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Résumé de l'article

Le changement climatique est le plus grand défi auquel est aujourd'hui confrontée l'humanité, et ses effets – de la perte d'habitat aux impacts psychologiques – sont discutés dans la plupart des disciplines académiques. Le patrimoine archéologique des régions arctiques et subarctiques se trouve parmi les nombreuses victimes du changement climatique : le réchauffement global, les conditions météorologiques erratiques, l'érosion côtière et la fonte du pergélisol menacent, en effet, les archives anthropiques et écologiques que l'on trouve dans les environnements nordiques. Dans ce contexte, l'archéologie est particulièrement à même de fournir des perspectives à long terme sur les réponses anthropiques aux changements climatiques, et ainsi éclairer le débat actuel. De plus, les recherches archéologiques et l'intégration du patrimoine archéologique au sein de la société contemporaine peuvent permettre de répondre ou même d'atténuer certains enjeux socioculturels liés au changement climatique. En se focalisant sur les communautés yup'ik et le patrimoine archéologique hautement menacé du delta Yukon-Kuskokwim (Y-K) en Alaska, nous soutenons ici que l'archéologie communautaire peut fournir de nouveaux contextes à la découverte et à la documentation du passé et, par conséquent, à renforcer l'engagement et la résilience culturelle. Nous soulignons les bienfaits que représentent le patrimoine archéologique et la pratique de l'archéologie afin de minimiser certains impacts sociaux et psychologiques du changement climatique mondial, autant pour les communautés que pour les individus. Nous suggérons également que l'archéologie joue un rôle dans la réduction de la distance psychologique liée au changement climatique, un obstacle reconnu comme limitant l'action et l'adaptation des individus et donc atténuant le changement climatique, en particulier dans les régions où ses effets ne se sont pas fait ressentir immédiatement.

Archaeologies of Climate Change: Perceptions and Prospects

Kate Brittonⁱ and Charlotta Hillerdalⁱⁱ

ABSTRACT

Climate change is the biggest challenge facing humanity today, and discussions of its effects—from habitat loss to psychological impacts—can be found in most academic disciplines. Among the many casualties of contemporary climatic change is the archaeological heritage of Arctic and subarctic regions, as warming, erratic weather patterns, coastal erosion, and melting permafrost threaten the anthropogenic and ecological records found in northern environments. Archaeology is uniquely positioned to provide long-term perspectives on human responses to climatic shifts, and to inform on the current debate. In addition, the practice of archaeological research and assimilation of archaeological heritage into contemporary society can also address or even mitigate some of the sociocultural impacts of climate change. Focusing on the Yup'ik communities and critically endangered archaeology of the Yukon–Kuskokwim (Y–K) Delta, Alaska, here we argue community archaeology can provide new contexts for encountering and documenting the past, and through this, reinforce cultural engagement and shared cultural resilience. We emphasize the benefits of archaeological heritage and the practice of archaeology in mitigating some of the social and psychological impacts of global climate change for communities as well as individuals. We also propose that archaeology can have a role in reducing psychological distance of climate change, an acknowledged barrier that limits climate change action, mitigation, and adaptation, particularly in regions where the impacts of contemporary climate change have not yet been immediately felt.

KEYWORDS

Arctic, environmental archaeology, community archaeology, cultural heritage management, resilience, Yup'ik, Alaska

RÉSUMÉ

Archéologies du changement climatique : Perceptions et perspectives

Le changement climatique est le plus grand défi auquel est aujourd'hui confrontée l'humanité, et ses effets – de la perte d'habitat aux impacts psychologiques – sont discutés dans la plupart des disciplines académiques. Le patrimoine archéologique des régions arctiques et subarctiques se trouve parmi les nombreuses victimes du

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changement climatique : le réchauffement global, les conditions météorologiques erratiques, l'érosion côtière et la fonte du pergélisol menacent, en effet, les archives anthropiques et écologiques que l'on trouve dans les environnements nordiques. Dans ce contexte, l'archéologie est particulièrement à même de fournir des perspectives à long terme sur les réponses anthropiques aux changements climatiques, et ainsi éclairer le débat actuel. De plus, les recherches archéologiques et l'intégration du patrimoine archéologique au sein de la société contemporaine peuvent permettre de répondre ou même d'atténuer certains enjeux socioculturels liés au changement climatique. En se focalisant sur les communautés yup'ik et le patrimoine archéologique hautement menacé du delta Yukon-Kuskokwim (Y-K) en Alaska, nous soutenons ici que l'archéologie communautaire peut fournir de nouveaux contextes à la découverte et à la documentation du passé et, par conséquent, à renforcer l'engagement et la résilience culturelle. Nous soulignons les bienfaits que représentent le patrimoine archéologique et la pratique de l'archéologie afin de minimiser certains impacts sociaux et psychologiques du changement climatique mondial, autant pour les communautés que pour les individus. Nous suggérons également que l'archéologie joue un rôle dans la réduction de la distance psychologique liée au changement climatique, un obstacle reconnu comme limitant l'action et l'adaptation des individus et donc atténuant le changement climatique, en particulier dans les régions où ses effets ne se sont pas fait ressentir immédiatement.

