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Habituating field scientists

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Abstract

This article explores the sensory dimensions of scientific field research in the only region in the world where free-ranging bonobos (*Pan paniscus*) can be studied in their natural environment; the equatorial rainforest of the Democratic Republic of Congo. If, as sensory anthropologists have argued, the senses are developed, grown and honed in a given cultural and environmental milieu, how is it that field scientists come to dwell among familiarity in a world which is, at first, unfamiliar? This article builds upon previous anthropological and philosophical engagements with habituation that have critically examined primatologists' attempts to become 'neutral objects in the environment' in order to habituate wild apes to their presence. It does so by tracing the somatic modes of attention developed by European and North American researchers as they follow bonobos in these forests. The argument is that as environments, beings and their elements become familiar, they do not become 'neutral', but rather, suffused with meaning.

Keywords

anthropology of the senses, bonobos, field science, habituation, human-animal relations, place

Introduction

Through much of the 20th century, scientists were divided in their approaches to the study of animal behaviour. Comparative psychologists, based predominantly in the United States, examined their animals in laboratories. The observations and field experiments of the European ethologists, on the other hand, typically took place in an animal's natural environment. Habituation was of interest to both groups of scientists, but came to be significant in very different ways.

In the context of the lab, experiments were concerned with the *phenomenon* of habituation, commonly described as a form of learning in which an organism

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decreases its response or ceases to respond to a stimulus after repeated presentations. For the ethologists, by contrast, habituation came to be redeployed as a *technique* to facilitate scientific research in the field. Many wild animals, including primates, flee upon seeing humans. This is a major obstacle for field scientists interested in observing their behaviour. Unlike the 'hides' that early ethologists had used to deceive animals about their presence, habituation has enabled ethologists to observe animals in the open and more closely, and to follow them as they move through the landscape.

Canonical descriptions of habituation emphasize that the scientist must strive to become a 'neutral element' in the study animal's environment (Tutin and Fernandez, 1991). As the early American field primatologist Ray Carpenter (1934) wrote, the aim of field primatology was 'to observe the activity as it would have occurred had there been no observer present' (p. 22). Nonetheless, scientists have long debated the extent to which the behaviour of the animals they observe is affected by their presence (Crofoot et al., 2010).

Recently, practices of habituation have also become an object of social scientific and philosophical interest. Writing against the dominant narratives and debates of the scientists themselves, scholars such as Haraway (2003) and Despret (2013) have followed the primatologist Barbara Smuts (1999) in arguing that encounters in the field are characterized by *intersubjectivity*, and that animals typically 'know better' than to accept a researcher as a 'neutral object' (p. 109). What remains relatively overlooked in the analyses of both the scientists and the philosophers, however, is the background of a 'neutral environment' *tout court*. By contrast, this article seeks to draw the environment into the foreground of analysis. It does so with reference to research conducted with junior scientists who study free-ranging bonobo apes at a field site called Luikotale, near Salonga National Park, in the Democratic Republic of Congo.

Recent calls in animal behaviour science seek to examine the phenomenon of habituation in animals' *own* environments. In their study of predator avoidance in wild crabs, for example, Raderschall et al. (2011) argue that sensory information is often 'noisy' and that what we might call habituation – away from the laboratory context – involves attention to numerous environmental elements in association, rather than to one isolatable element.

Following older trends in Science and Technology Studies (STS) that emphasize the *circumstances* of scientific production (Knorr-Cetina, 1999; Latour and Woolgar, 1986), and more recent trends that emphasize the importance of place in scientific practice (Henke and Gieryn, 2007; Kohler, 2002; Walford, 2015), this article takes a sensory and phenomenological approach to the practice of scientific fieldwork in order to examine the ways in which researchers make themselves at home, and come to form habits, in the forest in which they live and work.

How do researchers come to 'dwell among familiarity' (to paraphrase Heidegger) in a world which is, at first, unfamiliar? In the animated environment of the rainforest, it soon becomes less clear what kind of verb 'habituate' is: Do researchers simply habituate to their environment? Do they habituate *themselves* to the elements of the forest through effort and reflexivity? Or might they be, in part, habituated by the forest and its beings?

Habituating bonobos

Bonobos (*Pan paniscus*) have been branded as the 'feminist, pacifist, vegan, Kama Sutra specialists of the nonhuman primates' (Stanford, 2012: 26) and have gained a certain celebrity in the last twenty years, in both scientific and public communities. There are two primary reasons for this. The first is that the bonobo, along with the common chimpanzee (*Pan troglodytes*), is the closest evolutionary cousin of *Homo sapiens*. The second is that whereas chimpanzees behave in accordance with many of the tenets of classical evolutionary theories of inter-group competition and male dominance, bonobos appear to defy them.

The notion that bonobos are 'feminists' and that bonobo society is 'matriarchal' originates from observations that females are often dominant to males (despite males being larger). Bonobos' reputation as 'pacific' originates in their peaceful inter-group encounters, which have been contrasted with chimpanzees' 'warmongering' attempts to claim territory and females from neighbouring communities. Where primatologist Richard Wrangham (Wrangham and Peterson, 1996) has argued that 'demonic' human male violence has an evolutionary heritage, others, most prominently Frans De Waal (2013), build upon Darwin's speculation that human morality grew out of prosocial tendencies in other animals, in order to challenge the view that morality is a thin veneer hiding a selfish, individualistic human nature. I have heard those who study bonobos in the wild express frustration with the presentation of both of these arguments. They argue that observations in the wild can foster a more nuanced and complex picture of bonobo social life.[1]

In order to study a 'community' of free-ranging bonobos, and tackle these behavioural questions, however, field scientists need first to habituate them to the presence of human observers.[2] Frustratingly for the scientists, bonobos are notoriously 'timid' and difficult to habituate (Van Krunkelsven et al., 1999). Both bonobos and chimpanzees live in what is known as a 'fission-fusion' social structure, in which a single community frequently divides into smaller subgroups (called 'parties'), which recombine according to the availability and distribution of resources. As a result of these fluid social dynamics, exposing and habituating each individual to human presence takes much longer than it would if the whole community of bonobos moved as a single cohesive unit. Bonobos, like chimpanzees, typically take around three years to habituate.

Bonobo habitat also impedes efforts to habituate the apes. They range over a large territory (which may be up to 50 km^2) that is almost entirely forested. Whether the bonobos are moving on the ground or in the trees, they are often partially concealed by either the leaves of the canopy or the terrestrial vegetation upon which they feed. Visibility can therefore be extremely low for human observers, making it difficult to find and follow bonobos – and to collect data. Past interactions with humans – and especially human hunters – also shape apes' responses to habituation. Researchers seldom come across naïve populations, and are often contending with negative associations that primates may have made with human presence, such as hunting or logging, which may increase their timid and cautious behaviour around humans.

