seven year SDS partnership, the Maasai can use the money that they obtain through such employment – cash that originates from academic funding campaigns – to supplement their increasingly compromised pastoral livelihoods within a protected space where their options to diversify their livelihoods have continued to remain extremely limited (Cruikshank 1998:63-68; Galvin et al. 2008). Sought-after agricultural foods and fresh water were available at waystations through the NCA, yet the Maasai often lacked financial resources to acquire them during periods of extreme scarcity in the dry season. While this may be comparable to affixing a bandage onto a gaping structural wound, if the many groups of palaeoanthropologists who descend upon Oldupai during the dry season actively strive to make their work more relevant and beneficial to the Maasai, an accretion of small changes can lead to more substantial transformations that make periods of scarcity during the dry season less devastating. When I asked members of Maasai communities how palaeoanthropologists should address the challenging issues that the Maasai face, a young woman replied that

researchers can ensure that the Maasai “get jobs, [and] we can get water”, while a man explained that employment allows the Maasai to “get money to buy food”.

The homestead excavation was yet another example of the Maasai creatively acquiring resources in unfamiliar realms in order to continue their valued pastoral lifeways (Latour 1987:145-162). The Maasai revealed that opportunities to work with researchers can avert the need to travel great distances in the pursuit of urban employment. The supplementation acquired this way can hopefully obviate the unsustainable practice of selling pastoral livestock (Ingold 1980:231), and a local said that employment could help the Maasai reacquire animals that they had sold. Addressing becoming involved with palaeoanthropology, another local said that “due to dryness, you may move your cattle, but this remains an opportunity *here*” [emphasis added]. Thus, the Oldupai Maasai may not have to abandon their homes and seek water elsewhere, which in 2016 caused a violent and rare conflict. The Maasai would furnish places with names based on events that had occurred there in the past. Ultimately, Oldupai Gorge itself can become a boundary object that facilitates collaboration and communication (Star and Griesemer 1989), as it will cease to remain solely significant to researchers. These beneficial collaborative events, which the Maasai said would foster *eseriani*, can finally make the Gorge a place of unique and joyful significance to the Maasai who live around Oldupai. Moreover, with ubiquity of cell phones, I observed the Maasai using instant cash transfer services to send funds to family and friends who did not live near the Gorge. However, collaboration can provide myriad benefits to researchers and the Maasai alike.

SDS spokespeople initially proposed this collaboration and translated the interests of the local Maasai to align with those of the partnership, ensuring that Maasai

contributions to the new standardized package still addressed the emerging palaeoanthropological theories. However, at the homestead dig, researchers not only gained control stones for their residue analysis studies. Another of SDS's interests was engaging with local communities, a desire that had been difficult to meet due to the exigencies associated with rapidly collecting livelihood-sustaining traces of the past.

The laiguenani leader of the esteemed elder age-set, the Maasai spokesperson in this emergent standardized package who selected which locals would be participating in the homestead dig, also expertly negotiated Maasai participation in the collaboration by translating the interests of palaeoanthropologists so that they aligned with the Maasai's. To the Oldupai Maasai, an ideal to strive towards was *eseriani*, the peace of mind resulting from communication, unity, and addressing needs. As an influential conflict resolver, the laiguenani had just returned from the water-based conflict in the neighbouring Maasai community, since a laiguenani "know[s] how to talk with people. Make peace". More than just supplying elusive and greatly-desired monetary supplements, the collaborative dig nourished the highly-valued and sought-after *eseriani* in three primary ways: by establishing lines of communication between researchers and the Maasai, by finally bringing both groups together, and by addressing the drought. Moreover, he emphasised that in order for palaeoanthropologists to make their work more relevant and beneficial to the Maasai, which is an explicit interest of the SDS partnership going forward, they must consider the complex issues that the Maasai were facing. Reflecting on the idea of collaboration, the laiguenani leader said that "there is a lot of problems here for services. One is water, another is school, and hospitals. Those are important for society here. Then we will see the benefit of anthropologists here".

