Learning to See Climate Change

Children's Perceptions of Environmental Transformation in Mongolia, Mexico, Arctic Alaska, and the United Kingdom

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What are the factors that render environmental concerns salient in people's lives, and under what conditions do people make connections between an abstract concept such as climate change and concrete experiences in their own daily circumstances? Taking as our focus ethnographic work with children in several different ethnographic settings (Barrow, Alaska; Oaxaca, Mexico; Tuv aimag and Uvurkhangai aimag, Mongolia; and East Anglia, United Kingdom), we explore how the children come to articulate environmental knowledge as a process of "figuring out" and the extent to which the children engage with the changing climate as a matter of concern. The paper provides an ethnographic account of the main themes that emerged in each region, before developing a comparative discussion of some key factors that gave shape to how climate change comes to matter in the lives of the children. Three dimensions are explored: the effect of climate change on livelihoods and the proximity of children's experience to those livelihoods, the political salience of the narrative of climate change, and the temporal depth invoked by the environment.

Experiencing an Abstraction

Climate change is both an abstract concept and a concrete phenomenon that people experience in the course of their lives. To encounter climate change is to encounter claims about the interpretation of data, but it is also to have a sense of material transformation in the environment around you.

Simultaneously, we are talking about changing precipitation patterns modeled at a global level (see, e.g., Marvel and Bonfils 2013) and the effect on one's livelihood of the failure of crops due to rainfall levels in a particular area during a particular season (Ayeri et al. 2012; Laube, Schraven, and Awo 2012; Macci, Manandhar, and Hoermann 2015). Or the ice as an archive from which one can recover climatic data about past environments and historic concentrations of carbon dioxide and methane; and the experience of the ice thinning under you as you move upon it—and, as Hastrup (2013) points out, these two ways of encountering climate change through the ice can end up in a state of dissonance. This raises our first question: In what sense are these ways of "seeing" climate change linked? Do people connect an abstract concept with their experience and, if so, how and why? What we explore in this paper then are the ways that climate change is articulated in concrete circumstances. Here we wish to evoke both of the meanings that articulation conveys; that is, we are interested in how (some) people annunciate climate change as something real and significant to them and also how they connect their own specific observations and knowledge with scientific claims about climate change as a global process.[1] To examine these processes of articulation, we will report on findings from our multisited ethnographic research, working with children (aged 7–12) in arctic Alaska, boreal Mexico, Mongolian steppe, and wetland United Kingdom, thinking through comparison in order to gain a better understanding of the dynamics at work.

It is worth emphasizing here that our choice to work with children by no means implies that we assume them to be "blank slates" or indeed taught by single sources. Examining the ways that children constitute knowledge, for example, through making observations (Bodenhorn 1997), imagining potentials (Ulturgasheva 2012), experimenting with materials (Briggs 1991),

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1. This draws on the sense in which Stuart Hall (1996:141) uses the term: "the form of the connection that can make a unity of two different elements, under certain conditions. You have to ask, under what circumstances can a connection be forged or made?"

developing familiarity and identity through play (James 1993), it is clear that they are not simply reproducing adult narratives. Rather, we find children at this stage in their lives energetically engaged in processing complex ideas and contradictory information. That is why we find them so compelling.

What is of interest here is how young people in particular become cognizant of a thing that they might call climate change, the ways that climate knowledge might emerge from material encounters in everyday life, and how it becomes a matter of concern for them—in other words (echoing Callison 2014), how climate change comes to matter.

Rudiak-Gould (2011) has highlighted the importance of reception studies for the anthropology of climate change. He suggests that alongside "observation studies" focusing on awareness of change through firsthand observation of local effects, we also need an ethnographic understanding of how the scientific discourse of climate change is received and comes to influence environmental perceptions. We should not see such knowledge as foreign; it is "part of these societies, and we therefore cannot ignore it" (Rudiak-Gould 2011:11). From his own ethnographic work in the Marshall Islands, he describes the ways that Marshallese citizens sought out and learned information about climate science, listening to relevant local radio programs, attending educational sessions, and so on, and he argues that "awareness of the scientific concept of global warming renders local impacts more noticeable, salient and worrisome" (Rudiak-Gould 2011:12). In similar ways, Bodenhorn (2013) describes encounters between Iñupiaq whalers' associations and biologists and the recognition among them that "something is happening with the ice" that needs to be understood through dialogue with academic scientists.[2]

It is this process of becoming aware in ways that matter that we are keen to analyze across a number of field sites: What are the factors that render environmental concerns salient in young people's lives? What is of interest here is the relationship between perceptions of change and awareness of the scientific discourse about global climate change, and how one feeds (or does not feed) into the other. (And, of course, in the course of ethnographic research, "climate change" may or may not come up—for this reason, methodologically we did not rush to frame discussions around climate change; rather, we allowed the children with whom we worked to express their relationship with the environment in the ways most relevant to them. So part of the work of comparison is thinking about why engagement with the environment leads to talk about climate in some places but not in others.) It is clearly not enough to

simply say that local experiences make you aware of what might be happening to the climate on a global scale—for example, Whitmarsh (2008) reports that flood victims in the United Kingdom do not seem to have a particular sense of concern about, or an increased understanding of, climate change, and yet in some contexts (such as the Marshall Islands, as Rudiak-Gould describes), local experiences are very deliberately understood through the lens of global climate change, and people actively draw on scientific discourse to interpret what they see around them.

We have found ethnographic work with children to be a particularly revealing way of exploring these dynamics. How do children learn to pay attention to specific aspects of their material world? Perception is not a given; it is a learned activity, and when we talk about "seeing" climate change, we are talking about considerable cognitive complexity involving material encounters with the immediate surroundings and their interpretation as evidence of long-term processes. Under what circumstances, and in the context of what influences do children develop this sense? As Toren (1993) has argued, children are at once products and producers of history, and their engagement with the world is a process of continual meaning making as knowledge is constituted afresh in the course of their own lives. What is interesting is the way that the children articulate knowledge from home, from school, from media sources, from friends, and from their own direct experiences of the material environment. As children explore their environments, they make observations and connections. It is a process of figuring out.

In what follows, we outline the ethnographic approach taken in the different sites and give a brief account of the main themes that emerged in each region. Ultimately, we propose three key dimensions that shape how climate change comes to matter in the lives of the children: the effect of climate change on livelihoods, and the proximity of children's experience to those livelihoods; the political salience of the narrative of climate change; and the temporal depth invoked by the environment.

Walking and Talking with Children

Our research involved the development of activities through which children could investigate the locality of their school and reflect on changes within their environment. This process was a collaborative, transactional one in which we actively sought to include children and teacher's participation not only in the process of data gathering but also in the design of research activities themselves. However, at the same time, to facilitate comparison, we wanted activities in the different locations to be structured around a common pattern.

Our work in each school therefore involved three phases. During the first phase, we focused on walking as a "relational and textural activity" (Vergunst 2008), asking children to identify "special places" that were important to them and to plot routes through the surrounding area so that they could show us the locations that they felt were of significance. In this

2. For a contrasting account of Inupiaq perceptions, see Marino and Schweitzer (2009:213), who speak of the scientific discourse about climate change as a "world of knowledge that exists outside the local." They were working in areas farther west than Bodenhorn; given the current vulnerability of many Inupiaq villages on the northwestern coast to rising sea levels, it would be interesting to know whether these observations hold. At the same time, geopolitical interests in Alaska render these issues politically sensitive and often influence what people say.

focus on the sensing of place, we follow Basso (1996) and his phenomenologically inspired emphasis on place-based thoughts. By putting the children in a position where they were the authority, walking along routes planned and led by them, following conversations initiated by them, we hoped to place the emphasis on their knowledge and experience.

In the second phase of the research we organized specific follow-on activities in the schools with the aim of generating extended reflections, each developed on the basis of their relevance to the places and topics identified on the walks. These activities were highly site specific and, as such, took varied forms (including, e.g., art projects, creative writing, and archaeological digs). Here, we draw on the methodological approach of ethnographic conceptualism (Ssorin-Chaikov 2013), generating commentary, response, and reflection by means of particular creative interventions, taking as a site of ethnographic reflection the ways that participants reflect on and through this creative work. As part of this phase, some schools chose to make contact with participating schools in other countries,[3] and these points of encounter were a useful source of comparative reflection.

The third phase of the research involved interviews with participating children and teachers, giving them the opportunity to reflect on the activities they had engaged in over the course of the project and also providing us with a context by which we could gauge attitudes and knowledge. Whereas in the first two phases we made an effort not to frame children's responses by prompting particular themes—in particular, avoiding bringing up climate change unless the children themselves spoke of it—during this third phase we adopted a semistructured approach that sought to investigate comparative absences in the way that the children had shared place with us, as well as the main themes that they had highlighted.