Habituating animals is a very active process, and one that advances in incremental steps. Early in the process, bonobos make 'alarm calls' upon seeing humans, and rapidly

descend to the ground and flee. Habituation is then a repetitive process of losing and finding the bonobos again, with habituators often going several days without finding the bonobos, and with 'contact time' sometimes lasting only five minutes. After several months, bonobos gradually stop calling out in alarm, and they may even begin feeding peacefully in the trees with researchers below. Eventually, they can even be followed from 5–7 meters as they walk on the ground (researchers are required to keep that minimum distance, if possible), sometimes passing within a meter of habituators in order to collect fruit. This is when detailed behavioural observation and data collection can begin.

The bonobo's home range is limited to the left bank of the Congo River, and they therefore live exclusively in the DR Congo. In the 1970s, wild bonobo habituation began in parallel at two different field sites in the Equateur Province of what was then Zaïre. The 'Lomako Forest Pygmy Chimpanzee Project' (LFPCP) was started in 1973 by Noel and Alison Badrian, who began habituating two bonobo communities (Badrian and Badrian, 1977). Although they never succeeded in fully habituating either community, they and their successors published many of the pioneering papers on wild bonobo social organization, sexual behaviour, feeding ecology and locomotion.

In the same year that the Badrians set up their camp north of the Lomako River, the Japanese primatologist Takayoshi Kano, who had been travelling through Equateur Province by bicycle looking for a suitable site, settled several hundred kilometres to the southeast of the LFPCP site. In 1974, he and another primatologist, Suehisa Kuroda, began habituating a bonobo community. Initially they observed bonobos feeding in villagers' sugar cane fields, and then in 1978 they opened up an artificial sugar cane provisioning site in the forest in order to continue their documentation of behaviour and social organization. The provisioning of food enabled the Japanese primatologists to habituate their bonobo communities much faster than the Badrians had been able to, and to observe them in the open spaces of cleared fields. As a result, they were the first to document bonobo behaviour and social organization in some detail, and the first to point to female dominance and coalitions (Kano and Mulavwa, 1984).

Starting with the violent anti-Mobutu demonstrations in Kinshasa in 1991, and then during the First Congo War (1996–1997) and Second Congo War (1998–2003), wild bonobo research became intermittent and then ceased altogether. Following the wars, the Japanese returned to their study site and discovered that many of the bonobos had been killed or had otherwise disappeared (Furuichi and Mwanza, 2003). Around this time, new sites with a focus on conservation were being established elsewhere in DR Congo: at Lukuru, around Salonga National Park, and around Lac Tumba. Luikotale was one of these new sites, and is now the second-longest-running site to study communities of habituated bonobos.

Habituating scientists

In July 2012, I arrived at the Luikotale field site to work as a research assistant (RA) for two PhD students, Ira and Philip (the names of researchers are pseudonyms).[3] The site itself was established in 2001, in the forests of an Nkundu village called Lompole, by primatologists Gottfried Hohmann and Barbara Fruth.[4] During Congo's civil wars,

Hohmann and Fruth's (2003) previous bonobo habituation site, near to that of the LFPCP, had become inaccessible. In 1999, Hohmann was introduced to Lompole's forest by a young Swedish man, Jonas Eriksson, who had grown up in the area (his parents had been missionaries in the region), and was at that time conducting fieldwork for a PhD under Hohmann's supervision. Since 2002, the Luikotale Bonobo Project (LKBP) has been based at a field camp (Luikotale) located 20 km south of the village of Lompole, which receives payment from the Project in exchange for limiting hunting and fishing in the study site area. Several local men from the group of villages, collectively called Bolongo, also work at the camp as fishermen, cooks, porters and occasional bonobo trackers.[5]

The LKBP seeks to examine the socio-ecology of two adjacent bonobo communities. Habituation of the first bonobo community, the 'Bompusa community' of around forty bonobos, began in 2003. By 2007, research assistants had habituated the Bompusa community to a level at which they could begin collecting behavioural data on a daily basis.

Ira arrived in 2008 as a research assistant for a project examining male mate competition and its implications for both inter- and intra-sexual social relationships. When we arrived together in July 2012, it was his third trip to Luikotale, and he was planning a further twelve months of field research to collect data for his PhD on long-distance vocal communication. Philip was also beginning data collection for his PhD, which sought to examine gestural communication between mothers and infants, and had spent five months at the site. Ira and I joined Philip and a group of four other researchers, all of them working as assistants, either collecting data on the community of habituated bonobos or working towards habituating a second, neighbouring community to the east of the first. Another four researchers also arrived during my time at Luikotale, replacing those whose field season was over.

Since February 2002, Luikotale has been home to a continuous presence of young foreign researchers (between four and eight at any one time), local field assistants and occasional Congolese researchers from universities and institutes in Kinshasa. While senior scientists rarely spend more than a few weeks in the field at a time, junior researchers typically spend between six and twelve months continuously collecting behavioural and ecological data. This is not unusual; young researchers are at the centre of data collection at almost all long-term research stations for animal behaviour field science. Most of them are recent graduates with degrees in biology, ecology or animal behaviour, who are preparing to apply to postgraduate degree programs in the USA and Europe, for which a stint of lengthy and challenging field experience is thought to make them attractive candidates. Almost all have previous experience at other sites, and working with other primate species, such as geladas, mangabeys and several species of New World monkeys, or other social species, such as meerkats.

While I was at the site, the LKBP did not employ local people to undertake full-time work as guides, bonobo trackers or as research assistants collecting data – unlike many other great ape field sites in sub-Saharan Africa. This meant that the skills of tracking and following bonobos had to be learnt by the foreign researchers themselves. Job advertisements for the position of RA at Luikotale still emphasize 'above average physical fitness' and 'resistance to social and psychological stress', as well as the ability to live in a 'very remote and basic camp'.

Luikotale is known as one of the toughest field sites at which to do research, and exceptional in terms of its 'remoteness'. It can only be reached by chartered small aircraft; it is hundreds of kilometres from the nearest urban centre and hospital (although there is a small clinic in one of the nearby villages); certain foods (rice, coffee, sugar, milk powder) must be flown in from the capital, Kinshasa; and, given that there is no phone network nor internet, researchers have little communication with the wider world. Many of the researchers told me that the intense nature of the fieldwork appealed to them because, after several field experiences, they wanted to push themselves to the 'extremes' of field research.

As an RA at the site, I was more participant than participant-observer. I worked according to the same schedule as researchers: four days in a row following bonobos and collecting data ('forest days'), followed by one day off, usually to input observational and other data collected in field notebooks into computer spreadsheets ('data days'). I felt hunger pangs and lost weight due to the intense physical requirements of the work, I was soaked by thunderstorms and bitten by ants and I frequently lost items of equipment needed to record bonobo vocalizations. I became demoralized when walking through swamps and streams or when tangled in vines or patches of the forest from which it seemed impossible to escape. I also experienced the joy of small comforts, such as warm washing water on a rainy day, or a rare cake cooked by one of the researchers from the provision of flour, as well as peaceful moments in the forest reclining with and watching the bonobos, or moments of excitement when bonobos would hunt or engage in unusual behaviours. Most importantly, I learned to find and follow bonobos through a sensory engagement with the forest; I became faster and more agile in my movements and became more confident in my skills as a bonobo researcher.