Water has to be the foundation of sustainable and long-term commitments, because as another local explained, “without water, teachers will not stay”. Most Maasai around Oldupai emphasised that local communities see no benefits nor no detriments to archaeological research conducted there. As one Maasai stated, “[researchers] take benefits home with them, leave us just watching”. Interviewees repeatedly stated that the Maasai seek to become engaged in palaeoanthropology, yet it seems that this information has not reached researchers. Countless Maasai decried that researchers were not hiring them, but were instead employing assistants from other regions in Tanzania. Reflecting on future collaboration between the Maasai and researchers, one interviewee postulated that it would “get archaeologists to consider issues that may seem minor”.

The new standardized package can increase the relevancy of palaeoanthropology in many ways, as information is another resource that the package can transmit. Unlike money, the movement of information will be multidirectional. One morning, a Maasai man said that contrary to what tour guides espouse, the Maasai do not hunt wild animals. He explained that each Maasai clan has a designated animal that they are assigned to protect, and the Maasai will kill a lion only if it continually attacks their cattle. Furthermore, many promoters, artists, and writers still conceive of and portray the Maasai as timeless and archaic, guided by the notion that the Maasai’s sophisticated pastoral livelihood actually entails ignorant overgrazing. In reality, the Maasai make calculated migrations, practice dynamic foraging strategies, masterfully analyse environmental conditions to establish the optimal composition and size of their herds, and sustainably utilise resources (Galaty 2002; Hodgson 2011:64-70; Nelson 2012). This thesis demonstrates and emphasises that there are no fundamental cognitive differences between

researchers and the Maasai, and the drought case study illustrates that the two groups have remained isolated from each other due to the exigencies of their subsistence practices.

This *practical* disconnect, not a result of nefarious intentions but rather of addressing necessities, has severed communication between the Maasai and researchers and has *created* what initially appeared to be primarily perspective-based differences between the groups. Yet as this ethnography has shown, there is no foundation for the notion that the Maasai's perspective on a singular reality/"natural" world is inferior or more clouded than that of scientists (Goldman et al. 2016; Latour 1993a:215-236; Latour 1993b:13-112). While the Maasai stressed that they had no idea why researchers are so engrossed by digging in the Gorge, most desired to be privy to palaeoanthropological discoveries about the deep past. Many of my Maasai collaborators explained that they had heard that researchers were *rumoured* to be seeking the "first man" to live in Oldupai. Thus, this "first man" had to be Maasai, as oral histories were clear that the Maasai were the first inhabitants of the area. As a consequence, some locals proclaimed offense at the excavation and disruption of their revered direct ancestors, who were not being permitted their deserved final rest. After having come across the mobile clean laboratory, one man thought that "maybe there is something kept there... maybe to keep cattle from destroying", while another posited that researchers were protecting themselves from the sun. Others made statements such as "I hear there is some important things that is of interest outside of our country", while one esteemed elder revealed that "we don't know what [researchers seek], but if we did, we would have searched for it. We are losers because we are ignorant. Those who are clever should eat, we are losers. It

has a certain value that has not been realised among us. We see the bones, tools, but we don't understand. They must have some sort of monetary value. This is why the researchers are here. If there is just scientific value, where do you get the money to come for lengths of time?" Another set of practices – the fresh standardized package – can curb these practice-based communication breakdowns.

These failures of communication demonstrate the need for palaeoanthropological researchers and the Maasai to connect, yet knowledge mobilisation will have to be multi-directional. More than correcting misinformed assumptions that foreign visitors may have about the Maasai, such as the erroneous idea that the Maasai hunt wildlife, the Maasai can contribute greatly to the new standardized package. The Maasai possess vast and sophisticated knowledge of the Oldupai area, which they traverse daily. The young Maasai elder who had brought me to a set of fossils that he had recently come across showcased this knowledge and skillset with the statement that opened this section: "[w]e know how to do this work. For example, we dig for water, very far away, can find bones". Each rainy season brings erosion, and with it, hidden troves of bones and stone tools begin to emerge around the vast Gorge. A young warrior proposed that he could learn how to identify potential dig sites so that he could probe the landscape while on his year-round livestock expeditions, and suggested that research teams employ the Maasai as research supervisors who can facilitate communication with the communities around Oldupai. As one young man said, "this is our land, we know everything".