In this paper, our primary focus will be on what was learned from the first phase of the work: the walks. This phase had the most consistency of method across the different field sites and proved especially valuable for getting a general sense of children's sense of place and identifying key factors in their relationship with specific places. However, where appropriate, we draw upon material from the second and third phases to go into more depth in our interpretation of material gathered during the first phase.

Arctic Alaska

Utqiaġvik (Barrow), Alaska, is the northernmost town in the United States and has been a permanent Iñupiaq whaling community since well before Euro-American whalers arrived at the end of the nineteenth century. Since the discovery of oil and the heating up of the Cold War in the mid-twentieth

century, it has served as a magnet community, drawing people in from regional villages as well as further afield. Perhaps counterintuitively, then, this remote Arctic community was the most diverse of any of our participating schools. Although Iñupiat continue to be the majority population, the 64 students who participated in the project represented Filipino, Korean, Thai, Samoan, and the lower 48 states, as well as Iñupiaq backgrounds. Because of the frequency of intermarriage, many students proudly claim more than one cultural antecedent. While the population of the school is ethnically heterogenous, a commitment to the incorporation of local knowledge has been mandated by the North Shore Borough School Board through the adoption of the community-led Iñupiaq Learning Framework (Harcharek and Rexford 2015), which is gradually having an influence on different areas of the curriculum.[4]

After a collective discussion of sites important to them, the students were asked to provide individual brief accounts about their own "special places," which then formed the basis for the route of group walks in the local area. Despite the cultural diversity in this group, the main sites associated with "specialness" were the beach, the gravel pit, and "camping"; these sites became central to the walks. Iñupiaq children offered accounts of these places that linked pleasure with resources of key community importance (such as whaling, duck hunting, and fishing), and incorporated specific subsistence sites into their sense of what places were special.

The beach was the most frequently highlighted special place. Extending along the entire length of the village, this is an entirely open access area that is punctuated with meaningful sites associated with whaling and other celebrations such as Independence Day. Children shared their pleasure in going to the beach with friends and family to have a picnic or build a bonfire and to "run from the waves" (the Iñupiaq term *picasauruq* was uniformly used for this). Less frequent but still intense were mentions of individual activities: beachcombing; "to look for creatures"; to "look at the water change color"; and to "look for rocks," all of which also foster observational skills. This was therefore a place where children enjoyed wandering on their own and spending time with friends, but it was also recognized as an important resource site, not least because it is the site where bowhead whales are brought to shore for butchering in the fall and where whaling celebrations take place. Crucially, the beach was a place to "bond" with family but also simply to have fun.

The second key site was the gravel pit. This is an important economic resource for Barrow, but for children it was a place of action, fun, and excitement, where they go sledding in winter and to ride all-terrain vehicles (ATVs), in the summer, thrilled by the "steep hills." Family appeared as a significant factor here

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3. Where this was requested, the project facilitated such communication through offering a workshop about the setting of the school that they were making contact with, organizing web-based virtual meetings and helping with the translation and exchange of letters.

4. In a context where most schoolteachers are not themselves Iñupiaq, there is some unease about the extent to which they can take on an Iñupiaq framework: "They feel it is 'not their place to teach the culture'" (Harcharek and Rexford 2015:25). The schoolteacher with whom this project worked, however, was an enthusiastic proponent of the scheme.

too, not so much through family events as evoking memories of particular family members who "might give you a helping hand," teaching important skills such as how to handle an ATV.

Beyond the reach of our walks, but appearing in children's vivid accounts of their special places, was "the tundra," site of family camping trips to go fishing, berry picking, and hunting for geese and caribou. Also frequently mentioned was Pigniq (Shooting Station, about 5 miles north of Barrow), where many children spoke of their excitement learning how to hunt ducks with parents, grandparents, and extended kin. It is still customary to provide young children with bows and arrows to go after birds before they are taught to handle guns, and it is not unusual at Pigniq to see clusters of (mostly) young boys pursuing shore birds with bows. The birds are rarely caught, but the boys begin to learn how to observe movement and predict behavior.[5]

The identification of these special places raised very direct questions about the effects of climate change among the children. They identified local changes with reference to permafrost melt, coastal erosion, and fall storms and discussed at some length the impact of the polar ice cap shrinking. When asked about the greatest challenges in a changing future, talk immediately turned to food. Some students thought about this in terms of increasingly unreliable food deliveries to local stores. The bulk of the discussion, however, focused on changes in and threats to those species that local people depend on for subsistence. Students quickly turned this into an exercise in listing local sources of food for humans and other animals, moving across English and Iñupiaq words as they did so; they often displayed their knowledge by contextualizing it through accounts of their own participation in hunting, fishing, berry picking, and the like. A smaller number of students shared concerns about the effects of climate change on these sources of food. It should be noted that in these contexts all students were aware of climate change, but attitudes concerning it ranged from anxious to disinterested. Of equal importance is the fact that all students were aware that "change" and "future conditions" were dependent on many things, from changing ice conditions to shifting demographics to oil development.

These classroom-based discussions continued on the walks. One striking way that environmental change manifests itself is through the impact on ice cellars, something students were given the opportunity to learn about as one whaling captain invited them to descend into his ice cellar. Ice cellars are dug into the permafrost as a place of long-term storage for subsistence food: marine mammals, fish, ducks, geese, caribou. They should be cleaned out every spring so that migrating whales "see" a welcoming place for them and decide to give themselves

up to the whaling captain and his wife (see also Bodenhorn 2001). Directly related to changing conditions, the children were warned that dangerous gases may be released by melting permafrost, or cellars may become flooded because of the rising sea level. Indeed, in recent decades, there have been reports of ice cellar failures across the North Slope, including instances of flooding and thawing (Sakakibara 2008), and the consequent loss of food and of the crucial capacity to share and store food. Moving through the landscape with children, for many of whom food is crucial to the understanding of their local environment, this was a dramatic and vivid manifestation of the materiality of climate change in their lives.

Mexico

In many ways, Ixtlán de Juárez, Oaxaca, contrasts markedly from Barrow: megabiodiversity characterizes this young mountainous region, in contrast to the minimalist—and flat—ecosystem of the Arctic Tundra. Nevertheless, Ixtlán resembles Barrow in its size, its centrality as a regional center, and as a community whose main resources (in this case, forests) are communally managed. Here, too, teachers and parents are working together (sometimes in opposition to the state) to incorporate more local knowledge into early-education curricula. Here we walked with 79 elementary school students, largely with Zapotec roots, around the town and the forested hills.

As with students in other locations, many "special places" were beyond the reach of an afternoon's walk: in particular *el monte* (the upper reaches of the communal forest which is often a site of family outings). For our initial walk, however, we focused on routes around within a couple of hours' proximity to the school. The routes that the children chose revealed a deep familiarity and detailed knowledge of trails and shortcuts not always well-known to the adults accompanying them. Spaces especially set aside for play—the playground (*juegos*) and football field (*las canchas*)—were central to the children's sense of their local environment. However, these were specifically valued as "good" because of the different sorts of activities that take place there; the games certainly had their attractions, but quite often it was what they might find in the place (or on the routes to and from the place) that most captivated their attention. For example, taking a footpath along a creek to the football field, and having to jump across a couple of small arroyos, the children talked enthusiastically and knowledgeably about the kinds of food you could gather but also about potential risks they might pose. Although watercress is considered both tasty and healthy, for instance, the children were well aware that this could be dangerous to eat; they took great pleasure in pointing out great clusters of watercress that, however enticing, would not be good to eat because it was growing close to a polluted stream.

Several plants were identified for food and medicinal uses over the course of the walks; and occasionally the children (most often, although not exclusively, the girls) would come to a complete stop and search the grass intently looking for

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5. One woman in Barrow related to Bodenhorn a conversation that she had had with her son: "Why are you so good at predicting where your opponents will move on the basketball court?" "It's just like watching caribou," he answered. "You watch them long enough, and they will tell you how they are going to leap."

particular flowers and leaves. Much of this knowledge had been passed on to the children from family members; one boy, for example, running over to a Bougainvillea and recalling that his uncle made tea from the flowers that was good for coughs was met by a chorus of additional comments from his schoolmates as to what other curative powers Bouganvilla was held to have within their respective families. Many of these plants were found in the green around the main church—a special place chosen almost universally because it is "so pretty" and is a tourist attraction.

