



CHAPTER 2

'Tears of the Earth'

Human–Permafrost Entanglements and Science–Indigenous Knowledge Encounters in Northeast Siberia

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In May 2016 the Royal Anthropological Institute hosted an international conference 'Anthropology, Weather and Climate Change' held at the British Museum in London during which the co-editors of this volume convened a day-long panel session titled 'Northern Futures? Climate, Geopolitics and Local Realities'. One of the highlights of the panel session was a presentation by Eveny reindeer herders, who travelled from northeast Siberia to speak at the conference. While expressing their concerns about climate change, the Eveny spoke about the increased likelihood of risk situations in the areas of their subsistence and travel, including floods, wildfires, unprecedented loss of the domesticated reindeer, and overwhelming changes in flora and fauna.¹ The reindeer herders spoke about the plans of the Russian and international extractive companies to start mining gold and silver on the territory of reindeer pastures, which will inevitably lead to an ecological catastrophe, contamination of rivers that supply vital fresh water, and the transformation of boreal forests and meadows where reindeer graze into ecological ruins. Their emphasis on how human and animal safety is severely undermined by the long-lasting effects of forest fires, accelerating permafrost thaw, prompted the panel to discuss and consider the effects of wildfires across the Arctic. The reindeer herders supported their

discussion by video- and photo-evidence of several environmental calamities they have experienced over the previous two years, including a dramatic landslide.

Using a mobile phone camera, one of the reindeer herders managed to video-record how a geyser of muddy water flashed out of the dry ground. It looked as if a subterranean river came out suddenly after being pushed up by thawing permafrost. The scary footage of the environmental calamity took the audience members' breath away as they were silently watching a startling dynamic of the floods erupting from below and engulfing the reindeer herders' campsite in minutes. The video captured how people were trying to flee the flooded area to safety, hurriedly yet calmly. People were moving fast but nobody panicked and screamed out in fear. The visual testimony of the intensification of ecological fragility and rapidity of environmental degradation in the Siberian Arctic provided by the reindeer herders raised serious questions about the scale of the environmental risks and the human capacity to avert ecological disasters.

To a large extent, the Eveny presentation of the effects of permafrost thaw back in 2016 served as an eloquent articulation of the environmental crisis and visual evidence of cryocidal processes discussed in Chapter 1. It also portended the current regime of high run-off pressure that generates multidirectional and simultaneous responses to permafrost thaw across human and non-human domains. The report offered by the reindeer herders continues to reverberate, with the grimness of current news about deforestation rate as a result of intensive logging, droughts, flash floods and wildfires (Jamail 2019: 133–55). Every year Siberia loses several kilometres of land as it erodes, either slowly turning into post-cryogenic, unliveable ecological ruins disappearing under the muddy waters of melted permafrost or disappearing entirely under encroaching ocean waters in coastal areas of the Siberian Arctic. The dramatic changes in the cryosphere are attributed to a number of anthropogenic activities associated with oil and gas extractive industries, military initiatives and hydrocarbon developments, all of which have been continuously generating chemical and radioactive contamination, significantly contributing to the rapid degradation of permafrost.

Four years after that conference panel, in July 2020, a spell of abnormally hot weather across large territories of Siberia saw nearly 300 wildfires blazing at once, causing record high carbon emissions. The gigantic wildfires are accelerating the pace of permafrost thaw while amplifying the pace of ecological degradation. In March 2021, meteorologists already predicted that in the forthcoming summer

Siberia would face a similar type of extreme weather which will inevitably cause more wildfires (Physorg 2021).

The startling dynamic of cryogenic changes and predictions articulated by the reindeer herders serve as an invitation to discuss the human capacity to adapt, predict, avert risk situations and negotiate safety in the face of profound unpredictability. They also invite us to consider available models for ascertaining the collective and individual ability to mitigate current and future environmental calamities. Recent revelations about the speed and intensity of the permafrost thaw and the amplified rate of ecological degradation have pointed to limitations and underestimation of the scientific models (see Shakhova et al. 2010; DeConto et al. 2012; Lovejoy 2013). Numerous reports have confirmed that the accelerated speed of degradation is currently on track to far exceed projections. This stresses the necessity to activate and shape those forms of collaboration that could open up new channels for addressing climate change and transgressing mainstream knowledge (Allen, Breshears and McDowell 2015;



Figure 2.1. *Effects of permafrost thaw in the area of Sebyan.*
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O'Reilly 2016). The latter requires consideration and recognition of plural worlds as well as thinking at more-than-human scales.

The debates surrounding the concept of an Anthropocene have recently facilitated a critical view of European anthropocentrism and rampant capitalism as conceptual sources of the planetary condition of endlessly worsening environmental degradation and loss of biodiversity (Moore 2015; see Introduction, this volume). With regard to this, the process of the Anthropocene associated with the colonial destruction of diverse and plural worlds is rightfully viewed as a product of 'colonialist one-worldism' (Escobar 2020) and 'a scenario of the end of the world' (de la Cadena and Blaser 2018). Building on the latest calls to challenge the dominant man-centred paradigm, my ethnographic consideration of human–permafrost entanglements will echo the arguments developed by Marisol de la Cadena (2015), who advocated inclusion of heterogeneously entangled worlds in political disputes over land use and human–non-human security. It will also resonate with Arturo Escobar's critique of the developmentalist-liberal world vision embedded within the modernist ontology of separation. Escobar pertinently stresses that knowledge hierarchies with the divisive pattern of scientists/experts developing, changing and modifying 'ignorant'/'primitive' indigenous groups have long prevented a true dialogue between different conceptions of the worlds or 'cosmovisions' (Escobar 2018, 2020).

I also agree with Escobar that any attempt to arrange such a dialogue will face institutional and systemic obstinacy, resisting the possibility of putting the complexity of indigenous pluriversal cosmovisions into a symmetrical interchange with the dominant anthropocentric (man-centred) ontology of natural scientists who tend to prioritize objective factors and straightforward cause-and-effect links in their understanding of the scenarios of change. To enable such dialogue, it would make sense to critically evaluate the lessons from the past, from which there is currently a refusal to learn or which are intentionally silenced and erased. Therefore, this chapter aims to identify the prerequisites for arranging such a dialogue by considering rare examples where the dialogue and partnership were possible, even temporarily.