Perhaps because of this immersion in the physicality of the work at Luikotale, I became interested in the sensual nature of the researchers' work and life in the forest. The anthropology of the senses has devoted considerable attention to the cultural phenomenology of the ways in which different groups of people develop different 'techniques of the senses', distinguishing, valuing and relating to the senses in everyday life as 'embodied forms and sensibilities' learned at an early age through 'child-socialization processes' (Geurts, 2003: 74). In this article, however, I am concerned less with the *longue durée* of sensory internalization, as with the ways in which junior scientists develop their senses, and become sensitized to certain 'elements in the environment' in the immediacy of a particular time and place.

Sensory science

In STS, a great deal of attention has been paid to the ways in which scientists see the world; how they come to know the world – and, of course, the knowledge they produce about it. In other realms of social life, sensory anthropologists have pointed to the equation made between seeing and knowing, and have attempted to move beyond the dominance of the 'higher senses', in order to examine other senses: smell, hearing, touch and balance, for example. The sensory and affective dimension of fieldwork in the natural sciences, however, remains largely unexplored.

Indeed, even the scientist's body remains understudied. Despret (2013) notes that scientists' bodies in field reports are often simply reduced to the abstract concept of 'the

presence' (p. 52). This is perhaps understandable, given that bodies are thought to interfere with the objectivity of scientific research, with field workers 'striv[ing] to remain detached, passive in external appearance, unresponsive to [the] overtures' of their animal subjects (Despret, 2013: 4).

In their non-scientific publications, however, primatologists themselves sometimes express frustration at not being able to write about their fieldwork experiences. As Schaller (1964), a primatologist who studied gorillas in the Virunga Mountains, notes,

> my previous work is a compendium of facts, discussing the apes as subjects to be studied, not as acquaintances whose activities my wife and I discussed at the end of the day. I have no space to reveal the enjoyment I derived from roaming across grassy plains and uninhabited forests and climbing mist-shrouded mountains. (p. 12)

In their memoirs, primatologists often devote much of their writing to such experiences; from the 'thrill' of encountering a new baby (Robbins, 2014: 163) to simple sensory experiences such as the 'smell of rotten wood and wet vegetation' (Van Lawick-Goodall, 1971: 57).

Despret (2013) and Herzig (2004) are right to argue that any aversion to the body evidenced in scientific publications should not extend to the work of STS scholars. In attempting to bring the bodies and sensory experiences of Luikotale researchers to the fore, I take inspiration from the work of feminist STS scholars, such as Haraway (1989) and Barad (2003), who demonstrate the ways in which the subjects and objects of scientific practice are always in the making, as well as Despret (2013), who attends to the ways in which scientists 'undo and redo' their own bodies in order to interact with their animal research subjects.

I also follow Myers and Dumit (2011), who suggest that to really understand scientific practices of 'becoming-with', and the shifting, tentative, and precarious nature of scientists and their objects of research, one must keep pace with scientists as they get tangled up – in their forests, their research subjects, their techniques and technologies. This article therefore seeks to go beyond the work of historians and sociologists of primatology such as Haraway (1989) and Rees (2007), by following primatologists into the field. An attention to the kinaesthetic, affective and conceptual dexterities which scientists acquire through their work enables the ethnographer to speak to the relation between movement, bodies, feeling, and meaning.

Following bonobos

How might one conceive of the senses that shape bonobo experiences of the world? Unlike Nagel's (1974) proverbial bat, whose sensory echolocation makes her experience of her world difficult for human beings to imagine, humans share many sensory apparatus with bonobos. Both have forward-facing eyes, with colour vision adapted to noticing subtle changes in the colour of fruits (indicating ripeness), and binocular vision enabling them to judge depth and distance (when moving between branches at speed, for example). Like humans, bonobos' olfactory sensitivity is less well developed than it is in many other animals, but their taste buds are sensitive and they have relatively good hearing (often

communicating vocally across distances of up to 800 m). Adult bonobos are about half the size of humans, and weigh around 30–40 kg. While they do spend several hours of each day feeding high in the canopy, they travel terrestrially, moving rapidly through the undergrowth and sometimes covering 10 km in a day.

When researchers first arrive at Luikotale, they almost inevitably find work in the forest difficult: Days are long and the work of finding and following bonobos is impeded by vegetation, which can trip or tangle in clothes and equipment, by irritating insects (including more troublesome insects like wasps, bees and driver ants), as well as by swamps and streams. Piper was a research assistant at Luikotale in 2012. 'For the first few months,' she explained to me one day, 'I was very frustrated with how clumsy I was in the field (think drunken, blind elephant tripping every two steps); this made me feel inept and quite insecure about my abilities as a researcher.'

Viola, a PhD researcher, also described feeling 'like a fumbling idiot' at the beginning of her first field season, although she did not associate this with being a bad researcher. Instead, her anxieties about being a good researcher centred on her ability to keep a visual on all of the bonobos in a feeding tree in order to get good data. This work, however, is also impeded by vegetation, poor visibility, heat, exhaustion and irritating insects (such as sweat bees, which crawl and fly in their hundreds around researchers' faces and into their eyes and ears).

During my first few weeks at Luikotale, one RA, Mark, who had been at the study site for eight months already, explained how for him the forest had transformed from a hostile place into one in which he felt safe and at home. He attributed this change to his own affective orientation to the forest; once he had stopped fearing it, and seeing it as alien, he had begun to open himself to it, and had been able to feel emplaced and grounded.

The forest is the place in which researchers cultivate a somatic awareness of the elements of most salience to bonobos. They cultivate this awareness through a sensory engagement with these elements and through an imitation of the movements and actions of the bonobos and of their colleagues. In what follows, I focus not so much on data collection itself, as on the techniques researchers develop in order to be in a position to collect this data.

Cultivating somatic awareness

Researchers at Luikotale rely on their bodies in order to find and follow bonobos, as well as in order to respond to their moods and movements. They have very little equipment in the forest; most have simply a pen, notebook and pair of binoculars. In order to make their way through the forest, some carry a pair of secateurs, which they learn to use as they move, deftly clipping vines and saplings in order to clear their path. Some hold their secateurs almost permanently in one hand as they move through the forest, barely looking at what they cut. Others have them attached to their belt with string, and pull them from a pocket when they are needed.

Researchers leave the camp early in the morning – a few hours before dawn, and sometimes as early as 3:00 am – in order to walk the 4–7 km to the bonobos' nesting site and to arrive before the bonobos begin to stir. They pull on their sneakers or walking shoes, and their field shirt and pants (often soiled from the previous day, and dew-covered

from hanging on the line – occasionally with a cockroach up a sleeve), and walk briskly towards the fallen log marking the entrance into the forest. One walks behind the other, their breath visible in the cool air, nocturnal insects humming as their headlamps dance over tree roots in the darkness of the pre-dawn forest. The primary trail is well-trodden and maintained, leaf-covered and one or one-and-a-half meters wide. Depending on how far east or west the bonobos have nested, the researchers may also take one of the half dozen smaller trails that branch off from the main one, in order to get closer to the nesting site. These trails are often less than half a meter wide and occasionally rendered more difficult to navigate by fallen trees and streams.