The playground was clearly attractive because it gave students an opportunity to play on the swings instead of sit in a classroom. But what was striking about this location was the sense of danger associated with it—danger specifically associated with spirits. This was first brought to our attention when a student remarked that you could "get scared" walking up the path to the swings at night. Others chimed in, relating stories of La Llorona (a ghostly woman who wanders around crying—some people say like a child; others say like a woman crying for her lost child), and most frequently producing tales of goblins (*duendes*) that they had heard from parents or other relatives, but also their own experiences of seeing their traces in the landscape, hearing them and feeling their pull. Overall, the children narrated a lively awareness of shifts in the relationship between place and danger and a strong sense of the role of nonhuman agency in the sociality of the places they passed through.[6]

It was this sense of curiosity about what you might find that was a key characteristic of the children's movement: some explained that they did not necessarily go to particular places (such as the churchyard) specifically in order to look for things, but part of walking is always being on the lookout—for dangerous things (such as duendes), pleasurable things, and useful things. As in Alaska, this sensory awareness attuned for "what you might find" therefore combined a sense of play, aesthetic interest, cultural knowledge, and practicality. Occasionally, it also served as a way of making observations about change, as in remarks that the eucalyptus in the playground had been much less stressed last year.

Children often linked their botanical knowledge to the concept of *biodiversidad* (biodiversity), which figures in their vocabulary as an important term when talking about community-based conservation and sustainable forest management (Chapela 2005) and is widely familiar from home and school environments. However, if biodiversity was an abstract term made concrete in the children's experience, this did not appear to be the case for climate change (*cambio climático*); while the concept was recognized as important, there was a lack of clarity about its meaning, and it was not widely discussed or applied in relation to what

the children experienced around them.[7] Both categories are moralized: biodiversity is "good"; climate change is "bad." How they might be linked is still up for discussion.

Mongolia

Research took place in two provinces of Mongolia, allowing us to work with primary schools based in distinct ecoregions: Mungunmorit *sum* in Tuv *aimag*[8] (35 students) and Bayangol *sum* in Uvurkhangai *aimag* (22 students), situated within forest steppe and desert steppe landscapes, respectively. In both locations, children eagerly demonstrated a strong knowledge of the local geography learned from family and (to a lesser degree) the classroom, describing sites of significance for the community. In Mungunmorit, for example, the children pointed to each of the hills around and recited the stories associated with them at length; these accounts were vivid even when the children had not been to a particular place themselves. What was clear was that a knowledge of the distinctive local features was a strong part of the children's sense of identity and pride in coming from that particular *sum*, and that they felt it was important to know the stories that adults in their community knew. In Mungunmorit, especially, sites of historical significance were particularly important to the children, who described locations relating to the episodes in Chinggis Khan's[9] life and who took us to a site where the revolutionary hero Sukhbaatar and his army had stayed and fought during the Mongolian Revolution of 1921.

The children also had a strong sense of the sacred geography that surrounded them, taking us to *ovoo* (stone cairns that mark particular geographic points such as the tops of hills and are associated with worship of the eternal blue sky), circumambulating and tossing stones onto them in the manner that they have learned from family. In Mungunmorit, the children ran to sit under the lone tree (*gants mod*), which has been honored with prayer scarves and at which they spoke of gathering to greet the rising sun at the lunar new year (*tsagaan sar*). A tree that stands alone is sometimes said to have a powerful spirit that causes the tree to flourish where others have not (Humphrey 1995). Interestingly, frequent visits to these sites offered the opportunity for children to observe environmental changes: commenting, for example, that the gants mod seemed not to be growing as well as it once had, noting the drying out of grass along the way, and commenting that they believed that the grass was no longer as green as it had been in past years.

Fruit picking (especially currants and blueberries) featured as a particularly important seasonal activity for children, with

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6. It is worth noting that the participating Ixtlán teachers all come from the region, and two or the three contributed their own stories to these conversations, a dynamic that allowed the youngsters to explore their storytelling skills to their hearts' content.

7. As water becomes more obviously a resource in decline, it will be interesting to see the extent to which this changes.

8. A *sum* is an administrative district within a larger *aimag*, or administrative region.

9. The *sum* is located in relatively close proximity to the birthplace of Chinggis Khan (Delüün Boldog) and to the sacred mountain, Burkhan Khaldun, which he revered and which influenced the course of his life.

family and friends, in Mungunmorit. Again, this served as the context for remarks about environmental concerns that the children had. Wild strawberries were not as easy to come by as they had been in past years, which the children attributed to how dry it was. The opportunity to gather pine nuts, meanwhile, was affected by the large number of people who come from the capital city and gather them before they are ready.

In Bayangol, the children took a particular joy and pride in the Ongi River, with several of them telling us that the name of their *sum* referred to how the river had made them wealthy with livestock (Bayangol literally means "rich river"). There was a strong sense of its importance for peoples' livelihood as well as it being a pleasant place to go and play; the children were therefore keen observers of changes in the river, remarking on seasonal changes as the river froze and thawed and also remarking on reduced flow during the summer months. Indeed, comments about the reduced flow of rivers were prominent in walks in both locations, with children connecting their own observations with what they had heard from family members about rivers drying up. They connected this with a lack of rain and worried about how livestock would survive. Significantly, in both locations children spoke of this not only as a local problem that they themselves had observed but also as a problem on the national level, affecting not only their own *sum* but also threatening Mongolia as a whole. Several children referred to this directly as being caused by global warming (*delhiin dulaaral*). They attributed their knowledge of global warming to television, as well as to lessons in school. In Bayangol, an additional factor affecting river flow was the impact of informal mining activity (High 2012); we were told that a few years ago such activity further upriver had resulted in the river running dry. Again, this observation of a local phenomenon opened out into discussion of the affects of mining on a national level; they spoke not only of problems with informal mining but also with industrial-scale mining by companies (particularly foreign companies) that "don't mind destroying the beautiful countryside."

The sense of the future that the children expressed on the walks was undoubtedly marked by the issues they had linked to global warming: there was a consensus that the landscapes would become dryer and that herding would be increasingly difficult. However, children in the two locations had very different visions of what would happen to their *sum*. In Mungunmorit, there was an expectation that the center itself would grow, becoming more of a focus of population, more built up, developed, and even "greener" (while this would appear to contradict the idea of the land drying out, it might be suggested that this is a sense of a developed urban space having maintained green space in the same way that the capital city Ulaanbaatar has trucks watering its lawns and trees to keep them green[10]). In Bayangol, the expectation was that the *sum* center would shrink and even "might not exist anymore" as people

moved to provincial centers or to Ulaanbaatar. Although these senses of the future lead to contrasting outcomes, both show children's awareness of the increasing draw of population into urban spaces (Bruun 2006; Sneath 2006).

England

In the United Kingdom, we walked with 200 children in six rural East Anglian schools, all in low-lying historic wetland areas: three in the Cambridgeshire fenlands and three in villages adjacent to the Norfolk Broads. The children in the schools were predominantly white British with very few from ethnic minority backgrounds, although a significant minority in one of the schools were children from Eastern European families.[11]

The history of land use change and population movement in the region leads to complex differentiations of social class. If we consider "pupil premium" statistics[12]—that is, a measure used to calculate additional central government funding for schools, offering some indication of the level of economic disadvantage among students—we see that two of the participating schools are above the national average percentage of pupils eligible; two are around the average; and two are below the average. However, this obviously does not give a full insight into class differentiation within the communities; the areas of East Anglia studied are simultaneously "commuter belt" areas, which attract middle class in-migration of families where parents work in Norwich, Cambridge, or London, changing the dynamics of established rural working-class populations, historically engaged in farm work (Hoggart 2007). However, while this led to important differences in terms of access to activities and experiences within the local area (such as horse riding) and beyond (such as foreign holidays), children shared their own experiences and engagements with the locality through play and imagination as a "common ground." A key factor here was the separation of adult and children zones of activity and knowledge, combined with the small proportion of the population making a living from the land, leading to children's economic disengagement from the working landscape (discussed below in "Having a Stake") in a way that was broadly normative across social class.

In a national context where conservation organizations frequently express concerns that children are suffering from "nature deficit disorder"[13] (see, e.g., Moss 2012), it was striking how much personal experience the children had about their surroundings and how much they valued exploring and playing in their local environment. For example, they enthusiastically

10. We are grateful to David Sneath for this observation.

11. The particular dynamics of sense of place among migrant children in this fenland school are discussed at more length in Irvine and Lee (2018).

12. Eligibility compared to the national average is stated in Ofsted (Office for Standards in Education, Children's Services and Skills) school reports.