Based on ethnographic research in two reindeer herding communities in northeast Siberia in 2014–2020, my discussion will look at how the latest environmental changes associated with permafrost thaw are navigated and articulated by Siberian Eveny reindeer herders. First, to foreground my discussion of the Eveny cosmovision of environmental change, I critically evaluate the latest theoretical takes

on human–non-human relations with a special focus on the post-humanism versus animism debate. Then, I shall look at how the latest dynamic of permafrost thaw in Siberia is being understood through both the scientific and the indigenous lens. This will include an overview of recent cryogenic and anthropogenic transformations which affect the local ecosystem, hydrology and more-than-human worlds. Finally, I examine the instances when reindeer herders’ knowledge was pivotal for scientific research in northeast Siberia. However, the scientists’ inability to recognize and properly document their joint effort was due to a mindset which was locked in a ‘one-world’ vision. The discussion will provide an account of what types of expertise and sensitivity are required for collaborative dealing with environmental unpredictability and the latest dynamic of climate change.

On the Reindeer-Morphic Model of the World

Before I move to the discussion of the reindeer herders’ responses to the latest dynamic of environmental degradation and permafrost thaw, I would like to introduce the Eveny legend about the creation of the Earth.² The legend goes as follows:

People did not live on the Earth before, they used to live in the sky. They lived very well there. Once a woman got expelled from her native sky because she rejected a marriage offer from a man she did not love. Having been rejected by people, she left the sky riding an eight-legged reindeer. Reindeer and woman were riding for a long time until the reindeer got very tired and suddenly fell out of the sky. When they both landed on water, the eight-legged reindeer advised the woman to pick hair from its fur and throw it in the water. In water, the reindeer hair transformed into wooden logs out of which the woman made a raft. Then, the reindeer advised the woman that she had to kill him and butcher his body. She followed the advice, and as soon as she butchered the reindeer carcass, the reindeer hide turned into the earth, then skull and bones transformed into mountains, hair turned into a forest, hair lice turned into wild reindeer. When she was breaking bones, the sound of breaking bones turned into thunder and the last reindeer breath turned into wind. Then his heart turned into a hero, lungs turned into a boy and a girl. This is how the Earth was created. (Dutkin and Robbek 1978: 156)

This aetiological myth about how a reindeer became an originator of the Earth with the help of a woman carries a very important point for my discussion. The story highlights that Earth and its features,

including humans, have been engendered as a result of actions taken by a woman, and all features of the Earth are continuous with the non-human – reindeer – pointing to a zoomorphic or reindeer-morphic model of the world. It is a model of the world that posits the Earth as being in a post-reindeer condition and highlights that all features of the world are mutually constitutive and closely interconnected through their genesis. Here, humanity is conceived in its existential interconnectedness with non-human elements of the world, i.e. all features of the world are interwoven in the earth–reindeer–human assemblage. Given the dramatic speed with which the Siberian environment is transforming in response to climate change and environmental degradation, the myth, with its strong emphasis on the interdependence and interconnectedness of human and non-human, becomes especially pertinent.

Such emphasis on interconnectivity has a special resonance with the recent sociological and philosophical strand that prioritizes non-human over human while focusing on post-human, extra-human or non-human sensibilities. Post-humanism, conceived as a response to ongoing environmental catastrophe and as an explicit critique of imperial capitalism, posits a new type of relationality which is more generally receptive to worldly alterity and epistemic multiplicity (Haraway 2008; Kirksey and Helmreich 2010; Wolfe 2010; Hodder 2014). The post-humanistic trend in social theory is an important contribution to ecological thinking in resistance to the dangers posed to life in the age of the Anthropocene (Braidotti 2009; MacCormack 2012); however, knowledge accumulated by indigenous groups (referred to as either indigenous knowledge, traditional environmental or ecological knowledge, or ethno- or native science) often continues to be ignored by post-humanism, which, like other 'postmodern' philosophies including poststructuralism and postcolonialism, typically does not reference the scope of indigenous knowledge in the recent spate of publications outlining its parameters (see Bignall, Hemming and Rigney 2016). There is a tendency in the post-humanist field to distance oneself from and ignore any ideas related to indigenous knowledge and indigeneity, diminishing these to a romantic expression of otherness or an essentialist, defensive response to the domination of Western colonialism, simultaneously prioritizing Eurocentric theoretical perspectives even as they critique Enlightenment ideas (see particularly Raffles 1999, 2002, 2011; Tsing 1999, 2005, 2011). In other words, although they aspire to decentre man, they remain ethnocentric, 'leaving "the anthropological machine" of Western humanism essentially untouched' (DiNovelli-Lang 2013: 140).

While simultaneously giving a cold shoulder to anything indigenous and striving to erase the boundary between multiple species, many post-humanists erect new divisions, once again reinstating hierarchical distinctions between an Enlightened First World and a colonized Indigenous Fourth World. This is the kind of divisiveness that stems from a dominant one-worldism, i.e. the modern cosmopolitanism based on an ontology of separation. Such ontologies divide ‘the human from non-human (culture from nature) and distinguish the “civilized” (European, moderns, rational people) from the “non-civilized” (primitives, barbarians, underdeveloped people, nonmoderns, terrorists)’ (Escobar 2020: 123). Following this modernist, bio-colonial vision, the ‘non-civilized’, non-Western subjects could only be contingent assemblages and products of systemic/colonial forces, and their struggle for recognition and autonomy is rendered futile because the perspectives, experiences and positions they hold and defend are destined to dissolve in the networks of externally imposed, colonial, structural and institutional forces.

Furthermore, elision or omission of indigenous knowledge has also to do with the latest critique of animism. The term ‘animism’ is rejected by opponents who tend to reduce the notion, linking it to a desire to remain either mired in the past, i.e. evolutionism, or trapped in a set of worries about proving the reality of a non-human other, i.e. radical alterity or perspectivism.³ By reducing indigenous knowledge down to a ‘noble savage’ trope, the critique of animism dismisses the extent to which the twenty-first-century Siberian hunters and reindeer herders continue to understand more-than-humans to be enlivened by animist relationality. This is the kind of relationality and expertise that has been relying on a symmetrical fusion of human and non-human that recognizes sentient qualities of the earth, the earth that is defined by actions of humans and non-humans.

As an epistemological and ontological stance, animism has been questioning human exceptionalism for more than a century. Yet post-humanists often criticize animism for its anthropomorphism besides its relationality and attribution of personhood to non-humans, i.e. a view of every object as a potential human-like subject. But, as Signe Howell has eloquently shown, post-humanists’ desire to ‘think beyond the human’ is confronted by a similar predicament of being stuck within the same ‘reality’ question to which they found no satisfactory solutions (Howell 2016: 59). By ditching animism, ‘post-humanism obstructs appreciation of indigenous ontologies because the post-humanists too easily seek to conflate them with the Western one’ (58).