This excavation of the Maasai homestead was the first instantiation of a standardized package that has the potential to become increasingly robust and inclusive as the SDS partnership progresses year after year. In an ANT framework, it is yet another

association between heterogeneous actants (Latour 2005), an assemblage that uniquely includes the inhabitants of Oldupai Gorge. The standardized package will facilitate collaboration *and* the establishment of facts (Fujimura 1992:169). Palaeoanthropologists will thus find assistance in producing publications essential to academic and scientific subsistence. However, the resultant facts will not only be those pertaining to palaeoanthropological reconstructions of the past. Following the homestead excavation, a Maasai excavator divulged that “today we like what we are doing. Because you say you work together with Maasai of the area, we saw today what you have done. The idea, we have been *talking near to the camp* [emphasis added]. We need to continue to cooperate. We appreciate it is true you are talking”. As outlined earlier, it is through this verbal exchange of information that Maasai oral traditions – facts – solidify. Thus, eseriani-nourishing collaboration – which may allow the Oldupai Maasai to continue their pastoral subsistence practices – can enter into new oral traditions and become a factual actant, rather than merely a sought-after ideal.

Standardized packages shape the conduct of collaborators (Fujimura 1992:176-177). Publications are vital to palaeoanthropological subsistence, yet collaboration with local communities is not a practice that immediately results in valuable papers that explore the deep past. Nonetheless, this new package will on one level ensure the observance of anti-contamination protocols for those involved with SDS’s work. Yet to the Maasai, contamination almost seemed to be that outsiders have continued to impose themselves on the area without considering local inhabitants. Importantly, on another level, SDS’s new associations with the Maasai – which as demonstrated were and will be beneficial to both local communities and to researchers – can gain potency and prompt

other groups of researchers to act accordingly (Latour 1993a:158-236). Beyond mere short-term monetary supplementation and information exchange, the standardized package may plant the seeds for a growth of Maasai interest in the cultural heritage that they have been excluded from for over a century, producing a new generation of Maasai scholars who can rectify palaeoanthropology's neocolonial present.

Chapter 5: Conclusion

Looking back, colonial-era archaeological researchers supplanted local populations by seizing cultural heritage and proclaiming Indigenous societies to be static and backwards (Murimbika and Moyo 2010:87-91; Trigger 1984:358-368). Similar to these past colonial practices, excavations on the African continent are still primarily conducted by foreign teams who displace Africans from their own countries' archaeological resources (Shepherd 2002:205; Wadley 2014:209). Archaeology has frequently neglected to attract and inspire African academics, and has failed to engage local communities in meaningful ways. Furthermore, divergences between institutions and such communities over the best use of archaeological sites can lead to degradation, as these sites often provide local publics with natural and cultural resources (Killick 2015:245-247; Murimbika and Moyo 2010:96-100; Willoughby 1991:74-84). Members of communities adjacent to dig sites may not recognise the multifaceted value of archaeological sites due to being continually *excluded* from heritage (Murimbika and Moyo 2010:96-100).

Palaeoanthropological archaeologists have ventured to Oldupai for over a century (Leakey 1978), yet an enduring and meaningful interface between palaeoanthropologists and the Maasai has yet to materialise. Visiting a site called *Juma's Korongo*, I and a few members of SDS explored the remnants of a former museum that had been built by Mary Leakey. Designed to showcase what her and her colleagues had initially thought was an ancient hominin gathering place of some sort, they abandoned the museum when the supposed home bases turned out to instead be the vestiges of ancient fish nests. In a context of exclusion and hardship, neighbouring Maasai communities made use of the

museum's walls and roof once it had closed. Going forward, SDS will systematically excavate Juma's Korongo, as the erosion that comes with seasonal rain had revealed that the locality was harbouring a plethora of stone tools. Notably, the team plans to continually collaborate with the Maasai communities around Juma's Korongo, which will further strengthen the fresh, holistic, productive, inclusive, and mutually beneficial standardized package. After scoping out the area, our team was invited to a wedding that the Maasai were celebrating right next to the site, and in the years to come, SDS hopes to refurbish the museum. The design and functions of the facility will be guided by the knowledge, needs, and aspirations of the local Maasai community.