13. This term was coined by Louv (2005).

described activities such as ditch running in the Cambridge-shire fens—an adaptation of free running for a landscape where wetland has been drained to provide land for arable farming: "you run along as fast as you can and jump from edge to edge and try not to fall in." As the children walked, they communicated a strong connection with their dwelling places, expressed through kinship and friendship ties, excitement about places where they play, den building (Sobel 1993), just "looking for things," or gathering berries in the bushes and picking fruit in the remnants of old orchards. The sense of connection was evident in the relational way that children spoke of their environment; the language of "my" and "ours" was commonplace in description of landscape features; for example, a child might talk about having a personal relationship with "my" tree.

Children had a vivid sense of narrative imagination about the places they moved through; these meanings with which children "enchanted" the landscape were generally personal meanings, or meanings shared with peers, rather than meanings held by a wider collectivity. One example of this was the "dark alley" shown to us by several of the groups of children of all ages at one of the Norfolk schools. This was, in fact, a fenced public pathway leading from the main road running through the village to a road that runs close to the village recreation ground. The tall trees overhanging both sides did indeed create a very shady passageway, and for this reason it was seen as a space of adventure for the children and described as "spooky," "scary," "muddy," "sparky-ish,"[14] and the perfect place for games of manhunt. In a somewhat spread-out village where many of the roads were narrow and had no pavement for pedestrians, and where children expressed difficulties getting around, it was significant that this long passageway for pedestrians only had such value for the children, and the trees shading it on either side made it a potent space for their imagination: indeed, one of the younger groups on the way to the "dark alley" sang "we're going to the forest, the forest, the forest" the entire way there. This demonstrates well children's capacity for improvisation in finding and adapting spaces of play within the imposed environment.

Particularly in Norfolk, one way that the children's familiarity with their environment manifested itself was in the widespread awareness of flooding, with children recounting instances when housing had been affected by flooding and when water had been "up over the road," and connecting these with wider anxieties in the community, especially those of their parents. ("Mum and dad say the house will float away.") Children shared these experiences of flooding while pointing out the material markers of flood risk and flood management, such as floodgates, "liable to flooding" road signs, and drainage ditches. Nevertheless, it is important to note that this awareness of flooding was treated as locally specific in that it was not linked

to flooding or other events that occurred elsewhere nationally or globally, nor was it connected (either during the walks, or when asked directly about this during interviews in the final stage of the research) with concerns about global climate change. In this regard, the children's awareness of their own environment was not articulated as part of a wider set of concerns that linked the local with the global imagination.

During the final stage of the research, in order to investigate this, when interviewing the children we asked them directly about their knowledge and understanding of climate change. Most children professed to having either no knowledge or very scant knowledge of terms such as "climate change" or "global warming." When pressed, however, they were often able to offer very reasonable explanations of them, citing school lessons, parental conversations, or news and documentary programs where they had encountered the concepts. Some did express fear and concern about the issues (e.g., "I hate listening to the news at night because I can't sleep"), but almost invariably initially children expressed the belief that climate change was something that happened elsewhere, "in big cities," "in the North Pole," "in the rain forest"—even "in Scotland."

The children's narratives therefore reflect wider research suggesting that direct experience of flooding in the United Kingdom does not imply increased concern about climate change, with accounts of flooding focusing on local factors (Whitmarsh 2008). Furthermore, the children's knowledge of flooding did not seem to have a defining effect on their sense of the future of their environment, with the present-day managed landscape naturalized as the pattern of terrain and envisaged as a state that could and would persist.

In terms of the children's own perceptions of environmental change, much more clearly articulated, and much more prominent in their imagination, was a sense of the impact of housing development in the future (see also Irvine et al. 2016). In each of the schools, children identified spaces that were likely to be built upon. This sense of property development becoming the most valuable way to use land, and the sense that other land uses might give way to development, was extremely strong across all the children.

If places of play are "children's places," as Olwig and Gulløv (2003) remind us, it is important to remember that they are very rarely children's places in an uncontested way: the "uneven distribution of influence and status reflected in different conceptions and uses of places" (8), so forcefully demonstrated in such property developments, means that children's own work of placemaking can be sidelined by those with more influence and control. The majority of those with whom we worked envisioned a near-inevitable future in which places that were familiar and important to them would be "turned into roads and houses." Interestingly, reactions to such development revealed class dynamics that were not readily apparent in other domains. For many of the children of all backgrounds, this involved a sense of loss, although for some it also led to a sense of resentment—most marked among those children who perceived a mobile middle class of which they were not part

14. This was a reference to the "sparky" sound of leaves crunching underfoot.

"asset stripping" the neighborhood (to borrow the language of Skeggs (2005) on "propertising" working-class culture), as in the context of some children in Norfolk identifying the encroachment of holiday homes.

These accounts from the different research sites, although necessarily brief, offer some sense of the texture of children's relationship with place and the themes that emerged on the walks. They highlight the particular aspects of environmental change that the children were aware of, the sources of this awareness, and the ways that the children linked (or did not link) local phenomena with climate change. In the next section, we will turn to a comparative discussion to explore some key factors that appear to play a role in shaping how children come to see climate change.

Learning to See 1: Having a Stake

After the walks, one of the schools in Norfolk, United Kingdom, made contact with the children in Barrow, Alaska. The children wrote letters, made a class presentation about their lives to share, and asked questions over a weblink. When asked what they had learned from this exchange, the children remarked at length on how interesting and surprising it was to them that some of the children in Alaska had spoken about helping in the whale hunt. Some made the contrast with their own lives, in which they had very little involvement in the supply of food, in spite of living in a rural community and being surrounded by farmland: "We have the harvest holiday, which is for, like, . . . we're meant to help out with the harvest, but that is just like a holiday; we don't do it anymore. We don't need to."

The children's comparison here is insightful and revealing. As noted above, the East Anglian children had a strong sense of relationship with the land around them, yet there was not a strong sense of connection to or involvement with the agricultural processes that shaped the landscape (much of which was dedicated to arable farming). Two points can be made about this. The first relates to the United Kingdom rural economy. Although rural landscapes continue to be characterized by the preponderance of farmland, the number employed in the agricultural sector has declined dramatically in the last half century (Zayad 2016). In the areas where we were working, agricultural land accounted for 86% of the land use but only 1.8% of the workforce (above the national average of 1.5%), compared with around 25% in 1950. Thus, even those children from rural working-class families historically involved in the agricultural sector are likely to have very limited direct exposure to working the land. Alongside this decline of the percentage of the population involved in agriculture, there has been increased centralization in built-up areas of what had previously been a more dispersed rural population (Hill 1992), and large scale in-migration, particularly from United Kingdom cities, as people choose to live in rural towns and communities out of a desire for the countryside aesthetic and lifestyle, commuting to Cambridge or London (although in these cases, the children themselves often claimed a very strong

sense of local identity from their own experiences growing up there[15]).

The significance of all this is that East Anglian children's families had, in the vast majority of cases, very little of the knowledge that comes from working the land. And in spite of what often figured as a strong sense of attachment to the immediate environment, there was a disconnection between the local landscape and family livelihoods. This contrasts markedly with the other sites in the study. In the Mongolian schools, for example, the majority of children came from nomadic herding households.[16] As Marin (2010:174) has observed, "the nomadic herders of Mongolia demonstrate a detailed understanding of weather and climate and provide an account of climatic change that integrates multiple indicators," including observations about severity of dust storms and the frequency, quantity, and intensity of rainfall, and such observations are therefore present as part of the child's family life. Moreover, herding occupied an important place in the sense of value and prestige both at home and at school. For example, displays at the entrances to the schools featured lists of the top herders in the *sum*, detailing the numbers of the different animals in their herds; this is in keeping with the practice of honoring and celebrating prominent herders with prizes. Environmental effects were therefore rendered salient by their impact on herding livelihoods, not only because of the connection between conditions for herding and the wellbeing of the family but also because of the strong sense of the cultural significance of herding for the Mongolian national identity (Bulag 1998).

The children in Norfolk who made the contrast with their counterparts in Alaska were pointing to differences in proximity to their means of sustenance. Whaling is central to Iñupiaq social life, and although Barrow youth, like their counterparts elsewhere, may often show signs of disaffection with the rules and the instructions of their elders, this does not hold in the case of whaling. There is no shortage of young recruits willing to work long hours, do whatever they are asked to do, and share the outcomes of their labors with countless others. This involves learning (by instruction as well as observation) how to see environmental hazards such as thinning sea ice, changing ocean currents, and shifts in wind direction that influence bowhead migration patterns (see also Sakakibara 2010).

A second point about the contrast relates more specifically to the children's role; it is not simply that children observe

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15. An interesting dynamic of such in-migration is that the children themselves can often have much greater familiarity and knowledge of the rural environment (learned from peers and personal experience) than their parents, who did not grow up there.