Despite the ongoing critique of animism by post-humanists, the scholarly inquiry into animacy and animation continues to spark interest from a wide range of analytical angles. If the early anthropologists like Tylor and Frazer used the term animism to classify peoples according to social evolutionist hierarchy, the subsequent generations of anthropologists who have conducted ethnographic research with shamanic and animist societies worldwide have heavily problematized the evolutionary classifications of their predecessors and criticized their Eurocentric assumptions about the superiority of humans over non-human beings. The old evolutionist theory of animism was updated by several generations of scholars, including Signe Howell (1984), Nurit Bird-David (1999, 2006) and Barbara Bodenorn (2000, 2004) among many others.

The new take on animism posits that the boundary between humans and non-humans is permeable and that personhood extends beyond the confines of the human body. Due to the latter developments in the theory of personhood, unbounded potential for identification and continuity between humans and non-humans continues to be identified as a prominent feature of animist thinking (Howell 1984, 2016; Pedersen 2001; Willerslev 2007; Brightman, Grotti and Ulturgasheva 2012; Rival 2012, 2016; Willerslev and Ulturgasheva 2012; Ulturgasheva 2017 and many others). Lately, several productive attempts to rethink animism have extended the inquiry on animism beyond the notion of 'soul'. Nowadays, the concept of animism is undergoing continuous reinvention and is even being applied in the highly technological and experimental setting of robotics laboratories, illustrating the power of 'technological animism' even in the absence of souls and soul theory (Richardson 2016).

As the Introduction to this volume highlighted, new animacies emerge from ecological ruins generated by capitalist expansion and environmental destruction (Povinelli 2016; Weston 2017; see also Murphy 2008; Fortun 2014; Shapiro and Kirksey 2017). Within new animacies lies the principle of unbounded co-constitution that weaves human and non-human intimacies, whether microbial, viral or chemical, spreading through the entire fabric of bio-, techno-, eco- and socio-existences, i.e. 'life that becomes not-life, an other-than-life, a becoming-nonliving' (Thacker 2005).

Since creatures alongside chemical and toxic 'other-than-life forms' co-constitute, intrude upon and invade other forms of human and non-human existencies in and through their substances, they generate intimacies that enliven new animacies. However, the kind of humanism or anthropocentrism this analytical angle challenges

largely comes out of Western, industrial and post-industrial humanity, charged with the neo-liberal fetishization of an individual. The latter implies that the post-humanist/STS focus on animacies and intimacies selectively prioritizes a post-industrial/industrial context to highlight the irrelevance (or ‘humano-centrism’) of those forms of animism that such an approach associates with the anthropological past-perfect. The latter begs the following questions.

Do new animacies truly and holistically encompass our understanding of human and non-human existences across and beyond life and non-life forms? Are they also running the risk of lumping diverse takes on animist human–non-human entanglements into one box labelled humano-centrism? How really humano-centric are animist ways of being and knowing? If we prioritize microbial and viral animacies and discard forms of animism that continue to be practised, for example, by our Siberian interlocutors, would it only confirm the primacy of the natural sciences and dualistic humanism once again? If animist relationality is really and fully anthropocentric, what kind of ‘anthropo- or humano-centrism’ does it stand for and is it guilty of?

In response to this set of questions my further discussion will show that Eveny reindeer herders’ ways of dealing with the latest environmental upheavals and their attempts to reduce environmental uncertainty through divination rituals continue to emphasize the persistence of animist relationality that encompasses both humans and other-than-human beings. This is the kind of relationality that reflects ‘human proclivity to anthropomorphize’ (see Howell 2016: 44); however, it is far from positing either radical otherness or human exceptionalism.

The Siberian Eveny legend about a reindeer as a creator of the earth is particularly eloquent in these regards, as alongside the relation it equally reproduces co-constitution, i.e. if the reindeer constitutes the earth and earth constitutes the reindeer, then humans are constituted of reindeer and reindeer are constituted of humans. If we use the language of post-humanists, the story about the reindeer would be essentially a story of rapid evolution of microbes constituting reindeer or it would be an account of a reindeer microbiome transmitted and expanded across species including humans. Both versions of the story, i.e. animist and post-humanist, are quite different but they do not seem incompatible from a broad perspective. If we accept the anti-dualist symmetry of two conceptual schemes, we shall see two different angles of the same animate matrix where the animist angle emphasizes relation and the post-humanist one highlights co-constitution.

It is also important to acknowledge that animist cosmologies and shamanic ways of thinking and perceiving the world continue to be crucial for human adaptation in Siberia and the entire Arctic region in general. So nowadays the question of adaptability and human capacity to survive and cope with the latest environmental challenges requires attention to nuances of people's lived experiences, including their relations with animist/spiritual forces of the land.

Hyper-animism of Permafrost

Permafrost is an important climatological feature of the entire area of northeast Siberia (and all of the Circumpolar region), so any changes within its characteristics generate a number of simultaneously occurring risk situations, subjecting local communities to potential and ongoing infrastructural and ecological disasters. The history of regional development has shown that the dynamic and unpredictable nature of permafrost obstructed the development and management of any construction and engineering projects in the region. Permafrost always resisted and defied human control.

Given that the notion of permafrost has been shaped by the modernist ontology of separation and emerged as a scientific object from within the positivist, Enlightenment-driven epistemology, the existing discourses on permafrost are mainly associated with the technogenic, man-privileging perspective (see, for example, Streletskiy and Shiklomanov 2016; Chu 2020; Streletskiy 2021). Within the development-centred, modern cosmivision, permafrost is mainly conceptualized as an archive of the geological, genetic, palaeontological or mineralogical data and a technogenic obstacle that continues to impact industrial and development projects in the Russian Arctic. There is no space in the modernist ontology for a body of knowledge that takes into account the frozen ground as the entanglement of cosmological, geological and ecological processes, i.e. the onto-epistemology that includes the earth-ice formations constituting permafrost as agents affecting people's destinies and human history.

The need to stay attuned to the rhythms of all interrelated human and non-human elements, together with the recognition of relational symmetry and interdependence, has been central to the human capacity to survive and adapt to the permafrost-bound land. Such perception of the land also enabled an understanding of it as an elusive, viscous and unpredictable force. The Eveny engage with permafrost as a container of shamanic or animistic spirit forces, nurturing

provider and contributor to human and more-than-human livelihoods and security. This vision of the land is filtered through the animist matrix in which the land emerges as a power saturated with the potential for animacy and transformation. In this sense, permafrost could be characterized as, borrowing from Timothy Morton (2013), a hyper-object. As an animist hyper-object, permafrost engenders and animates social dramas, sustains wildlife and holds imminent and anticipated futures.