The later in the morning one arrives at the nesting site, the more likely one is to be met with its characteristic smell of bonobo urine and faeces. As the researchers sit and wait for the bonobos to emerge, blues and greys dapple the canopy, birdsong begins and the intermittent crepuscular sounds of insects give way to the dawn chorus of the forest. The bonobos' movements increase and soft vocalizations can be heard between mother and infant bonobos, or occasionally higher-pitched and louder vocalizations, along with the rustling of the canopy, indicating either copulations or contretemps – or both. The spattering of urine and faeces on understory leaves is either ignored, or attended to with interest by researchers in search of hormonal samples. If two parties of bonobos have nested in close proximity, then they often call back and forth to each other. After a while, males begin to make their way down to the forest floor. They are followed by adolescents and eventually by adult females and their infants. Typically, only when the dominant females have descended does the party move off.

The pair of researchers in the forest follows the bonobos, walking quickly with them when they travel, and stopping to rest with them when they feed or when they pause to groom and relax. Back in camp, meanwhile, those on the rota for the afternoon shift prepare themselves to receive an SMS message on the satellite phone (radio communication is unreliable for more than 500 meters in the forest). This message, sent by the morning team, gives them the current location of the bonobos, and sometimes a direction of travel. They then walk through the hot camp to the edge of the forest, the buzz of insects suddenly thickening the air around them, just as the enclosing canopy simultaneously cools it. They follow the path taken by the others that morning, walking faster than their colleagues had been able to in the darkness, sweat beginning to bead on their foreheads. In the heat and colour of the day, they experience the rapidly shifting intensities of the forest more acutely, emerging into unexpectedly hot or thick patches, noting changes in smells, quality of air, density and type of vegetation.

To overcome low visibility, bonobos locate each other using vocal communication. It is this long-distance communication that Ira studies. Bonobos produce long distance calls, known as 'high hoots' (Hohmann and Fruth, 1994) when they are separated from other parties. In order to pick up on subtle differences in these calls and to make sense of what they might mean, Ira analyses his recordings with a spectrogram, which furnishes him with a visual representation of the calls. His data have demonstrated that when bonobos combine their high hoots with a preceding 'whistle', this is very often followed by the movement of the calling bonobo to the responding party. The spectrogram in Figure 1 is an example of a 'whistle-high hoot' uttered by a lone male searching for another party. The initial 'squiggle' visible on the spectrogram represents the 'whistle'.

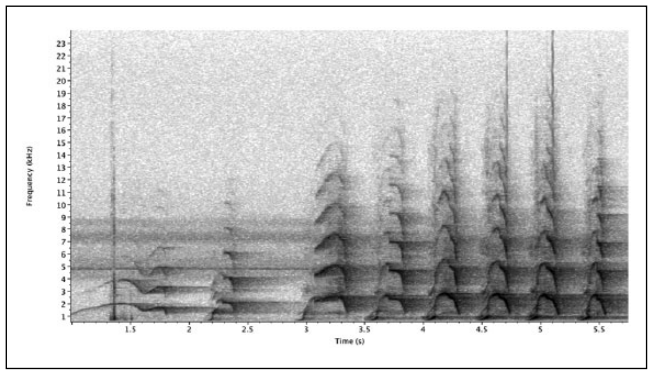

Figure 1. Spectrogram depicting the 'whistle-high hoot' of the adult male bonobo

Figure 2. Ira recording bonobos with his microphone and digital recorder. © Lys Alcayna-Stevens (2012).

The 'noise' in the background of the spectrogram is a visual reminder of the unbroken chorus of birds, insects and amphibians with which researchers' and bonobos' lives are suffused. The initial dark peak represents the sound of Ira's microphone knocking his cumbersome Marantz digital recorder as he lifts it higher to capture bonobo vocalizations (Figure 2). This peak reminds us of the equipment and technology integral to Ira's data collection. More importantly, however, it also recalls that his primary instrument of research – the thing that moves the microphone when he hears the sound he is waiting for – is his own body: his senses, his being, and his ability to find, follow and identify bonobos.

Researchers' methods and data collection practices often shape how they come to know the bonobos. For example, certain protocols allow researchers to relax when their focal animal is out of sight, or to collect *ad lib* data or film behaviours during rapidly unfolding social interactions. Differing data collection protocols lead to a development of different sensitivities. Karen, a PhD student working on female competition and dominance in the context of feeding, documented feeding trees with meticulous care (marking the tree itself and noting its location on GPS), and had an excellent mental map of the bonobos' favourite fruiting trees and their degree of ripeness. She was therefore one of

the best researchers at intuiting where lost bonobos might be congregating. Ira, on the other hand, had a greater interest in differentiating and decoding bonobo vocalizations, be they contest hoots, high hoots, conflict screams, pant grunts, peeps or threat barks.

Whether they were aware of the meaning of different vocalizations or not, all researchers used their hearing to locate bonobos. Bonobos are easily lost as they move rapidly and silently through the dense vegetation, and can melt out of view when they are travelling on the ground. However, given that lost bonobos can mean hours or days of missed data, researchers are often very anxious to find them again, both for their own data collection and as a duty to their colleagues.

When searching, researchers frequent the parts of the forest in which bonobo parties have been moving recently or in which they were last seen, and listen for the sounds of bonobos jumping through trees or the sounds of playing and laughter; they listen for the distinctive popping sound of certain fruits (*Dialium spp.*) as they are eaten or the sound of plant stems (*Haumania*) being torn and eaten, or branches being manipulated to build nests. What they hope to hear, though, are the loud calls or high hoots, which can carry over several hundred meters and give them a sense of the group composition of a party, and, if repeated, of the speed and direction of travel.

While sounds and smells, such as the odour plumes of rotting fruits or the scent of a recently present bonobo, often assist researchers in finding lost bonobos, vision remains central to primatological data collection. Most behavioural data is collected by focusing on specific individuals using 'focal animal sampling', or by measuring party composition using 'scan sampling' (Altmann, 1974). Seeing also becomes of the utmost importance in being able to identify individual bonobos. When very little is visible through dense foliage, and when subjects move fast in social situations of heightened excitement (particularly in cases of aggression or during copulations), researchers must be able to identify individual bonobos almost intuitively, from the shape of their genitalia, the tint of their fur, the build of their bodies, a hand, a foot or the glimpse of a face. Without an identification, much data is useless.

In thinking about their initial attempts to identify individuals, researchers often recalled their frustration that there was not more teaching on the part of colleagues. Like much of the somatic awareness researchers needed to develop, coming to recognize individual bonobos was understood to be a Gestalt experience. In the words of Mark, a research assistant working on female mate competition, after months of patience 'one recognizes bonobos naturally, like seeing a well-known person in a group of people, just because of his way of moving'.