16. The need for children to be at school from the age of 6 places particular pressures on mobile pastoralist families to live closer to the *sum* center (Ahearn and Bumochir 2016), sometimes causing the mother to move to the *sum* center with the children, leaving the father alone to tend to the herds. In the schools where we worked, around one-third of the children, in fact, stay in dormitories at the school during term time because the *sum* center is too far from where their family is based.

other members of the household interfacing with the environment through work but also that the children themselves play a role in that work. As Lancy (2015) has remarked, the context of full-time schooling as the primary "employment" for the child renders surprising the widespread expectation that children contribute to the household economy. Indeed, as Ahearn and Bumochir (2016:94) have described with regard to Mongolian children having to attend school in the *sum* center, mobile pastoralists report "stress on the labor supply available to care for livestock and maintain winter homes and curtailed opportunities for children to learn winter survival and herding skills." It is noteworthy that in Barrow, the children interpreted their landscape to a significant degree through the lens of subsistence activities and the sociality associated with these activities: an afternoon's berry picking and fishing or learning how to shoot with a specific family member. Here, we see children learning their environment through practical activities, encountering and gaining an understanding of ecology through culturally mediated tasks (see also Zarger 2010): the development of identity and skill interlaced through opportunities for participation (Lave and Wenger 1991). On the walks in Oaxaca, we saw children's engagement with ethnobotanical knowledge learned from family members, which children readily linked to the concept of biodiversity as well as to practical knowledge of curative plants. Interestingly, one of the results of research conducted by Barraza and Bodenhorn in 2004 was that children's sense of participation in forestry was limited (Ruiz-Mallén and Barraza 2006, 2008; Ruiz-Mallén et al. 2009) This, the authors felt, was at least in part because of restricted opportunities to go to the forest with parents because of the time spent in school and a sense that forestry did not figure as part of their life-future. This might go some way toward accounting for the children's comparative silence about the observed effects of environmental processes when compared with the Mongolian and Alaskan contexts, but this requires further consideration; the children we worked with certainly had a sense of involvement in the forest other than as a commercial resource, and most identified the monte as a place they liked to go with family, a domain of significance that was not highlighted in the research a decade earlier.[17]

To be involved in subsistence activity is a part of growing up in an Iñupiaq community (see also Sprott 2002) and figured as a strong element of the Barrow children's sense of their life-futures. We see an upbringing in which the development of an autonomous self requires one to experiment, test limits, and gain an understanding of one's place, interfacing with the material conditions in which you live (Bodenhorn 1997:124). Crucially, students explicitly articulate this in connection with

taking pleasure in family and community activities. The encounter with the material changes that might be said to signify climate change is therefore not a world apart from the children's lives but rather part of their learning process.

If we consider the Mongolian context, we see there too children are expected to pitch in with economically and culturally meaningful activities. Besides household chores, they are asked to walk small herds to nearby pastures and to help with various collective tasks when gathering or milking animals (Michelet 2016). There is a keenness to introduce children to animals even before they can walk—this functions simultaneously as a way to entertain children and a way to "draw their attention" to important and valued domains of activities (Michelet 2016:230). Such "playful participation" is welcomed from a young age even where it might be disruptive (Michelet 2016:232, 233). Then, as they become older, children are motivated to take the tasks more seriously, such that participation became a meaningful status marker (Michelet 2016:242).

What this means is that children have a sense of involvement in the adult world; through their competences, children are participating in the economic and cultural activities that dominate adult lives; through their experiences children are participating in an understanding of the world that is deemed socially meaningful. Or, to put it rather more accurately, children's worlds and adults' worlds are not held apart as separate domains of knowledge and activity but are instead shared. In this setting, children seem to have a sense of their knowledge as something that can be relevantly and pertinently brought to bear on problems.

This was not the case in the United Kingdom, where often the very idea that a child's knowledge gained as an outcome of everyday encounters would be of interest to us as researchers seemed surprising to the children. For example, at the beginning of one of the first walks in the Cambridgeshire fens, in answer to the question, "So tell me what you know about your village," one girl answered: "I have lived here all my life but I do not know anything about it"—then, over the course of the walk, went on to reveal detailed knowledge about buildings, plants, and animals within the landscape. What was striking that the word "know" in our question seems to have signaled something very different to her, closing off these experiences as not of interest as a form of "formal" knowledge, even though she undoubtedly had a great deal to show us about her village. Such knowledge is hard to frame as meaningful in the context of a classroom in which context-independent, specialized academic knowledge is largely accepted as the goal of learning.

Evans (2006), in her ethnography of working-class childhood in Bermondsey, London, describes vividly the ways that schooling "seals off" the outside world, with children's own experiences deemed illegitimate in the context of school learning. While Evans's attention is on the negative effects of such a boundary for working-class attainment in particular, I would argue that the sealing off that is being described points toward a wider disconnection between children's knowledge and "formal" knowledge and that this accounts for the disengagement

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17. This may in part reflect the impact of local environmental education initiatives carried out by the ecotourism office and indeed extracurricular environmental education activities developed in conjunction with local managers as a consequence of the Roots of Success program described in the body of research cited here, a project in which Bodenhorn played an active role.

of children's vivid involvement with their local environment from more generalized concerns across the class profile of children we worked with. The focus on what has been called "powerful knowledge"—defined by Young (2008) as knowledge gained in specialist educational establishments, enabling those who acquire it to see beyond their everyday experiences (see Beck 2013 for a critical discussion of the concept)—places a distance between the theoretical knowledge gained in school and empirical knowledge beyond the classroom. Moreover, it creates a sense that what children "know" is qualitatively different from what adults are meant to "know." So the rich accounts of what the children saw in the United Kingdom context were not readily connected with formal scientific accounts of processes of change—the two forms of knowledge were worlds apart.

By contrast, in Alaska, as the children walk, they share concerns about the food that they play a part in providing, while in Mongolia the children's own observations about their environment are linked to matters of wider concern about the effects of aridity on herds and livelihoods. From this position, the children feel that they can draw on their own experience to make relevant and pertinent observations on environmental issues, and from this vantage point, make connections with concerns that transcend the local level: when they hear about concerns such as global climate change in school or on television, this is not an abstract "other" lurking beyond their lives but is rather something that they have a stake in.

Learning to See 2: Political Salience

When the children in Mungunmorit planned the route for their walks, one of the most striking features was the extent to which their sense of geography invoked the history of Mongolia. The children were eager to show their place in the making of the nation. First, this meant highlighting local sites that were significant because of their association with Chinggis Khan (ca. 1162–1227), unifier of the Mongolian people and builder of empire, a figure whose heroic status has been central to Mongolian nationalism since the democratic revolution of 1990 (Kaplonski 2004), and images or statues of whom are often displayed around the children's homes, including on the family altar. In addition, they drew attention to the connection between Mungunmorit and the revolutionary army of 1921, recognizing Sukhbaatar (1893–1923), the leader of that army, as a heroic figure who liberated the Mongolian people from the Chinese.

In other words, their understanding of place connected knowledge of the *sum* with a sense of nationhood that transcended the local while at the same time being vividly manifest within it. This was seen by teachers as resonant with the goals of the newly reformed curriculum that had been introduced in 2014, which, we were told, seeks to ground an understanding of the different academic subjects more firmly in the children's own experience and the specific context of Mongolian history and geography.

As Sneath (2010) has argued, the development of Mongolian national identity in the twentieth century placed a growing emphasis on the *nutag*, or "homeland," in which people have their roots as a constituent feature of the nation-state. This sense of locally anchored belonging therefore plays an important role in the imagination of the national community. With this in mind, it is interesting to see the ways that the children's "special places" expressed a sense of local value linked to, and contributing to, the values of the national culture. For example, the children ran with us up a hill overlooking the school where we were told that they regularly go after classes. Here, they spun prayer wheels beside a stupa, which they explained had been built for a celebrated local racehorse trainer; the children conveyed a sense of the prestige of raising horses that win prizes at *naadam* (the annual festival of traditional Mongolian sports) and also joy and pride in their own ability to ride horses, several of the children having raced in naadam themselves. Beside the stupa, the children showed us where they had arranged stones in circles to make the outline of a *ger*, the nomadic dwelling, so that they could "play house."

For the children, there seemed to be a clear sense of the significance of rural lives, and of their own locality, for a Mongolian national identity (see Kaplonski 2004 on the Mongolian nationalist sense that the *huduu*, or countryside, is where the "real" Mongols live). Yet children's sense of their *nutag* was also outward looking; hence, they were able to articulate their own local observations with what they perceived as national issues—aridification, pasture land degradation, and in the case of Bayangol, mining.[18] A comparison with the United Kingdom context is interesting here: while the children in East Anglia were aware of issues affecting the countryside, in particular the effects of housing development (see also Irvine et al. 2016), these observations were not articulated in ways that connected local concerns with a sense of what might be shaping the national future. Indeed, there was not a ready sense that their childhood rural experiences gave them an adequate point of view from which to engage with current affairs on the national or international level. By contrast, the children in Mungunmorit and Bayangol had a keen sense that the health of the countryside—*their* countryside—was diagnostic of the health of the nation, and so their observation of local changes gave them a vantage point to comment on geopolitical issues facing Mongolia.