The term ‘permafrost’, literally the combination of two words, ‘permanent’ and ‘frost’, evokes a sense of permanence along with an association with immovable, monolithic, eternally frozen ground. However, contrary to what the term evokes, its morphological and cryogenic characteristics often point to its plasticity, impermanence and sensitivity (see also Cruikshank 2005 and Hastrup 2013). This supposedly eternally frozen ground has the propensity to transform its shape in response to any slight internal movements. Permafrost consists of several horizontal layers composed of a mixture of alluvia, sediment, frozen rocks and large ice deposits that intermittently alternate between fluid and solid states (Alekseiev 2016: 41–110). These layers are dynamically interacting with each other, turning one into another while co-constituting and reconstituting their states and textures. The upper layer (about 10–20 metres thick) is a stratum which is sensitive to any drastic fluctuations in seasonal weather conditions, while freezing to the bottom in winter and melting in summer. It is the frozen field located below the surface layer that is defined by scientists as permafrost. The estimated thickness of the layer is in the 20–1,500 metres range.

The temperature of internal ice layers is never permanent and stable, as it is characterized by intermittent changes in temperature, either reaching up to 0 or 1 degree Celsius or falling drastically to –21 degrees Celsius. Because of the fluctuations in temperature, subterranean layers of the ice ground are mutually able to deform, reform and reproduce by expanding in all directions, either amplifying or decreasing responses across layers. Such a state of permafrost points to highly energetic geological masses. The state of aggregations depends on the scale and pace of interaction between internal subsurface temperatures and external air, in addition to the interactive dynamic between internal water channels and seasonal weather fluctuations. Subterranean ice formations are mobile and highly sensitive to changes in an internal temperature regime often affected by external factors such as prolonged rains or intensive floods (Nekrasov and Deviatkin 1974).

Permafrost is an important factor in the process of surface and subsurface water exchange, regulating subterranean and surface water flows into the network of rivers. When the exchange becomes unbalanced, it leads to an intensified interaction between permafrost and fresh water that contributes to an increased transience of bodies of water such as lakes and lakelets. When internal ice layers melt, the unfrozen open ground turns into lakes filled with ground water rich in minerals. Moved by strong winds, such lakes can migrate at a rate of 5–10 metres per year across the territory. While remaining still, the lakes generated by melting permafrost burn the ground, producing an effect that Eveny refer to as a *khokki necherek* or, translated from the Eveny language, the 'hot teapot' effect. If a hot teapot is put on ice, the teapot will melt it, producing a shallow hole. The mobile lakes are producing similar shallow holes just like hot teapots.

Strong winds play a crucial regulatory role, since, moved by the winds, lakes are prevented from burning or heating the ground further. By changing location, such lakes provide the space for the permafrost to reconstitute its layers. Hence, the permafrost manifests an amazing plasticity or capacity to retain equilibrium between receiving and giving the ice form. In that sense, Arctic winds and transient lakes act like a natural sculpting mechanism that first deforms and then reforms the ice grounds. Wind acts as a powerful agent, making the lake follow the direction the wind blows. The interactive dynamic between wind and a migrating lake challenges the fixity of the landscape by exercising their own constitutive and reconstitutive power.

According to Eveny, migrating lakes are both a good and a bad sign: on the one hand, a transient lake is an indicator that permafrost is melting, but on the other hand, owing to their capacity for transience, it allows the ground to reproduce or reconstitute the ice formations that it loses while melting. Such natural ice reconstitution may happen over one winter; however, if temperatures are not cold enough it often leads to a number of cryogenic catastrophes. All of the above only intensifies the instability of an already shaky and movable surface consisting of marshy hollows, ravines and gullies. When all the natural protective layers needed for containing movements within subsurface grounds are destroyed or get out of balance, the internal grounds become unstable and erupt as a landslide.

Here we are dealing with quite a sensitive landscape characterized by a high likelihood of transience, eruption, movability and flammability. Moving across such a sensitive landscape always promises a



Figure 2.2. *Deep hollow is about to trigger collapse of the mountain.*

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variety of risks throughout all seasons. In the perception of Eveny reindeer herders, permafrost has always been an enormous animating force and animist shape-shifter, involved in an ever-changing, uneasy relationship with its surface layer, the land. It is also a powerful imaginative and transformative force that animates and changes the shape of the earth, just like the reindeer from the aetiological myth. As a non-human powerful person, subterranean ice grounds can be generous and nurturing as they replenish mountain streams and local rivers along which Eveny move. Or they can change their mood, erupting suddenly and causing huge obstacles for human movement along rivers and streams. Such land is saturated with its capacity for transience and mobility, making lakes move and mountains disappear.

Migrating lakes and collapsing mountains point to the profoundly deterritorializing effect of melting permafrost. These manifestations of transience, plasticity and changeability serve as signifiers of the modes of co-constitution and connectivity that enliven and animate life forms. This transformable, highly animate nature of permafrost has always been part and parcel of a responsive social world, as the shape-shifting cryogenic landscape has necessitated a high scale of human–animal mobility and sociality extending beyond humans. Hence, permafrost serves as a matrix for hyper-animation where an interactive, transformative dynamic is activated by the movements and plasticity of life forms that are continuously erupting, co-constituting, reconstituting, submerging or emerging again. The latest transformations within the matrix magnify the powerful agency of a shape-shifting landscape and intensify the fragility of humans threatened by a complex dynamic of Anthropocenic processes.

Tears of the Earth

In two Eveny reindeer herding communities in northeast Siberia where I conducted research, the latest environmental transformations are manifested in a flux of the interconnected events all triggered by permafrost thaw. The sense of entanglement with which events unfold is becoming more and more pervasive as permafrost thaw drives a sequence of other destructive events, the impact of which proliferates erratically in all possible directions. Therefore, the directions the changes take become increasingly hard to predict by locals.