While a growing number of university-educated Tanzanians have entered the discipline of palaeoanthropology and have furnished themselves with prosperous and stimulating careers, SDS has just begun to facilitate opportunities for the primarily rural-dwelling Maasai to engage with palaeoanthropological research, and the team is supporting Maasai students in post-secondary schooling. The Maasai are proud of their established pastoral lifeways (Galaty 2002:361-362) and have made many efforts to preserve it, but this does not mean that they are timeless and static, which many make the Maasai out to be (Galaty 2002; Hodgson 2011:64-70). Most Maasai told me that knowledge is not transferred to the next generation in schools but rather through oral traditions, yet in one such oral tradition, a young laibon prophet – who lived during the transition from colonial rule to independence and was warning the Maasai about coming challenges – proclaimed that the Maasai should “send children to school”. Local Maasai described their aspirations to attend school and to begin a career in anthropology, and

they said that education would allow them to have a voice and to contribute to discussions at the national level.

Nowadays, the wet season is a time of abundance for Oldupai's locals, as water bountifully flows through the Gorge. Each year, the rains also erode the walls of the Gorge and reveal undiscovered sources of palaeoanthropological treasures.

Unfortunately, the dry season has become an increasingly desperation-filled and lengthening period of thirst. The dry season is also the period in which researchers – possessing the financial and logistical means to comfortably adjust to the current drought – descend upon this flagship research destination. All societies are dynamic and influenced by historical events, yet to a researcher with a brief stint in the field, the societies she encounters can appear timeless and seem to feature rigid and endlessly-recurring social structures. To take a diachronic approach that many have deemed incongruent with shorter field seasons, researchers can investigate narratives (Rosaldo (1980:1-28), such as oral traditions.

The Maasai told me many narratives of *exclusion*, such as the historical loss of access to pasture and water. While *all* humans construct social/natural hybrids and therefore do not meet the definition of “modern” that so-called “modern” societies have set as a benchmark (Latour 1993b), the Maasai sought to acquire items and services that they deemed to be modern. Identities are never rigid; one present-guiding oral tradition emphasised that the Maasai can and must embrace certain aspects of what they associated with modernity, such as education, all the while still *being* authentically Maasai.

Reflecting on exclusive policies, one local announced that “we can change houses, but

keep the culture. Still Maasai”. Others sought to supplement their valued, yet compromised, ethnobotanical medicines with biomedicine.

Nearly every Maasai in Oldupai with whom I spoke proclaimed that engaging with palaeoanthropological research would be highly beneficial, yet when I asked if it was possible to do so and still be authentically Maasai, the answer was usually resoundingly affirmative. The Maasai are fully capable and willing to join palaeoanthropological research, and thus able to freely augment what people assume is a rigid group identity (Galaty 2002). It is the palaeoanthropologists – guided by influential cultural norms to “publish or perish” – who are currently less free to transform their academic identities, meaning that SDS’s shakeup to established and exclusive palaeoanthropological field research has the potential to make significant and lasting positive change.

This thesis is an inscription. As an academically-valued paper, my thesis will permit me to acquire my master’s degree and thus credibility, a crucial ingredient in academic funding cycles (Finlay 2014:145-181; Latour and Woolgar 1986:187-230; Rabinow 1996:19-31). However, to counter false representations and narratives of the Maasai as archaic and premodern, images that continue to shape practices that are detrimental to the Maasai, researchers need to construct counter-narratives (Galaty 2002). These empirically-just narratives must acknowledge and normalise the Maasai as fellow humans with human needs and aspirations; must recognise that the Maasai do regularly seek “modernity”, yet that many parties exclude them from it; and must demonstrate that like all of us, the Maasai take great pride in their culture and thus retain as many aspects

of it as possible (Galaty 2002:360-362). Beyond being an academically-valued inscription, this thesis is one such counter-narrative.