In fact, in our discussions, it was interesting to see the interaction of multiple themes in the children's thinking about environmental change. Rudiak-Gould (2012) has spoken of "promiscuous corroboration" in accounts of climate change, where wider moral, social, and political issues are drawn into discussions on climate, creating a wider narrative of change

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18. When we were sharing our field experiences in Mungunmorit and Bayangol with the Mongolian anthropologist Munkh-Erdene Gantulga, he remarked that the children "speak like politicians."

within which evidence about the changing climate is interpreted—a narrative in which environmental threats are also threats to values. So, on the banks of the Ongi River, the children at Bayangol spoke not only of fears that land in the nation was being bought and sold by foreign hands who would degrade it (voicing in particular the sense that the Chinese posed a continual threat to Mongolia; see also Billé 2015) but also of the idea of global warming as a threat to the nation. What was clear was that climate change gained a particular salience as a way of thinking about Mongolia's place in the world and articulating concerns about the future of the Mongolian people.

The term "climate nationalism" has been used to describe the ways that concerns about national sovereignty shape people's understanding and attitudes on climate change (Fisher 2012; Liu 2015), often in ways that are seen to constrain action, as in the fear among some Chinese that attempts at international agreement ostensibly to mitigate the effects climate are forms of "imperialism" intended to benefit western countries (Liu 2015:286). In tracing how the Mongolian children connected their experiences with reflections about their nation's place in the world, we wish to show a contrasting side to "climate nationalism," whereby a sense of the significance of environmental issues for thinking about the future of the nation can be part of children's learning to see climate change in the world around them. In her ethnography of children's lives in Sudan, Katz (2004:228) uses the term "rural cosmopolitanism" to explore the "expanded field" of view by which children's detailed knowledge of their close environment, gained through work and play, is understood to be situated within wider "terrains of work and everyday life" (2004:226); children's sense of place and understanding of themselves is formulated through a sense of the global from which the "local" cannot be abstracted. What we need to think about here, then, are the conditions under which climate change becomes salient as a way of articulating this relationship.

Turning our attention once again toward Barrow, the geopolitics of the North have been closely connected, as we have said, with the presence of powerful politico-economic interests for generations, both as a result of resource speculation and due to its proximity to Russia (for a more detailed discussion of this, see Osherenko and Young 1989). If twentieth-century Alaska was a buffer between world powers, the probability that the northern polar ice cap will melt entirely in the near future creates a scenario in which polar nations jostle for claims to the riches that they assume will be available from the ocean floor—to be transported by megatankers through the ice-free Arctic waters (for details on the legal negotiations around such emerging futures, see Byers 2013). In such a setting, amid concerns that the indigenous population might be left out among the competing interests or rendered invisible inhabitants of an empty land whose future is decided elsewhere, visibility is itself a matter of crucial political and economic importance.

In Alaska, the discovery of vast oil potential during the 1960s led to protracted negotiations with Alaska Native groups—often

influenced by North Slope Iñupiat—which ultimately resulted in the passage of the Alaska Native Claims Settlement Act of 1971. ANCSA was an attempt by the US Congress to clarify the legal status of the 90% of the state that was then under federal control—in order to clear the way for oil development. This long and contested process resulted in the creation of native corporations that controlled lands meant to be simultaneously protected as patrimony and exploited for profit.[19] ASRC (Arctic Slope Regional Corporation) is a powerful regional entity that has the capacity to influence most aspects of North Slope life. A Fortune 500 member, it uses its considerable resources to help its Iñupiaq membership, providing scholarships, medical services, annual dividends, and the like. Although its major officers are also whalers, it is unequivocally pro-oil.

With a territory of 88,000 square miles, the North Slope Borough is the largest home-rule borough in the United States, overseen by an assembly of elected representatives from each of the eight member communities. For decades it has followed a tortured path to balance desire for oil money to meet the regional needs for income with an equally urgent responsibility to protect the animals on whom Iñupiat depend—and whose habitats are directly threatened by oil and gas initiatives.[20] The trajectory of children's learning should be seen against this backdrop of home rule. The school board is often the site of political struggles between state authorities and North Slope–led initiatives to introduce more local control into curricular design (see Harcharek and Rexford 2015). At the same time, however, it is also the site of local arguments about the ultimate goal of public education: to foster long-term Iñupiaq knowledge ways or to prepare young people to compete successfully in a twenty-first century market landscape.

In such a context, children's own environmental knowledge takes on a significance as the expression of the politics of cultural visibility. Their direct knowledge and experience of transformations in the landscape associated with climate change, as demonstrated on the walks during our research, gains salience as a way of communicating not only their place in the world but also the urgent need to pay heed to what is learned from within that place in the world. At the same time, such knowledge of the effects of climate change sits alongside an economic reliance on the extraction of oil that fuels such change, complicating any attempt to assign the Iñupiat to what Hughes (2013) describes as the "victim slot." Arguments about prioritizing environmental protection or resource extraction are conducted within the community, not between outsiders and insiders. A key question for the future will be the extent to which children's perception of climate change as a risk to sources of food and of identity, along with their knowledge of

19. For a legal analysis of this process, see Case and Voluck 2012 and Deloria and Wilkins (2011). For an anthropological discussion, see Bodenhorn (1988, 2004).

20. For a detailed exploration of how Edward Itta, as North Slope Borough mayor, tried to negotiate this balancing act during the first decade of this century, see Reiss (2012).

the thinning ice and coastal erosion, takes on a particular pertinence by way of its dissonant relation with the drilling of oil.

Learning to See 3: Temporalities

In each of the research settings, children were sensitive to seasonal changes. In Oaxaca, for example, the children described how you could hear the changing of the seasons: one girl noted that the springing up of *el aire*[21] marks the coming of the wet season; other children spoke of the arrival of different birds in the winter months and the changing of their songs in the spring. Yet one important difference between the sites was the extent to which observations about the changing seasons led to children reporting seeing environmental change between years. So in East Anglia, as in Mungunmorit, fruit picking was a key theme. To quote a girl from one of the Norfolk schools, there was an eager anticipation for the time of year when the "smell of bitter, sweet blackberries fills your nose and tempts you to eat one. Sugary, juicy, yummy." However, in Mungunmorit, unlike in East Anglia, children's accounts of the seasonality of fruit picking led to a reflection on how seasons themselves were changing in character: they remarked on the early arrival of fruit, and their difficulties finding wild strawberries in particular, seeing this as an indication of global warming. What is significant here is the role of time-depth in thinking about environmental variation (Irvine 2014). In this regard, part of the process of learning to see change is learning to situate it in time; and it is striking that in Alaska and Mongolia, where the effects of climate change were most vividly related and where the children themselves drew on explanations of climate change to explain what they were seeing around them, children's sense of their environment invoked a recognition of the temporal depth of the landscape.

In Barrow, the children's geography was influenced in particular by the seasonality of subsistence whaling, and especially by the celebrations that mark a successful catch: locations associated with *Nalukataq*, the spring whaling festival, with its blanket toss and the distribution of whale meat to families present, loom large in the children's memories. Both seasonal patterns and unique events are embedded in an expansive view of time. The fact that "the beach" was a major resource—for playing, walking, and anticipating subsistence—contributed to students' lively awareness of coastal erosion (which today is both incremental and extreme) as the major factor in the shifting coastscape. When asked whether they could see change, without hesitation they virtually all said that "the beach is getting smaller."

The Iñupiaq oral historian and filmmaker Rachel Edwardson, who has produced an educational documentary series on the history of the Iñupiat in partnership with the North Slope Borough School District, quotes a whaling captain who describes the multigenerational framing of this long-term thinking: "The whale that feeds my family is the grandchild of the whale that feeds my grandparents. I carry the DNA of my grandparents and therefore I carry the blood and oil of that whale too." As we saw in the children's walks, their geographies were expansively kinned—both laterally (uncles and cousins appear alongside parents and siblings as sources of teaching) and multigenerationally, not only through interaction with grandparents but also through *unipkaat*, or stories that stretch back through the generations, often through named ancestors. Thinking through generations, the children draw on a register of time that allows them to frame accounts of change.