Since a large part of the area in which Eveny live and move is covered by boreal, coniferous forest, this particular part of the land is highly vulnerable to the impact of wildfires caused by human carelessness in the vicinity of roads constructed by the industrial sector and utilized for the transportation of natural resources. Due to prolonged periods of very dry and hot days, it is often lightning that causes fires. In the Soviet past when wildfire-fighters were well paid and had the appropriate equipment to fight large-scale fire – including helicopters and planes – professional fire-fighters played a crucial role in containing and extinguishing fires. Since all of this institutional support is no longer properly maintained, the only means Eveny have at hand is their own community efforts. Without the necessary back-up and due support, the effect of their fire-fighting remains almost minimal. But, as Adriana Petryna's recent account of Californian wildfires has shown, even with the most up-to-date state support, the models of fire-spread and technologies of fire suppression have failed to catch up with a new type of fire hurricanes. According to Petryna, the accelerated rate at which the phenomenon of wildfire overtakes the technology of its suppression is such that any human projection of its behaviour is bound to fail, with dire consequences for emergency responders (Petryna 2018: 585).

In the Siberian case, fire-fighting techniques are also constrained by the limited capacity of the fire-fighters to perceive the fire-spread in its full scale of velocity. The speed of the fire-spread varies and has a capacity for deception that local fire-fighters fail to read, even if they have indeed completed their task of extinguishing a fire properly. The fire can break out after several weeks of quiet and invisible smouldering in the thick layer of moss and set a large area of forest aflame in no time. Over the past two decades the forest fires have become an annual phenomenon and one of the decisive factors that contributes to the appearance of huge sinkholes and ravines, leaving the surface perforated. Forest fires impact the land to such an extent

that ravines drop down by as much as a few dozen metres, while leaving internal layers of permafrost open and unprotected from intense heatwaves during summer. As a result, the temperature regime of internal ice structures rises significantly, intensifying further degradation of permafrost. All of the latter adds up to a considerable amount of detrimental change already going on underneath the surface layer and increases the likelihood of such phenomena as collapsing mountains, landslides and snow avalanches.

Since 2015, Eveny reindeer herders have been annually inundated by an unusual amount of precipitation and by the rapidly changing nature of floods. Quickly flooding rivers have lately become the norm rather than the exception. The speed of the development of floods has significantly increased. If in the past it would take one week of prolonged rains for a river to flood, now a river can rapidly flood within half a day. The speed with which river floods develop affects the condition of roads and migration paths used by reindeer herders, as the roads become quickly destroyed by flash floods.

Apart from the overwhelming amount of precipitation, reindeer herders attribute the changing nature of eruptive floods to the impact of forest fires, the effect of which is non-linear and multidirectional. Reindeer herders are particularly devastated to see how the pastures rich in lichen are being quickly destroyed by wildfire. An Eveny elder, Vasily Keymetinov-Bargachan, informed me that ‘Eveny shamans referred to forest fires as *tor ingamta*’, which translates from Eveny as ‘tears of the earth’. According to Bargachan, ‘the earth is crying now ... it cries with forest fires as every forest fire is a tear of the earth’. Given the speed with which permafrost melts, such an analogy is not just a poetic metaphor. Comparison of fire with tears might be viewed as counterintuitive or contradicting the basic scientific laws, but this impression will be deceptive. Since permafrost-bound land consists of ground saturated with ice, the Eveny reindeer herders’ observations make the connection between the frozen, ice-bound land and tears, as both consist of water as the former turns into liquid after large-scale wildfire strikes. The earth saturated with ice acts as a powerful animistic force that can respond to anthropogenic destructions with sadness and tears, just like a reindeer or a human being.

Moreover, the frozen layers of the earth turn liquid because fire destroys the layer that is hosting complex root systems branching in the soil. Acting as a natural shield for the internal frozen ground, these woven, branching roots protect permafrost from degradation. Alongside roots and branches, fire destroys the most valuable protective layer that mainly consists of lichen. The lichen layer plays

quite an important role as it safeguards the temperature regime of the entire ground ecosystem. While lichen has always been a vital element of reindeer diet, it also holds a central place in what Eveny call *bilaek* – a web of mercifulness in which each element is at the mercy and care of another element.⁴ According to Nikolai Neustroyev, an elder of the community of Tompo, the notion of *bi-laek* implies that ‘humans have always remained at the mercy of wild and semi-domesticated reindeer; reindeer have been at the mercy of lichen, which in turn has been at the mercy of the land which has stayed solid owing to mercifulness of lichen’. Since all elements in this human–non-human community have been bound by inter-reliance, their safety and continuance are determined by a symmetrical network of merciful dependence. If such an important element and crucial environmental variable as lichen is led to extinction, the entire system will experience destabilization of temperature balance, triggering further degradation of permafrost.

The disruption to the forest vegetation inflicted by wildfires simultaneously expands into the animal world, driving an escalated migration of wild species which try to escape environmental disasters in neighbouring regions. According to Eveny of Sebyan, people are now dealing with the rapidly changing behaviour of bears that do not follow established rules concerning human–bear interaction and whose behaviour is getting ever more erratic. What had maintained peaceful coexistence and properly sustained boundaries between humans and local bears is now being challenged by ‘refugee bears’ fleeing areas of boreal forest destroyed by fires. The challenge confronting Eveny is the unpredictability of these ‘refugee bears’ that do not follow conventions, rules and mutual expectations known and followed by local bears. Since bears are territorial and very defensive of the area they mark through scratching and rubbing trees, their sense of territoriality is challenged by wildfires destroying territorial boundaries. There has been a set of practices, taboos and rituals addressing the uncertainty and ambiguity of the animal world; accumulated knowledge about bears among reindeer herders does indeed revolve around this established set of rules. Features of the Circumpolar bear ceremonialism precisely point to this set of rules that shape and affect humans’ relations with the bear (see Hallowell 1926; Kwon 1999; Brightman et al. 2012 and others). However, the dramatic speed with which the latest environmental changes have happened is also affecting this well-established mode of human–animal mutuality. While fleeing conflagrant forests in the Russian Far East, the bears lose the sense of what constitutes a specific territory.

When disoriented and desperate, they tend to attack people and domestic reindeer erratically.

Furthermore, the population of domestic reindeer is rapidly decreasing due to significantly increasing numbers of wolves; these constitute one of the major threats to highly valued reindeer. Wolves require constant attention from reindeer herders as they demonstrate astonishingly high levels of adaptability. According to one experienced reindeer herder and hunter, wolves adapt quickly because they are highly observant predators with a very high potential for learning. They learn from each other as they gain and transmit their knowledge and skills to young wolves quite quickly. Since they attack in packs, young wolves learn from more experienced ones when participating in attacks on reindeer. They know when to retreat in good time and know when to return and launch a collective attack on herds of reindeer. He says:

They attack the reindeer as if they are their property. Unlike bears, they don't have any sense of social boundaries and respect for humans and reindeer. They always observe humans and know when a person has a rifle and doesn't have it. They become blunt and reckless when we don't have rifles at hand. Now they are taking the power over our reindeer as reindeer herders fail to protect them.