Learning from others

As primatologists Cheney and Seyfarth (2007) have argued, any conceptualization of a primate's 'environment' must take into account both physical *and* social elements. For example, bonobos' palpable excitement upon entering a fruiting tree does not seem to be purely about the fruit they will shortly consume. Fruiting trees are also the locations at which parties of bonobos, which have been foraging separately, come together to feed communally. Furthermore, recent research has suggested that sociality is important in habituation. Samuni et al. (2014) collected data that indicated that the immigration of

two well-habituated females from a neighbouring community hastened the habituation of other, non-habituated chimpanzees. They argue that primates can 'learn' to be habituated to human presence from other members of their community.

Contrary to criticisms that would suggest that a phenomenological approach fails to appreciate the social dimensions of experience, Csordas (1993) writes that somatic modes of attention are 'culturally elaborated ways of attending to and with one's body in surroundings that include the embodied presence of others' (pp. 138–139). And yet, as Wacquant (2004) suggests, such an approach also allows the social scientist to appreciate that 'the social agent is before anything else a being of flesh, nerves, and senses' (p. vii). In what follows, I will examine how researchers come to learn how to move through the forest through an attention to the bodies of others – bonobo and human.

In her study of popularized accounts of primatological research in the field, Rees (2007) has noted that the primates under study were often presented by primatologists as 'knowledgeable actors, and even instructors, with necessary skills for surviving in the particular environment, skills which must be learnt by the researchers both as quasi-group members and as scientists' (p. 887). Indeed, researchers often said that bonobos knew the easiest ways to get through thicket, or swampy parts of the forest, or how to get around ravines and where to cross streams. Furthermore, they often sampled the fruits bonobos fed on.

When following bonobos, the onus is on researchers to remain aware of the bonobos' movements and readiness to travel. Just as bonobos carefully watch the high-ranking older females of the group for signs that the party is about to move, so too must researchers attune themselves to the twitches and glances of the bonobos, and new researchers to the twitches and glances of their senior colleagues. But this attention also becomes habitual. While inexperienced researchers must exert themselves in watching carefully for cues, more experienced researchers talk about simply 'feeling' when the bonobos are ready to move.

When they are separated from each other (or when handing over to the afternoon shift), researchers face the same problem as do separated bonobo parties: They lose sight of each other almost instantly. Like a lost bonobo, lost researchers call out to colleagues in order to locate them; unlike bonobos, researchers then use a compass to orient themselves in the direction of their response and then walk as quickly as possible to catch up with them. Researchers use a long and loud high-pitched call, known as a 'whoop', in order to find each other. Whoop variations occur at many forested field sites, and at Luikotale, the whoop bears some similarity to the call used by the people of Bolongo. The spectrogram pictured here (Figure 3) shows one of my own whoops, uttered after a few weeks at Luikotale, on an afternoon when I had lost Ira and the bonobos.

Genealogies are visible in these spectrograms; if it were placed alongside others, mine would most closely resemble Ira's, while the calls of many other researchers would more closely resemble those of Heather, a PhD researcher who has spent longer at Luikotale than almost any other researcher, and who has taught many of them how to whoop (Ira's whoop has a long note at the beginning before the loudest point, whereas Heather's has a short first note and a much more drawn out second note).

Feld (2012) uses the concept of 'acoustemology', or acoustic epistemology, to explore the ways in which sounding and the sensual experiencing of sound can shape a particular

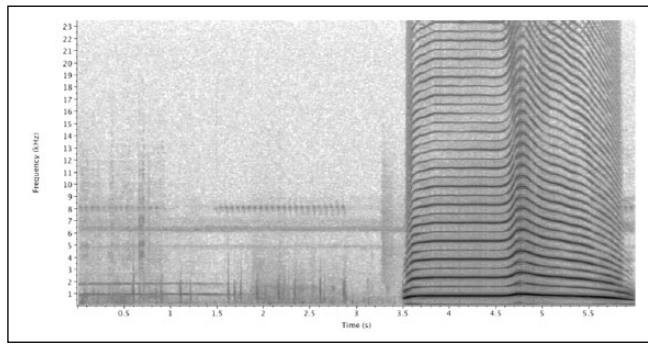

Figure 3. A spectrogram of my own 'whoop'.

way of knowing. Researchers' whoops provide a way of thinking about the senses not simply as a means through which to take in the world, but as a means through which they interact with the world. In approaching bonobos, researchers sometimes whistle, cough or tear leaves, so as not to surprise them. Similarly, when walking through the forest at dawn or dusk, some sing or talk loudly so as not to startle dozing elephants.

Inhabiting the forest

Researchers' protocols often require focussed attention in order to keep track of their 'focal animal' and its movements, both in order to follow the animals, and in order to collect continuous data on their behaviours.[6] Binoculars facilitate this kind of focus, as researchers literally zoom in and blur out all other distractions. When looked at through binoculars, bonobos appear less obscured by foliage than they do with the naked eye. And yet, researchers must also develop other kinds of attention.

When they search for bonobos, for example, their attention cannot be focussed, but must be dispersed and open. Researchers scan the ground for signs that the bonobos have passed, but they cannot be said to be *looking* in quite the same way as when they are looking through binoculars. Instead, they are open to shapes and patterns which are significant and meaningful to them. In many ways, they simply trust their eye to be 'caught' by such patterns. It is through a learned familiarity with the shape of a broken and blackening stalk of *Haumania* (which has gained salience because of its importance to bonobos, and its importance to researchers in finding bonobos), that researchers are able to spot these stalks as they lie camouflaged (to the untrained eye) amidst other leaves and vegetation.

When making the long walk to or from a nesting site, or else when the bonobos are lost and researchers must walk the trails in search of them, the forest is also revealed to researchers in myriad other ways. The chorus of birds, insects and frogs in the forest is unbroken, but it is not consistent. It changes as one moves through different habitats and is punctuated by sounds researchers associate with animals they know by sight or name: the black mangabey, the turaco, the large hornbill.

The soundscape changes as one moves through different habitats or from day into night. As the forest is submerged in a darkness punctuated by bioluminescent flies,

researchers hear the occasional cry of a hyrax, what they describe as 'car alarm' cicadas, an owl or the unmistakable amplified honking of a bat (for which they most often use the onomatopoeic, local Lonkundu name, *bonko*). As the morning mist clears, by contrast, they might hear monkeys jumping through the canopy, chattering and alarm-calling, or bush pigs snuffling and bellowing among tree roots, or a small duiker whistling, its white tail bobbing as it flees into the forest.

Sometimes the forest evokes olfactory memories: geranium, sandalwood, cucumber, peanut butter. At other times a musky odour gathers. Sometimes it is the identifiable scent of a monkey sleeping site, at other times it is more mysterious – leopard or elephant, perhaps? As researchers approach streams or patches of swamp, the chorus of amphibians rises and the light changes, shimmering on the water and accentuated by phosphorescent fungi and algae. At other times, the tone and intensity of the forest appears to shift for no discernible reason; one moves from a patch of forest which was cool, moist and dark, to one which is suddenly hot and close, where the sound of insects intensifies along with the feeling of claustrophobia. Sometimes the way the forest thickens and thins is audible and the earthiness and moisture of a rotting log can be tasted in the air.