In Mungunmorit and Bayangol, children's knowledge of their landscape likewise encompassed multiple registers of time. Memories of activities with parents and grandparents marked out particular places closely associated with family histories. These, in turn, were located in relation to shared representations of the deeper temporality of the environment: as well as a sense of the historic landscape associated with the making of the Mongolian nation, as described above, there was an attentiveness to the legends associated with particular geographical features, which the children placed in an unspecified distant past.

By contrast, the East Anglian children's view of their landscape was predominantly presentist (Irvine and Lee 2018). While they understood through experience that they lived in a landscape dominated by drainage infrastructure, this present-day managed landscape became, in a sense, naturalized as the pattern of the terrain—it was only with a great deal of prompting that the children engaged with what the landscape would have been like before drainage ("it used to be really soggy"). As noted above, these are low-lying historic wetland areas; inundation is therefore a significant factor in their past and a serious risk in the future. While such knowledge was in fact taught within school, it did not figure in the children's stories of place, and the idea of a changing landscape was glimpsed only very occasionally. The presentism of the children reflects a broader tendency among the wider population to bracket out visions of the past and future terrain of East Anglia: the effects of environmental variation on the region have become unthinkable. Areas that were once under water are now being farmed; houses sit on land that was once wetland (Irvine 2015). The present-day economy of the region relies on this remaining the case. We therefore see a region historically characterized by flux but now subject to tremendous political and economic pressures to preserve the landscape according to a pattern of a single data point in time (Irvine 2017). So whereas in Mongolia and Alaska the children had a sense of the time-depth of the landscape, which enabled a narration of those environments as changing, the children in East Anglia

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21. A specific pattern, usually beginning in March, when increasingly hot mornings are cooled down by light wind around midday and then often succeeded by thunderstorms in the late afternoon. In the beginning of this season, you get the heat and the air without the rain, but you know that the rainy season is on its way.

appeared more locked in to a view of the landscape as it stood in the present.

Why Does It Matter?

What can talking and walking with children in different parts of the world tell us about our human relationship with the changing climate? Susan Crate, agreeing with Basso (1996) that "wisdom sits in places," argues that anthropology needs "to grapple with the extent to which global climate change is transforming these spaces, symbolic forms, and places" (Crate 2008:573). Recognizing that children are at once products and producers of history (Toren 1993), we have shown that a focus on how they learn to pay attention to specific aspects of their material world reveals ways that meaning is produced in the face of emerging challenges.

Our goal in this research has been to understand those places that children deem significant in their lives, the extent to which they perceive transformations in those places, and whether climate change is a meaningful term for them when they come to articulate their environment. We are asking how things come to matter in terms of being recognized as having value that merits attention. How, in other words, do children come to learn to figure something as abstract as "climate" as important to their immediate lives? For Hulme (2009), the human response to climate change cannot be disentangled from broader questions about what people value and why. With this in mind, we have rooted ourselves in an understanding of what children deem significant in their environment, the grounds on which they acquire and learn to value particular forms of environmental knowledge, and the ways that they connect their personal experiences with other sources of information.

After exploring the rich ways that children expressed their relationships with the environments in four different settings, we focused on differences in how children perceived environmental processes. Our discussion explored three dimensions. First, we examined the ways that children can come to have a stake in concerns about climate change through their own proximity to the means of sustenance. This means that children not only are interfacing directly with the material conditions in which they live but also that through such activity they are participating in an understanding of the world that is deemed socially meaningful. From this position, the children feel that they can draw on their own experiences to make relevant and pertinent observations on environmental issues. Second, we saw that in conditions where environmental effects are diagnostic of wider concerns about threats to values (including, for example, national values), climate change can become a matter of political salience through which children are able to express concerns about their place in the world in which they live. Third, we saw how learning to see climate change was linked with a sense of the temporal depth of the landscape, a backdrop against which it is possible to think about environmental variation and to perceive what is exceptional and what is expected.

It is increasingly recognized that the cognitive and cultural basis of children's environmental perceptions should be seen as a matter of public policy importance. The *Stern Review on the Economics of Climate Change* (Stern 2007:23) states that "future generations will be even more strongly affected [by climate change], yet they lack representation in present-day decisions." Our contention is that a close attention to children's experiences is not only crucial for reasons of intergenerational equity but that it also adds greatly to our understanding of how, and under what conditions, human societies recognize and respond to climate change. In seeking to understand children's perceptions, we gain crucial insight into how climate change comes to matter, how experiences come to be connected with different sources of information, and how "climate" gains salience as a way of thinking and speaking about the world. In this way, the experience of children figuring things out can help to understand how an abstraction like global climate change becomes a concrete reality that can be engaged with and, potentially, acted upon.

Acknowledgments

Comments

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Vantage Points for Learning about the Salience of Hyperobjects to the Lives of Children

I sometimes imagine what authors in my reading pile would make of the manuscripts I review. If only to decenter my

understandings of environmental scholarship, criticality, and commentary, it sparks other ideas about what matters for well-being and flourishing (see Primdahl et al. 2018; Reid 2016). For this commentary, I found myself picking up Tim Morton's (2013, 2018) discomforting work. It unsettles my sense of the ecological, political, and anthropological, typically arguing that we are "always already" ecological rather than needing to become anymore so.

To elaborate, Morton deconstructs commonplaces that have emerged around materiality, places, relations, and affect. Whether it is in relation to the past, present, and/or future of human and more-than-human life, these have become increasingly indexed to an age of mass extinction, catastrophic anthropogenic global warming, and the Anthropocene (Bennett 2010; Bodnar 2008; Ingold 2012). Yet while their associated phenomena can be shown to be interconnected, Morton warns against invoking climate change as the key explanatory principle, as this risks rendering it a simplified concept and domesticated phenomenon. Rather, like globalization and mass extinction, it is better understood as an untamable "hyperobject" with vast, difficult-to-grasp features (if not heaps of them).

For Morton, hyperobjects are unlike familiar discrete things, as they are massively distributed in time and space relative to humans. They are not easy to see even as their presence is sensed (often with foreboding); in fact, their troubling realities and irrealities relay the uncanny and capricious. Questions soon surface about the faith we can place in our attunement to the effects of hyperobjects throughout different stages and configurations of our lives. This includes as children and adults of particular generations and locations, but also in the dappling of light and shade associated with various experiences of play (less than work?), travel and trauma, supremacy or marginality, lucidity/dementia, un/in/ability, and so forth (e.g., Lotz-Sisitka 2009; Martusewicz 2015; Scranton 2015).

These complexities to our lives serve to remind us that any "constructs," let alone "experiences," of a hyperobject are not only partial but refracted: we "can only see slices of it at a time" (Morton 2018:125). For Weintrobe (2013), some adults admit to the anxiety this can create; for Lertzman (2014), an environmental melancholia; while for Norgaard (2011), the lived realities of denial. Together, and in broad terms, many Westernized adults now seem to lead lives heavily inflected by miscomprehension and inaction regarding climate change, even as they might also recognize this situation spurs an "undistancing" and challenge to those cultural norms that have emerged in configuring emotion, conversation, and attention toward climate change. Waves of compassionate action, for example, may surface around environmental injustice or in response to willful ignorance triggered by this hyperobject; they may also recede and require new "structures of feeling" for these times (Pihkala 2017).

Now children usually become adults, learning and unlearning modes of living and responding as they do. In relation to climate change, though, it is seldom within a sole horizon of appreciating the scale or focus of (mis)management or denial.

Ambivalence is frequently there too, as in becoming cognizant of the following: "What makes humans the most dreadful is their ecological power. The uncanniness of human being is that it stirs up the oceans, divides the rocks, and ploughs up the soil" (Morton 2013:200). Yet in analyzing how children come to terms with living with ongoing environmental transformation and their implication in this, Morton (2013:94) reminds us that "futurality is reinscribed into the present, ending the metaphysics of presence: not through some neat philosophical footwork, but because the very large finitude of hyperobjects forces humans to coexist with a strange future, a future 'without us.'" So what inevitably comes to matter to children in Mongolia, Mexico, Arctic Alaska, the United Kingdom, and elsewhere is what adults and previous generations have already experienced and face: a "new phase of hypocrisy, weakness, and lameness" because "hyperobjects are directly responsible for the end of the world, rendering both denialism and apocalyptic environmentalism obsolete" (Morton 2013:2).

If we are to talk with children, we are not likely aided by an education that simply stresses that people rethink causalities in "super wicked problems" (another key way climate change is understood; Levin et al. 2012). We already have enough science and environmental education that does that, noting too these seem to have little effect on the prevailing climate of politics, economics, and education "for unsustainability" (Jickling 2013; Stables 2013; Wals and Benevot 2017). Equally, humanity cannot hope for a rebirth or awakening moment either: the vastness of this hyperobject reminds us that we are never outside nor can we escape our collective predicament: "Not only are we waking up inside a gigantic object, like finding ourselves in the womb again, but a toxic womb—and we are responsible for it" (Morton 2013:183).