The unruly bears and highly insidious and masterful wolves have the potential to exceed the limits of tolerability, while stretching the human capacity for resilience too thin. Maintenance of the human capacity for resilience depends upon keeping many of the environmental variables within tolerable limits (Eriksen 2016: 126–27). It is the tolerable limit to which humans adapted while utilizing a toolbox of skills, knowledge and things accumulated by generations of experts and which provide actors with the means to engage with ever-changing conditions. When such variables as unruly bears or wolves reach the edge of a tolerable limit, i.e. becoming more dangerous and unpredictable than ever before, the situation requires an amplification of the human capacity to adjust and accommodate to whatever emerges in accordance with an accumulated fund of knowledge.

Cosmo-Geo-Ecological Knowledge

What constitutes the Eveny fund of knowledge? Reindeer herders build on their own skills and knowledge, highlighting the ever-increasing

importance of a mobile lifestyle. Maintaining mobility is a vital element of their toolbox of skills which is centred on mobility and flexibility. One of the features that characterize the Eveny technique of survival has always been a special emphasis on the lightness of their material technologies and mobile infrastructure.

Easily movable tents, luggage and belongings, as well as a preparedness to move, instantly assured that people had a better chance of surviving and staying safe in the taiga. Mobility, specifically movement with their domestic reindeer, has been a predominant framework through which Eveny experience and understand the world and is a central component of their livelihoods which revolve around the seasonal cycle of reindeer migration. Reindeer, sledges, tents and skis have been the core aspects of their livelihoods; the idea of moving along one's family migration route is meaningful both to Eveny living in reindeer herding camps in the forest and to those living in small villages and urban centres.

Difficulties in getting from the villages to the reindeer herding camps and pastures and vice versa continue to condition logistical and psychological preparedness for risky situations. As one Eveny elder instructed:

You have to travel light but make sure you bring all necessary stuff yourself. The people who are able to survive are the ones who move between camps a lot and always have a tent, a bunch of ropes, a variety of light leather and plastic bags, a reindeer skin mat to sleep on, kettle, tea, drinking mugs, axe, knife and a box of matches. All of that has to be neatly organized so that you can pack your stuff within minutes.

This emphasis on lightness, constant alertness, organization of things inside the tent and readiness to flee the onset of disaster has been shaped in response to the need to escape environmental dangers in time, including floods, landslides and forest fires.

These strategies continue to be taught to the younger generations, together with the habit of reacting calmly to any sudden environmental calamities, even if they feel panicked inside. Although Eveny develop adaptive and accommodating rather than mitigating strategies, the reindeer herders, who have hardly contributed to the causes of dramatic climate change, never turn to debates about who is responsible (and therefore should pay) for the negative consequences that people are experiencing. Instead, they focus on the survival strategies, skills and means they have at hand. Eveny environmental knowledge is concerned with understanding how to cope

with dynamic transformations; rather than seeking to stabilize an ecosystem for maximum predictability as most geoscientists and engineers would do, they are more centred on devising coping strategies that build on their own patterns of mobility and observational skills. The emphasis on flexibility and alertness also highlights that a broader set of variables is required for taking a decision on a plan for action. For example, people continue to rely on divination practices centred on a ritual with a shoulder blade of a wild reindeer.⁵ In the absence of any scientific predictive device, this practice attempts to generate a reading out of uncertainty. According to an experienced Eveny herder and hunter of the community of Tompo: ‘One has to keep the dried shoulder blade of a recently hunted wild reindeer over the fire until one sees the first cracks. The cracks that appear on the shoulder may predict whether the disaster is on its way, from which direction the disaster may come and in which approximate form’. Unlike in southern Siberia and Mongolia, the ritual does not require a specialist diviner with the status of a respected medium for communication with the spirit world; any hunter or reindeer herder is able to make sense of the cracks according to their own individual reading. Reindeer herders carry out the divination ritual just before taking a long-distance trip, usually undertaken when their reindeer require a change of pastures. If the shoulder blade burnt before a forthcoming trip cracks along a straight line, the trip is meant to be uneventful and smooth. If the crack creates a hole in the blade, it is understood as a sign of potential misfortune that can be very hard to avert.

Techniques to predict the future include not only meticulous observations of the present, including signs appearing on a reindeer shoulder blade, but also an attempt to prevent calamity by appeasing the spirits of the land who, when properly fed and not disturbed by the loud presence of humans or their greedy behaviour, do not cause harm. People understand that the chances to contain the threat from powerful non-human forces may increase if they feed the fireplace and give the first piece of the hunted game to the land, as earth deities respond by providing benevolent protection. The ritual of appeasing the spirits of the land is aimed at containing their whims and encouraging their benign protective influence.

The whimsical nature of permafrost-bound land has been acknowledged by geoscientists. In my conversations with Russian permafrost specialists based in the regional city of Yakutsk, I learnt that they too struggle to predict the timing of shifts in permafrost. What is clear to them is that permafrost is degrading faster than natural scientists

have ever estimated and the thaw is rapidly changing the topography of the land. These geoscientists – whose observations are based on scientific measuring taken over the decades – concur that the shifts inside the ice formations often follow decentering and unsystematic moves. These moves are not based on a linear, proportional relationship between cause and effect. Since such shifts are aleatory by their nature, it is never certain what direction a sequence of further changes in internal layers will take. The radius of such a shift may be short and abrupt. Alternatively, the velocity of the shift may suddenly oscillate, reach the surface layer and erupt with a landslide or mud-flow. They find it increasingly hard to predict when the next disaster is likely to strike, as shifts within internal ice layers are becoming more unpredictable.

If the Big Science claims to privileged knowledge are predominantly held by mainstream institutional structures of climate science generously funded and backed up by authoritative bodies, here the scientists seem to be candid in admitting the limitations of their knowledge and lack of capacity to provide up-to-date devices for data sensing, sampling and forecasting. By offering such a perspective on the unpredictability of shifts, geoscientists were candid in highlighting that Russian geoscience is unable to provide proper monitoring of permafrost. The latter would require a long-term effort of observations and multidisciplinary research, jointly conducted by geoscientists, seismologists and glaciologists who currently lack the appropriate technology for monitoring and whose research is significantly underfunded these days. The situation with underfunding and lack of monitoring and sampling has not been unique to Russia, as a focus on permafrost and multidisciplinary, collaborative research on the cryosphere in general has not been prioritized by academia. This field of scholarly inquiry has been underfunded and understudied across all Arctic regions. Ann-Maria Virkkala and her colleagues pertinently stress that the comprehensive data and indicators of environmental changes in the Siberian Arctic and Subarctic, alongside other permafrost-bound areas in the American and Scandinavian Arctic that are likely to experience rapid permafrost thaw, are scarce (see Virkkala et al. 2019). Since these regions are under-sampled, the lack of data suggests that scientists do not understand the whole range of changes that global warming might cause, nor do they reach out to indigenous reindeer herders and hunters for any updates and observations, and if they even do or did so, the expertise and effort offered by indigenous experts are not recognized and properly documented in scientific papers.