To newly arrived researchers, the forest appears chaotic, tangled and impenetrable. To paraphrase William James, it 'blooms and buzzes' with manifold beings. As they walk through it each day, however, following, observing and imitating bonobos (and other researchers), elements in the forest begin to emerge and to 'make sense'. These elements are often those that have the most salience for bonobos: fruiting trees, edible fruits, herbaceous vegetation and pathways.

Semiotic environments

Unlike ethologists at savannah field sites, Luikotale researchers cannot rely on land cruisers to carry them from one part of the bonobos' home range to another. For them, the forest extends along a network of well-trodden paths and trails, and in the 'off-the-trail' patches of forest used extensively by the bonobos.

I find Ingold's concept of the 'wayfarer' productive here. The wayfarer 'in his perambulations, lays a trail on the ground in the form of footprints, paths and tracks' (Ingold, 2011: 47). Researchers wend their ways through the rhizomes of the forest, the exposed roots and vines. Moss-covered logs crumble beneath their feet to reveal that they are made of something that looks like soil, which is itself nothing more than myriad roots and a thin layer of decomposing matter.

Within the forest, researchers encounter the imprints of successive comings and goings. The most important trail, known simply as 'B' for the Badzungu River to which it runs parallel, was once an elephant trail, and was subsequently used by the people of Lompole to hunt elephants. Throughout the forest, one can encounter secondary vegetation, indicating former human settlements (*mpumba*), as well as small clearings indicating former hunting camps, human gardens or elephant gatherings. Bonobos, along with other frugivorous and herbivorous animals, leave traces of their presence in the forest vegetation, not only in the form of their paths and nests, but through their inadvertent gardening in the dispersal of undigested seeds (Beaune et al., 2013).

As they learn to inhabit the forest through movement, researchers become adept at noticing and using the paths formed by the journeying of other mammals (elephants, ungulates and pigs). Bonobos, too, make use of these paths. New routes become entrenched as researchers follow bonobos into deeper, more tangled undergrowth and cut their way through the vegetation in order to keep up. Even when they feel themselves to be deep in the 'untouched' forest, however, researchers will often encounter cut marks left by the secateurs of another researcher, weeks, months, or years before. The forest is a palimpsest of memories, traces and echoes of other times, animals and people: names carved into trees, trails named after former workers or researchers, and parts of the forest rendered particularly meaningful for the events which took place there.

Researchers use the traces left by bonobos (urine, faeces, half-eaten fruit) to locate and follow them, and to monitor what they eat, how many sleeping nests they build and how they use the vegetation in more inventive ways. However, researchers also make use of the traces of their own presence in the *memories* of habituated bonobos. The practice of habituation would have little effect if it were not for these traces.

Association

How might one conceive of bonobo habituation in the conventional sense? Canonical understandings suggest that bonobos become habituated to 'human presence'. But what can this broad concept mean in such a context? In order to rethink habituation, one might point to Thelma Rowell's understanding (quoted in Despret, 2014), which focuses on the animals' pragmatic interest in the human observer (Rowell is a primatologist and 'sheepologist'). In describing her work with blue monkeys, she recalls that eagles, which typically capture and eat the monkeys, would fly around overhead, but would not attack when human observers were present. As she puts it, 'if they look down, of course they have very good eyesight, they see a face looking up … which is very off-putting if you are thinking of catching a monkey' (in Despret, 2014: 134). She goes on to suggest that the monkeys may have become habituated in part because 'they realized that, by allowing us to be with them, they were being protected from the eagles'. In the forest, unlike the lab, it becomes difficult to isolate elements (e.g. humans) from their association with others (e.g. eagles – or the lack thereof).

Researchers say that habituation is a process without end. For example, despite the fact that formal habituation was completed in 2007, Ira thinks that the bonobos were even more habituated during his last field season (in April 2014) than they had been the year before. Other researchers muse about whether it is even possible to 'fully habituate' bonobos at all. They point to the fact that bonobos still react to certain human behaviours, such as sneezing, talking loudly or tripping over branches and roots. Bonobos are often described as neophobic, and it is not difficult to imagine that if researchers began to behave in an unfamiliar way or to interact with other elements in the environment in a novel way, bonobos would either become curious or alarmed.

In outlining the conceptual dissonance between Despret's (2004) account of 'reciprocal domestication', and meerkat scientists' own rejection of the term 'domestication' to describe their work of habituation, Candea (2013) suggests that the crucial difference in conceptualization centres on the question of what should count as 'the object' to be

studied. Candea argues that for the scientists, whole meerkats are not in fact the object of study; they are simply a good model for asking empirical questions concerned with subsets of their *behaviour* (such as cooperation).

Perhaps bonobos, like animal field scientists, are sometimes more interested in units of behaviour than in holistic organisms? Indeed, it does not seem to be humans, either as whole organisms or as a class of beings, to whom bonobos have habituated, but rather those individuals and behaviours with which they have become most familiar. Researchers note, for example, that bonobos seem more agitated when they are followed by a new researcher.

Bonobos can be described as world-bearers; they live in a world of meaning, in which some things matter more than others. However, the elements of their environment do not appear to become neutral or to blend into the background. It appears, rather, that those elements remain salient to bonobos even when they are familiar, simply because of the possibility that they might do something unfamiliar. In many cases, those other 'elements' are themselves world-bearers too, after all. One might even ask, provocatively, whether any element exists in the forest that does not *also* have a world of its own?

Certainly, when one is moving through it, one often feels as though the forest is *nothing but* a nexus of world-bearers. Among the shadows of the trees and their canopy, one is watched by countless pairs of eyes, most of these invisible. Even animals as large as elephants can stand in the shadows, unnoticed. Others move quietly through the undergrowth: forest antelope, leopards, civets, genets and duikers. In the canopy, birds and monkeys chatter and hop or leap, while dwarf pangolin and galagos pause and listen. Even the plants seem to travel and react to the 'presences' of other beings. The trees and vines, although more slowly, are constantly moving as they push their way towards light or food, attaching themselves to other plants, creeping, growing, retreating, flinching. One struggles, in the forest, to find anything that is not alive – or part of something which was once alive. Even a decaying log, or 'treefall' as it is colloquially known, is colonized by insects, fungi and mosses.

Muscular consciousness

Building on the phenomenological work of Husserl, for whom walking is the experience by which we understand our body in relation to the world, Ingold (2004: 327) notes, with surprise, that in Goffman's (1971) study of walking in a contemporary city, he describes it as an almost exclusively *visual* activity. When they first arrive, researchers have a tendency towards such visual walking, and they are often teased by others about the amount that they look at their feet, the forest floor, or their compass. Once they become accustomed to walking in the forest, however, they begin to feel their way through it, relying on the way the forest floor *feels* to their feet and bodies. Ducking and twisting, they focus on their sense of balance, and rely less and less on secateurs to cut themselves a path, searching instead for the paths and clearings made by the movements of innumerable smaller forest animals.

When I first started to walk through the forest and my trouser leg snagged on something, I would immediately fear that I might have been bitten by a snake. However, I gradually came to recognize the different kinds of snagging sensations and what they

indicated; I could feel whether I had caught on a thin but tough vine and needed a deft twist of the ankle to extricate myself, or a more brittle stem upon which I could tug, or a woody vine covered with spines that I would need to remove carefully from my leg. Beyond the bonobos and other animals, researchers also negotiate space with these vegetal beings. And yet, this negotiation does not exactly take the form of communication.