Which brings us to "learning to see" and the twin themes of coexistence and catching up with hyperobject-infused realities that neither children nor adults can control. Irvine and Lee (2018) show that we need something that walks children—and adults—through a complex range of lifeworlds: inner-outer-phenomenal-conceptual, which many are finding increasingly hard to navigate in these times. Yet if transversing is both signaled and marked by affective experiences that existentially and politically attune—and bind us—to this hyperobject (Reid 2013), we might yet/even learn to care for this—and all our fates—within and beyond our mutually implicated lifetimes (Kenis and Mathijs 2011)?

To conclude, studies from around the world repeatedly show the tensions of humans having "secreted themselves into every corner of the environment" and "that the environment is actually inside human bodies and minds" (Bennett 2010:116). Or, as Zylinska (2014:9) puts it when figuring out a "minimal ethics for the Anthropocene,": "Life typically becomes an object of reflection when it is seen to be under threat. In particular, we humans have a tendency to engage in thinking about life (instead of just continuing to live it) when we are made to confront the prospect of death: be it the death of individuals due to illness, accident or old age . . . but also of whole

populations, be it human or nonhuman ones." What else is more salient to the lives of children (Postma 2006)?

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Learning to Be More than Placelings

In his satirical short story, "Mister Squishy," David Foster Wallace (2004) offers a disarmingly simple take on human self-centeredness. Everyone believes that their vantage point is the one that matters, because "they themselves have been at the *exact center* of all they've experienced for the whole . . . of their conscious lives" (2004:30; italics in the original). When something happens, it happens to the left of *us*, to the right of *us*—how could it be otherwise?

Cultural anthropologists, it seems, agree. We may celebrate the limitless creativity of human societies, but we are also deeply attached to a particular notion of human limitation. People can only see things (global climate change, e.g.) with themselves at the exact center. This idea shows up in many guises. Historiography cannot help but be presentist, scholars from colonizing nations cannot help but see colonized societies in terms that flatter colonialism, societies cannot help but remake Christianity in their own traditional image when they convert to it (Robbins 2007), and so forth. We are "placelings" (Escobar 2001:143), and, so the argument goes, to imagine otherwise is both foolhardy and dangerous.

Placelings we may be, but that cannot be the whole story. Humans are capable of grasping things far from home. Not just far from home—but much larger than home, utterly unlike it, even radically counter to it (McCauley 2011; Sinatra, Brem, and Evans 2008). Theologians imagine a placeless, timeless God; physicists investigate transcendentally large, small, fast, slow, and strange worlds; environmentalists speak of a biosphere of which our local place is only a small part; indigenous activists weave the experiences of thousands of diverse societies into a single narrative. And these place-transcending concepts are not just the province of an intellectual elite—they are taught to young children, animate broad social movements, inspire millions. The question is not, How did we come to forget that we are just placelings? The question is, How is it that we sometimes manage to be *more than just* placelings?

Irvine, Bodenhorn, Lee, and Amarbayasgalan's article goes a long way toward answering that question in the particular arena of climate change. The progress they make is enabled by their directly comparative method, their attention to both observation of local change and reception of climate science, and their focus on children as they connect (or fail to connect) familiar local places to broader issues. In essence, the authors' answer to the question of how we become more than just placelings is: by learning to interpret what we see locally in terms of a fundamentally nonlocal discourse. That discourse—whether "global climate change," "nationalism," or its fascinating hybrid "climate nationalism"—may have been invented by a mobile, cosmopolitan elite with the means to visit many different places, but it can be grasped by anyone who comes into contact with it.

In this regard, the authors are wise to focus so much attention on the role of schools. The classroom is often the place where children first encounter those place-transcending discourses. That is hardly an accident. Compulsory schooling arose with nationalism in the nineteenth century as a tool to instill a national identity, culture, and dialect to weaken ties to the village and the province (Lem 1994)—in other words, to transcend (perhaps to destroy) place. The effects of this, with regard to children's environmental engagement, are complex. As the authors point out, school separates children for much of the day from their local environment and their parents' subsistence activities. One of the key features of school, it seems, is that it occurs indoors. At the same time, it is in the classroom that children most often come across the notion of global climate change, a concept that can bring broader meaning and deeper significance to the changes that they observe locally.

One might say then that schooling enhances climate change reception at the expense of climate change observation. At its best, however, schooling might promote both and even help to link the two together—which I believe to be *the* way that humans will be able to meaningfully grasp and tackle climate change. Efforts underway to indigenize education and render it more place based (efforts that I have seen personally in the Marshall Islands and Hawaii and that appear to be afoot in some of the authors' field sites as well) are promising. The power of the classroom to work against ethnocentrism might triumph over its more sinister agenda of eradicating place.

That is a necessary development. Climate change is more than just local, so we must be too. Fortunately, we are equipped to be more than just placelings, and cultural anthropologists should follow the authors' lead in investigating just how people manage this uniquely human feat.

Reply

We are grateful for these thoughtful comments, which push us to reflect on key blockages to any capacity to apprehend, let alone act upon, climate change. Our framing of the challenge as one of "learning to see" draws us inexorably toward two related problems, which are nicely articulated by Peter Rudiak-Gould and Alan Reid. First is the potential limitations of the vantage point from which any lines of sight are drawn: Can humans ever "see" other than with a field of vision that places themselves at the center? Second is the problem of scale: Can anybody truly "see" an object as massive as climate change?

Reid draws our attention to Timothy Morton and his characterization of global warming as an untamable hyperobject.

As Morton (2013:38) explains, seeing the sun beat down, he is "watching global warming unfold . . . Yet I do not see global warming as such . . . global warming is not here." It is massively distributed in space and time and as such is nonlocal. The challenge of such a recognition to a study such as ours, focusing on children's sense of place, is a profound one: What is the point in locality? From this perspective, we would need to recognize the "false immediacy" (2013:48) of children's observations of rivers drying up in Mongolia or of Alaskan ice cellars that can no longer be used because of permafrost melt: they are an index of the thing but are not the uncontainable thing itself.

This connects with the problem outlined by Rudiak-Gould: the limitation imposed by the idea that we can see only with ourselves at the center. To emphasize the place-based characteristics of learning might well be to ensconce such a perspective. Yet as Rudiak-Gould rightly recognizes, people do think about place transcendence in a variety of ways, and the dynamics of how this relates to sense of place are complex.

Our contention in this paper is not simply that children make local observations but the significance of what children do with these observations, the dynamics of how they learn. Learning is a process of placing these observations and experiences in relationship; and indeed it is Morton's (2013:83) contention that hyperobjects such as climate change are detected in interrelationship, in the mesh of links and gaps between the links. So threats to places of play might be conceptualized in relation to news of development elsewhere; knowledge of food sources may be articulated in relation to narratives of effects upon those sources gathered from parents, school, and media. Crucially, children's learning is a process of navigating contradictions and tensions between such contextualizing perspectives. For this reason, we follow Hastrup (2014:8) in her insistence that reproduction is different from repetition: if to learn is to place observations and experiences in relationship, it is to renegotiate, not simply to replicate.

A key dimension of this relationship is the extent to which it is recognized as a relationship in time. Dupuy (2015:6) mourns a failure to recognize the reality of the future, from which we receive the present-day ecology and geology of our planet as a usufruct. We might therefore seek out a "futures education . . . wrestling with anxiety and the relation of despair and hope" (Pihkala 2017:111), but we also need to consider the conditions under which such thinking is possible. Learning to see climate change here means engaging with expanded time horizons such that "environment" is not constrained as a fixed point but rather recognized as a dynamic relationship. Where we see such a constraint, as in the case of East Anglia's "temporal lock-in" (see also Irvine and Lee 2018), local experience and observation can indeed become sequestered and disconnected from the wider context that would render it salient.

Yet a key element in our approach has been to recognize children's own agency (without simply dumping all responsibility for the future at their feet). Recognizing how children learn to see in ways that articulate the problem of climate change anew moves us beyond a sense of socialization as replication. Indeed, as a recent study by Lawson et al. (2019) shows, children play an active role in socializing their parents on environmental issues. (Barbara Bodenhorn recalls the president of the communal authorities in Ixtlan laughing en route to a meeting with students: "It's my kids who are pushing me. They really talk to me about recycling, and not wasting water.") In the past year, the global growth of the School Strike for Climate shows a desire to find new ways of articulating the urgency of the problems faced, bringing with it a fresh recognition of the political salience of children's own experience. Children are not only learning to see but also are insisting that adults learn to see from their vantage point too. Our capacity to coexist with the oncoming reality may depend on it.

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