Such monitoring was possible in the Soviet period, before the late 1980s, as geoscientific research was well funded and, in addition, involved topographical guidance by local reindeer herders whose knowledge of the landscape and survival skills always guaranteed the safe and sound completion of any geomorphological project. In Soviet Russia, geoscientists would never have dared to embark on an arduous, long-distance journey through impassable forest and risky rocks without the guidance and help of reindeer herders. Some of them openly admit that without reindeer herders' knowledge of the landscape, they would never have been able to provide monitoring of permafrost and generate scientific data on permafrost (see Alekseyev 2010). However, it was not only reindeer herders' guidance that helped geoscientists to survive the unknown and hostile terrain of northeast Siberia but also the Eveny habit of staying alert to any subtle changes and signs generated in the course of divination practices.

According to their personal recollection, while in the field scientists would never question the reindeer herders' knowledge, as the reindeer herders' consideration of potential risk scenarios and their repertoire of mitigating and adapting strategies were always wider and less constrained by scientific requirements aimed at maximizing the sense of reliability and transparency of those scenarios. In personal recollections, one permafrost scientist told me that:

An experienced permafrost scientist, Gavrilov worked for a long time in the Siberian Arctic. He was the first who initiated the establishment of the research stations for observations of permafrost in the region. He always relied on local guides, and among them the most important people were Eveny reindeer herders. Any expedition to the field was not possible without them. At that time (around the fifties/sixties) there were zero communication devices, and no radio or telecommunication equipment to reach out for help was available. But for some reason, when he was just about to arrive in their camp, the reindeer herders were already moving towards him riding their reindeer. They would greet him and help with transportation of research equipment and heavy luggage. All the people in the camp already knew that he was coming, and cooked food and warm dry clothes were already waiting for him. What he told me is that, to ensure they are prepared to help and welcome him, the reindeer herders instructed him to do the following: before embarking on his long journey he should look in the direction his trip will take and shout forcefully in Eveny language: 'It's me Vladimir, I am on my way – I'll see you soon!' Vladimir learnt the indigenous language and was fluent in the Eveny language, as he understood that speaking Eveny was vital for his survival. People would get this message even in the most remote locations in the Arctic taiga and tundra.

At that time, when aircraft would land on frozen rivers and drop inexperienced researchers, reindeer herders were pivotal for their transportation. Reindeer herders were crucial for the scholars' adaptation in the field – reindeer herders taught them how to live and survive in local conditions.

In this particular instance the permafrost scientist describes what Eveny would call the practice of sending one's *djuluchen* towards one's destination. By announcing out loud his intention to undertake a trip, his colleague Gavrillov sent his *djuluchen* towards a camp of the reindeer herders where he was planning to arrive soon. The practice of sending *djuluchen* ('spirit that travels ahead' or 'forerunner') forward before one's travel is widespread among Eveny reindeer herders and hunters in northeastern Siberia. As I have shown elsewhere (see Ulturgasheva 2012, 2016), the concept of *djuluchen* illuminates the human potential to foreshadow one's own future by sending one's own partible component ahead of oneself into the future along the envisioned trajectory. According to Eveny, *djuluchen* is an inherent component of a human and animal personhood, which in literal translation reads as a 'shadow that falls or runs ahead of a person'.

It is a nomadic concept which signifies the partible or separable component of human personhood (some locals refer to it as 'one's travelling spirit') which departs ahead of its owner and arrives at the destination prior to the owner's actual appearance. Prior to the person's arrival, people have already heard and seen the arriving person's *djuluchen*, which is seen as a shadow that imitates the body image of the arriving person and even reproduces the movements and sounds of the person's walking around the camp and unpacking. Without even knowing that the person is travelling towards their camp, people may recognize that a specific known person will arrive in their camp sometime soon. The *djuluchen* travelling spirit awaits his or her owner, who reunites with the *djuluchen* upon his or her 'actual' arrival.

The informal recollection of how vital reindeer herders' expertise and skills of living on and from the land were for a scientist's survival illustrates that, when it comes to the question of safety, any knowledge, especially of the sort that helps people to stay safe and survive, is utilized as long as it proves to be effective. Listening and looking for the signs, including *djuluchen*, is part and parcel of the repertoire of flexibility that Eveny reindeer herders have mastered. The repertoire includes a broader set of variables required for taking a decision on a plan for action. This set of variables contains clear instances of thinking that encompass non-linear, acausal information emerging

out of a rather wider field than one can access by linear, cause-and-effect thinking. In other words, this strategy draws on more than one way of knowing. By teaching the scientist how to send his *djuluchen* forward, the reindeer herders expanded his understanding of flexibility. Moreover, the account by the scientist, who has been convinced by the instrumentality and effectiveness of the practice informed by animist ways of connecting and moving, provides an example of how distinct bodies of knowledge could be activated in mutually formative and inclusive ways. I view the latter account as a rare instance of the emergence of cosmo-geo-ecological knowledge, i.e. knowledge that combines several cosmovisions in a symmetrical, synergistic manner.

But this has never been acknowledged and documented formally. The contribution of reindeer herders has never been properly recognized by official Soviet and post-Soviet accounts as evidence of the uncertainties of scientific knowledge.

What we can also learn from the instances of partnership provided above is that the collective effort aimed at surviving the extreme conditions of the Siberian Arctic compelled the humility of the scientists and their readiness to listen and follow the animist rules of engagement with the land and resulted in genuine symmetry between them and reindeer herders. According to the principles of *bilaek*, the partnership worked because the scientists knew that they were at the mercy of the Eveny and their reindeer. As soon as reciprocity in the web of mercifulness is dismissed or disrupted, the collaboration turns into plain extraction and exploitation.