How should researchers orient their bodies vis-à-vis beings who do not communicate with eyebrow flashes and other gestures (cf. Smuts, 1999)? Philosophers, historians and anthropologists of science have emphasized the intersubjectivity and negotiation necessary in being-with other living beings. But can one be a 'polite guest' (Haraway, 2008) in the intimate entanglements through which the forest comes to habituate researchers? In such cases, the focus on 'perspective-taking' that has been privileged by many of those writing on human-animal relations (e.g. Despret, 2013) does not seem to apply. While they do indeed have their own complex forms of communication, if researchers are to engage with plants, it must be through an altogether different dialogue.[7]

Drawing on William James' work on emotion, Despret (2004) suggests that to have a body is to learn to be affected, meaning 'effectuated', moved, or put into motion by other entities. Similarly, in his examination of learning to become a 'nose' for the perfume industry, Latour (2004) writes that 'by focusing on the body, one is immediately – or rather, mediately – directed to what the body has become aware of' and that 'acquiring a body is thus a progressive enterprise that produces at once a sensory medium and a sensitive world' (p. 206).

But what of the world? How to think about researchers and bonobos' 'attunement' (Despret, 2013) to the flora and fauna of the forest? I find Bachelard's (1964) brief reference to 'muscular consciousness' evocative in considering the ways in which movements are not simply the result of an imprinted 'muscle memory' (p. 11) but rather a dynamic, changing and embodied ability, which enables skilled movement in novel situations through which researchers become attuned to the slower movements (the pushing, twisting and tangling) and properties of vines, saplings and branches.

Conclusion

A commitment to the principle of 'ecological validity' (that behaviours can best be understood in the context within which they evolved) means that field scientists are often willing to forgo the systematic, reproducible and tightly controlled nature of experimental research. It is the complexity of the bonobos' environment that they seek to examine.

In order to do so, however, canonical descriptions of habituation argue that the scientist must strive to become a 'neutral element' in the study animal's environment. While previous STS engagements with the practice of habituation have questioned the 'neutrality' of the human observer, they have not questioned the implied neutrality of 'elements' of the environment. In order to do so, this article has attempted to bring experiences of the environment into the foreground of analysis. I have argued that as environments, beings and their elements become familiar, they do not become neutral, but suffused with meaning – as well as the potential for unpredictability.

This article has not sought to redefine habituation, but rather to explore the range of phenomena, feelings and associations through which researchers gain familiarity with

the environment and beings with which they work. In order to do so, I have focussed on researchers' bodies, senses and their cultivation of a somatic awareness of bonobo movements, habits, intentions and environments. Researchers' bodies and beings are crucial to every level of their work, from walking into the forest, to finding and following bonobos, identifying them and collecting data.

In the environment of the forest, there are no isolated stimuli, and habituation is made possible through familiarity. It is through familiarity that bonobos come to tolerate the activities of researchers, and through a perceptual and muscular familiarity that researchers develop the habits necessary to negotiate movement through the forest and work with the bonobos and each other. It is this embodied familiarity that makes their data collection possible. Such embodied forms of knowing, sensing, feeling and relating in scientific research environments are an important part of practice in the field which should not be overlooked.

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Notes

1. In the wild, primatologists regularly observe bonobos hunting other primates, rodents and duikers (Surbeck et al., 2009), have documented an instance of cannibalism of an infant bonobo (Fowler and Hohmann, 2010) and have even witnessed an aggressive attack between bonobos which Hohmann and Fruth (2011) believe may have been lethal.
2. Bertolani and Boesch (2008) provide an excellent description of the habituation of chimpanzees in Taï National Park (Côte d'Ivoire), and Van Krunkelsven et al. (1999) and Narat et al (2015) provide accounts of bonobo habituation.
3. This article draws upon my experiences at Luikotale and extensive retrospective interviews with nineteen researchers who have worked at the site from 2003–2015, as well as other primatologists, both junior and senior.
4. For detailed ethnographic and historical work on the Nkundu people, see Brandstetter (1998).
5. The people of Lompole enter the parts of their forest not used by researchers each day for shifting cultivation (mostly cassava, corn, sugarcane, and plantains), hunting (using rifles, snares, dogs, bow and arrows, and spears), fishing, and gathering.
6. Most researchers have a 'focal animal' (which changes every few minutes, or every few days, depending on the kind of data they are collecting) which they must keep sight of, recording a predetermined set of behaviours related to their research (e.g. food eaten by bonobos, the vocalizations they produce, or their social interactions).

7. Darwin (1897) wrote a series of botanical books, culminating in *The Power of Movement in Plants*, which demonstrated that insect-eating plants made use of electrical currents to move, just as animals did. Contemporary research suggests that plants have sensory apparatus, which Darwin called 'devices', capable of registering what we would call sights, sounds, tactile signals, pain and much more (Chamovitz, 2012).

References

Alcayna-Stevens L (2012) Inalienable worlds: Inter-species relations, perspectives and 'double-think' in a Catalonian chimpanzee sanctuary. *The Cambridge Journal of Anthropology* 30(2): 82–100.

Altmann J (1974) Observational study of behavior: Sampling methods. *Behaviour* 49(3/4): 227–266.

Bachelard G (1964) *The Poetics of Space* (trans. M Jolas). Boston, MA: Beacon Press.

Badrian A and Badrian N (1977) Pygmy chimpanzees. *Oryx* 12: 463–468.

Barad K (2003) Posthumanist performativity: Toward an understanding of how matter comes to matter. *Signs* 28(3): 801–831.

Beaune D, Bretagnolle F, Bollache L, Bourson C, Hohmann G and Fruth B (2013) Ecological services performed by the bonobo (*Pan paniscus*): Seed dispersal effectiveness in tropical forest. *Journal of Tropical Ecology* 29(5): 367–380.

Bertolani P and Boesch C (2008) Habituation of wild chimpanzees (*Pan troglodytes*) of the South Group at Taï Forest, Côte d'Ivoire: Empirical measure of progress. *Folia Primatologica* 79(3): 162–171.

Brandstetter AM (1998) *Leben im Regenwald: Politik und Gesellschaft bei den Bolongo* (Demokratische Republik Kongo). Münster: LIT Verlag.

Candea M (2013) Habituating meerkats and redescribing animal behaviour science. *Theory, Culture & Society* 30(7–8): 105–128.

Carpenter CR (1934) A field study of the behavioral and social relations of howling monkeys (*Alouatta palliata*). *Comparative Psychology Monographs* 10(2): 1–168.

Chamovitz D (2012) *What a Plant Knows: A Field Guide to the Senses of Your Garden – And Beyond*. London: Oneworld Publications.

Cheney DL and Seyfarth RM (2007) *Baboon Metaphysics: The Evolution of a Social Mind*. Chicago, IL: University of Chicago Press.