Over the preceding pages, I explored what initially appeared to be epistemic/perspective-based differences between the Maasai and researchers. In an epistemological account, it is assumed that various groups have differing perspectives on a singular ontological reality (Goldman et al. 2016:28), a reality that people often grant scientists a sole privileged access to (Goldman et al. 2016; Latour 1993a:215-236; Latour 1993b:13-112). However, this version of reality – which includes a purely “natural” realm that scientists are assumed to be more able than others to truthfully and accurately understand – is itself a product of the members of “modern” societies forging certain arrays of prominent associations that promote such a state of affairs (Latour 1987; Latour 1993a:212-217; Latour 1993b; Latour 2005; Mol 2002).

For this practice-centred ontological account (Goldman et al. 2016:28), I used actor-network theory to demonstrate that both the Maasai and palaeoanthropologists constructed knowledge in parallel and equally logical *forms*. Inside of their epistemic cultures (Knorr Cetina 2007:363), both groups brought novel data and various established facts and technologies into debates and discussions; out of which consensus, new facts, and fresh technologies emerged (Latour 1987; Latour 2005). Thus, instead of fundamental epistemic or cognitive differences between scientists and non-scientists (Latour 1993a:192-236), what differed was the *content* of assembled black boxes. This content was tied to and often shaped by each group’s contextual realities, such as established cultural practices and their subsistence strategies that had to effectively navigate large-scale political-economic forces, which were themselves massive

assemblages of actants (Latour 2005:1-93; Latour 1993b:96-124). Researchers and the Maasai both expertly acquired countless varieties of actants in non-scientific and non-pastoral worlds in order to support their respective livelihoods that they found great pride in (Latour 1987:45-162). Furthermore, both researchers and the Maasai created and multiplied reality by enacting composite, yet conflicting, versions (Mol 2002) of hybrid (Latour 1993b) drought: a sought-after ancient drought and a despised contemporary drought. Unfortunately, a variety of policy and decision makers have not legitimised nor recognised the Maasai's version (Goldman et al. 2016). The drought case study demonstrated that it was the exigencies associated with palaeoanthropological and Maasai subsistence that have been hindering the emergence of a meaningful and enduring interface between the groups, despite that members of both shared in the act of digging in the Gorge to address their thirst. Finally, an emerging standardized package (Fujimura 1992) seems to be facilitating resource sharing, information mobilisation, mutually beneficial collaboration, inclusivity, the proliferation of *eseriani*, and multiple varieties of factual stabilisation.

Rather than seeking a sole truth, researchers must maximise the good that can potentially emerge from their activities, and explore the contested intricacies of deciding what to *do* (Mol 2002:164-178). On many occasions, Maasai and palaeoanthropological reconstructions of the past aligned. Both elders and researchers taught younger generations that Oldupai Gorge was a lake in the deep past. Nonetheless, other Maasai oral traditions that claim primary occupation of the region are incongruent with research papers produced by university-based scholars, yet it does not matter if Maasai and

palaeoanthropological takes on Oldupai's past are not always identical. The goal must always be to maximise the good that research can generate.

Instead of conducting research solely guided to producing publications and other academic assets, academics have to attend to the aspirations of people who can potentially be affected by such endeavours, and must produce research that can be an asset to these communities (TallBear 2013:11-15). Early in the 2016 field season, one Maasai warrior lamented that “there is no future” for the communities around Oldupai. After discussing SDS's ensuing collaborations, an elder foretold that “in the coming days, Oldupai will be nice. I see the archaeologists here always. I believe we will get some water, also we will get more peace. More *eseriani*”. SDS is pioneering inclusive research in the field of palaeoanthropology, and it remains to be seen whether these new associations can gain enough potency (Latour 1993a:158-236) to get other researchers to begin doing the same. As a normalising and humanising narrative of the Maasai's exclusion (Galaty 2002), I hope that this thesis can contribute, by being an actant in forthcoming associations (Latour 2005:121-140), towards an *eseriani*-filled future in which the Maasai's devastating version of drought – like that of palaeoanthropologists – is firmly in the past and only a distant memory.

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