Conclusion

This discussion has engaged with two distinct onto-epistemological dimensions of environmental change in the Siberian Arctic, namely, an animist cosmovision expressed through *bilaek*, i.e. a web of mercifulness and interconnectedness, and a geo-cryological world vision centred on the perception of permafrost as a scientific object and technogenic obstacle. The reindeer-morphic model of the world discussed above is central for understanding the animist cosmovision of *bilaek*. In accordance with *bilaek*, Eveny engage with and devise their strategies for dealing with the latest dynamic of climate change. In the absence of any infrastructural and state support, they continue to rely on their practical knowledge which revolves around their relations with cosmologically vital non-humans such as reindeer and lichen. For reindeer herders, the permafrost-bound land has always

been a complex and dynamically interconnected ecology, highly sensitive to any environmental pressures, including the ones induced by climate change. Their responses to the latter do not privilege humans and are far from exemplifying an arrogant anthropocentrism inherent to capitalist, highly individualized societies. Their outlook is neither humano-centric nor exclusively centred on the non-human or extra-human, as equal attention to both has been crucial for devising effective responses and survival strategies.

While recognizing the importance of scholarly inquiry with a focus on bio-, techno-animacies/intimacies and the post-humanist ontology of climate change, this material has shown that an animist cosmivision is more relevant for understanding Eveny relations with environmental calamities and their responses to them. It is the animist sociality that continues to inform their current modes of adaptability and techniques of adaptation, accommodation and adjustment. The reindeer herders' perception and understanding of the permafrost, together with their responses to the latest changes, offer us an encompassing view of the animism which recognizes the centrality of non-human actors (reindeer, bears, lakes, winds, mountains, weather and permafrost) and their powerful impact on human safety and well-being. Eveny responses and strategies show that they do not divide the world into human versus the rest of nature. They do not posit a human being as a dominant figure standing at the top of an evolutionary ladder, as in a destructive type of anthropocentrism, nor do they posit human exceptionalism. Although their animist livelihood and adaptability revolve around their own safety, their understanding of safety centres on the symmetry of human and non-human elements.

This account of a collaboration between natural scientists and indigenous knowledge holders particularized how Siberian Eveny reindeer herders' knowledge of the permafrost-bound land enabled scientific research on the Siberian permafrost conducted by Soviet Russian geomorphologists. The environmental knowledge of Eveny reindeer herders, informed and shaped by animist relationality and shamanic cosmology, was critical not only for geoscientists' physical survival but also for shaping the scientists' engagement with and understanding of the Siberian cryosphere. The scientists' informal recollections and personal accounts of their research conducted in the field alongside reindeer herders provided a rare glimpse into how the reliance and dependence of geoscientists on Eveny reindeer herders' knowledge illuminate an opportunity for generating a new type of onto-epistemological knowledge missed by scientists. The inability

to see the opportunity was due to a closed mindset which was unable to perceive a promising space for production of a cosmo-geo-ecological knowledge. This is the kind of knowledge that would enable a more complex, more encompassing understanding of the relational networks which are pivotal for forming future climate strategies and providing for human security.

If those instances had been properly acknowledged and documented, they could have made a difference in challenging the dominant knowledge paradigm built on exclusivity and the nature/culture divide. The discussion of the lack of recognition of the reindeer herders' expertise, aside from the lack of monitoring and under-sampling, emphasizes the limitations of the dominant modernist cosmovision exclusively centred on humans at the top of the hierarchy. This chapter partly responds to the need to pay tribute and do justice to Eveny reindeer herders' contributions to scientific studies of permafrost and partly shows how the effort of symmetrically co-mobilizing heterogeneous epistemologies is critical if science (in its plurality rather than singularity) is to respond adequately to the contemporary climate crisis. In a context where indigenous knowledge holders constantly find their views erased, or subordinated to 'more scientific' views and more dominant political agendas at national and international levels, such recognition (although informal and unpublicized) represents a much needed step towards decompartmentalization, the recalibration of knowledge production processes, and the destabilization of the science paradigm as Foucauldian power/knowledge.

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Notes

1. See Bodenhorn and Ulturgasheva 2016, 2017; Ulturgasheva and Bodenhorn 2016.
2. There are several types of creation myths in Eveny folklore with distinct plots and different sets of characters, both human and non-human. I have heard this version of the creation myth from several sources but it was first documented and published by Eveny folklorists, Khristofor Dutkin and Vasily Robbek (1978).
3. The analysis of radical alterity emerging out of the Amerindian ethnography of shamanic societies (Viveiros de Castro 1998; Descola 1996; Vilaca 2002) is often associated with the methodology of the 'ontological turn' (Henare, Holbraad and Wastell 2006; Holbraad and Pedersen 2018), which is heavily and continuously criticized by Eurocentric scholars. The debate revolving around the 'ontological turn' questions such fundamental concepts within anthropology as culture, ethnocentrism and reflexivity. The debate between those who advocate the ontological turn and its opponents remains to be resolved, due to the profound disagreements of both parties on the questions of difference and translation. See the examples of criticism of the 'ontological turn' by Bessire and Bond (2014), Boellstorff (2016) and Heywood (2012).
4. This discussion resonates with the account of a Canadian Métis scholar, Zoe Todd, who looked at human-fish relations in the Inuvialuit community of Paulatuq in the western Canadian Arctic (2014) and among her native Métis in the Lake Winnipeg watershed (2016) through the concept

of refraction, i.e. ‘a refraction in which we acknowledge that fish do a significant amount of labour in co-constituting our reciprocal responsibilities to one another’ (2018: 68). While drawing from the writings of indigenous scholars, including the work by Canadian First Nation legal scholar, John Borrows (2014), Todd relevantly highlights that ‘fish have borne witness to – and resisted – the incredible upheavals of Indigenous livelihoods, laws, language and lands over the course of the last few centuries. We need the principles of reciprocity, care, tenderness and trust that are centred in the “dynamic-but-rooted” (Borrows 2014) Indigenous legal orders in places like *amiskwaciwâskahikan*’ (2018: 73).

5. Russian ethnographer Vladimir Bogoraz also documented a similar divinatory practice among the Reindeer Chukchee, who used the scapula bone of the domesticated reindeer to predict the future. He described the divination ritual as follows: ‘The Reindeer Chukchee use for divination only the shoulder-blade of the domesticated reindeer. The animal, in most cases, is killed for this particular purpose ... The bone is taken raw, and the meat carefully cleaned from it. Then a small piece of burning coal is kept close to its centre. It is fanned, by means of blowing or light swinging, till the bone is carbonized, and gives the first crack. After the performance, the burned place is immediately broken through and reduced to crumbs, but the bone itself is added to the common kitchen-stock used for trying tallow ... Usually one vertical crack is formed, with various ramifications above and below’ (Bogoraz 1975: 487).

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