Crofoot MC, Lambert TD, Kays R and Wikelskia MC (2010) Does watching a monkey change its behaviour? Quantifying observer effects in habituated wild primates using automated radiotelemetry. *Animal Behaviour* 80(3): 475–480.

Csordas TJ (1993) Somatic modes of attention. *Cultural Anthropology* 8(2): 135–156.

Darwin C (1897) *The Power of Movement in Plants*. New York: Appleton.

Despret V (2004) The body we care for: Figures of anthropo-zoo-genesis. *Body & Society* 10(2–3): 111–134.

Despret V (2013) Responding bodies and partial affinities in human–animal worlds. *Theory, Culture & Society* 30(7–8): 51–76.

Despret V (2014) Ethology between empathy, standpoint and perspectivism: The case of the Arabian babblers. In: Marvin G and McHugh S (eds) *Routledge Handbook of Human-Animal Studies*. Oxon: Routledge, 23–38.

De Waal F (2013) *The Bonobo and the Atheist: In Search of Humanism among the Primates*. New York: WW Norton & Company.

Feld S (2012) *Sound and Sentiment: Birds, Weeping, Poetics, and Song in Kaluli Expression*, 3rd edition. Durham, NC: Duke University Press.

Fowler A and Hohmann G (2010) Cannibalism in wild bonobos (*Pan paniscus*) at Lui Kotale. *American Journal of Primatology* 72(6): 509–514.

Furuichi T and Mwanza N (2003) Resumption of bonobo studies at Wamba, the Luo reserve for scientific research. *Pan Africa News* 10(2): 31–32.

Goffman E (1971) *Relations in Public: Microstudies of the Public Order*. London: Allen Lane.

Geurts K (2003) *Culture and the Senses: Bodily Ways of Knowing in an African Community*. Berkeley, CA: University of California Press.

Haraway D (1989) *Primate Visions: Gender, Race, and Nature in the World of Modern Science*. London: Routledge.

Haraway D (2003) *The Companion Species Manifesto: Dogs, People, and Significant*. Chicago, IL: Prickly Paradigm Press.

Haraway DJ (2008) *When Species Meet*. Minneapolis, MN: University of Minnesota Press.

Henke CR and Gieryn TF (2007) Sites of scientific practice: The enduring importance of place. In: Hackett EJ, Amsterdamska O, Lynch M and Wajcman J (eds) *The Handbook of Science and Technology Studies*. Cambridge, MA: MIT Press, 353–376.

Herzig R (2004) On performance, productivity, and vocabularies of motive in recent studies of science. *Feminist Theory* 5(2): 127–147.

Hohmann G and Fruth B (1994) Structure and use of distance calls in wild bonobos (*Pan paniscus*). *International Journal of Primatology* 15(5): 767–782.

Hohmann G and Fruth B (2003) Lui Kotal: A new site for field research on bonobos in the Salonga National Park. *Pan Africa News* 10(2): 25–27.

Hohmann G and Fruth B (2011) Is blood thicker than water? In: Robbins MM and Boesch C (eds) *Among African Apes: Stories and Photos from the Field*. Berkeley, CA: University of California Press, 61–76.

Ingold T (2004) Culture on the ground: the world perceived through the feet. *Journal of Material Culture* 9(3): 315–340.

Ingold T (2011) *Being Alive: Essays on Movement, Knowledge and Description*. Oxon: Routledge.

Kano T and Mulavwa M (1984) Feeding ecology of the pygmy chimpanzees (*Pan paniscus*) of Wamba. In: Susman RL (ed.) *The Pygmy Chimpanzee: Evolutionary Biology and Behavior*. New York: Springer, 233–274.

Knorr Cetina K (1999) *Epistemic Cultures: How the Sciences Make Knowledge*. Cambridge, MA: Harvard University Press.

Kohler RE (2002) *Labscapes and Landscapes*. Chicago, IL: University of Chicago Press.

Latour B (2004) How to talk about the body? The normative dimension of science studies. *Body & Society* 10(2–3): 205–229.

Latour B and Woolgar S (1986) *Laboratory Life: The Construction of Scientific Facts*. Princeton, NJ: Princeton University Press.

Myers N and Dumit J (2011) Haptic creativity and the mid-embodiments of experimental life. In: Mascia-Lees FE (ed.) *A Companion to the Anthropology of the Body and Embodiment*. Chichester: Wiley-Blackwell, 239–261.

Nagel T (1974) What is it like to be a bat? *The Philosophical Review* 83(4): 435–450.

Narat V, Pennec F, Simmen B, Ngawolo JCB and Krief S (2015) Bonobo habituation in a forest–savanna mosaic habitat: influence of ape species, habitat type, and sociocultural context. *Primates* 56(4): 339–349.

Raderschall CA, Magrath RD and Hemmi JM (2011) Habituation under natural conditions: Model predators are distinguished by approach direction. *The Journal of Experimental Biology* 214(24): 4209–4216.

Rees A (2007) Reflections on the field: Primatology, popular science and the politics of personhood. *Social Studies of Science* 37(6): 881–907.

Robbins M (2014) Gorillas across time and space. In: Strier KB (ed.) *Primate Ethnographies*. New York: Routledge, 163–174.
Samuni L, Mundry R, Terkel J, Zuberbühler K and Hobaiter C (2014) Socially learned habituation to human observers in wild chimpanzees. *Animal Cognition* 17(4): 997–1005.
Schaller GB (1964) *The Year of the Gorilla*. Chicago, IL: University of Chicago Press.
Smuts B (1999) Reflections. In: Coetzee JM (ed.) *The Lives of Animals*. Princeton, NJ: Princeton University Press, 107–120.
Stanford CB (1999) *The Hunting Apes: Meat Eating and the Origins of Human Behavior*. Princeton, NJ: Princeton University Press.
Stanford CB (2012) *Planet without Apes*. Cambridge, MA: Harvard University Press.
Surbeck M, Fowler A, Deimel C and Hohmann G (2009) Evidence for the consumption of arboreal, diurnal primates by bonobos (*Pan paniscus*). *American Journal of Primatology* 71(2): 171–174.
Tutin CEG and Fernandez M (1991) Responses of wild chimpanzees and gorillas to the arrival of primatologists: Behaviour observed during habituation. In: Box HO (ed.) *Primate Responses to Environmental Change*. London: Chapman & Hall, 187–197.
Van Krunkelsven E, Dupain J, van Elsacker L and Verheyen R (1999) Habituation of bonobos (*Pan paniscus*): First reactions to the presence of observers and the evolution of response over time. *Folia Primatologica* 70(6): 365–368.
Van Lawick-Goodall J (1971) *In the Shadow of Man*. London: Collins.
Wacquant L (2004) *Body & Soul: Notebooks of an Apprentice Boxer*. Oxford: Oxford University Press.
Walford A (2015) Double standards: Examples and exceptions in scientific metrological practices in Brazil. *Journal of the Royal Anthropological Institute* 21(S1): 64–77.
Wrangham R and Peterson D (1996) *Demonic Males: Apes and the Origins of Human Violence*. New York: Houghton Mifflin Harcourt.

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