MOTS-CLÉS

Arctique, archéologie environnementale, archéologie communautaire, gestion de patrimoine culturel, résilience, Yup'ik

Contemporary climate change is arguably the biggest challenge facing our species and the future of all life on Earth today. While global political response and action is varied, climate change has emerged as central and much-researched topic across the spectrum of the natural and social sciences. Atmospheric concentrations of greenhouse gasses are higher than at any time in the last 800,000 years and global warming—the result of anthropogenic emissions from the pre-industrial period to the present—will persist into the coming centuries, causing profound and long-lasting changes in the Earth's climate (IPCC 2018). Northern sea ice levels are at a historical low, and nowhere are the effects of climate change more pronounced and destructive than in the Arctic. Arctic surface water temperatures are increasing by 0.6°C per decade (Neukermans, Oziel, and Babin 2018), winter warming events are increasing in frequency and duration (Graham et al. 2017), and the circumpolar region is now warming at more than twice the global average rate (Serreze and Barry 2011). Climate change is leading to decreasing permafrost; more unpredictable weather conditions; coastal erosion; infrastructural instability and changes in the abundance, distribution, and

seasonality of plant and animal resources (ACIA 2004; Hinzman et al. 2005; Joly et al. 2011; Moerlein and Carothers 2012; Moore and Huntington 2008). These changes are also having profound effects on subsistence-oriented communities that depend on these resources, particularly in Arctic and subarctic regions (Brinkman et al. 2016; Savo et al. 2016).

In addition to the environmental, economic, and socio-cultural threats to modern circumpolar communities, the archaeological and ecological records of high-latitude regions are now also being materially threatened by contemporary climate change (Hollesen, Matthiesen, and Elberling 2017; Hollesen et al. 2018; Howard et al. 2008). However, as well as being a casualty of climate change, archaeology has a clear contribution to make to modern climate change debates (Hudson et al. 2012; Mitchell 2008; Van de Noort 2011). The field has a long history of engaging with issues of environment and climate, and the interactions between these and human societies. After all, understanding the nature and extent of environmental and climatic changes in the past, and how societies respond to such changes, may prove crucial to being able to predict and adapt to contemporary climatic challenges (Hudson et al. 2012; Sandweiss and Kelley 2012; Van de Noort 2011). This is particularly the case in the Arctic where cold and wet conditions, along with a lack of modern development, has led to well-preserved and largely undisturbed archaeological and biological records (Hollesen et al. 2018, 575), documenting thousands of years of environmental change and human activity. In Alaska and Canada, community-based archaeological investigation has also proven a useful vehicle for engaging younger generations with local heritage and culture (Lyons 2016), and may even be effective in mediating some of the socio-cultural impacts of climate change amongst descendant communities (e.g., Hillerdal, Knecht, and Jones 2019).

Here, we explore the archaeologies of climate change from these different standpoints, deliberately selecting plural terminology to emphasize the multiple perspectives and voices that are necessitated in climate change research. First, we will briefly explore the history of climate change research within archaeology as an academic discipline and evaluate the current status of the field. While in current debate much emphasis is placed on the reconstruction of climate and environment, which is vitally important to modern field of archaeology, we emphasize the importance of considering diverse total ecosystem impacts of climate change, and the impact of changes on human lifeways and lifeworlds. Such holistic and entangled perceptions of environment and climate change mirror the traditional worldviews of many of the Indigenous groups now dealing with the effects of contemporary climate change. Here, we argue that the endangered archaeological record of the circumpolar north does not only provide an opportunity to better explore and understand the past, but also to enrich the present and inform the future.

We argue that archaeological investigation can play a key role in reinforcing group identities and resilience among some of the world's most climatically vulnerable peoples. Beyond scientific outputs and community-embedded approaches in regions impacted directly by climate change, we propose archaeology also has a significant role to play in the public perceptions and awareness of climatic change more broadly. Psychological distance is a recognized barrier to climate change action, particularly for communities whose ecological, economic, political, or social privilege insulates them from the immediate impacts of climate change (Gifford 2011; Spence, Poortinga, and Pidgeon 2012). We argue that, in these contexts, public engagement with climate science through the focused lens of archaeological research may be an evocative and effective means of relating climate change to the scale of lived experience and reducing this psychological space.

Climate Change in Archaeology

Archaeological records provide a unique source of data on long-term human–environment interactions, and archaeologists have long understood the importance of considering past environmental and climatic conditions when exploring the human past. From the early 1900s, the impacts of past climatic changes on human societies were beginning to be appreciated by contemporary archaeologists (Rosen 2007, 1). Raphael Pumpelly's (1908) “oasis theory” and Ellsworth Huntington's 1915 publication *Civilization and Climate* undoubtedly inspired a generation of researchers seeking climate-based explanations for past socio-cultural-economic change (Rosen 2007, 1).

Contemporary to these somewhat deterministic theoretical frameworks being established, environmental archaeology was emerging as a discipline. Although not widely recognized as a distinct subfield of archaeology until the 1950s, geologists, botanists, and zoologists had been contributing analytical tools to archaeological questions since the mid-1800s. By the late nineteenth century in Switzerland and Scandinavia, animals and plants were being found at archaeological sites, and were beginning to be acknowledged as useful in providing palaeoenvironmental contexts for prehistoric cultures. Advances in other fields, such as the work of Swedish geologist Lennart von Post on “pollen statistics” in early twentieth century (later to become the field of palynology), marks an important movement towards interdisciplinary archaeology that incorporated palaeoenvironmental reconstruction (Trigger 1988, 2–3).

The early and mid-twentieth century saw the first of such explicitly interdisciplinary archaeological projects, incorporating archaeology and the natural sciences, such as excavations at Fayum (Egypt, 1920s), Mesolithic Star Carr (United Kingdom, 1950s) and Jarmo (Iraq, 1950s) (Butzer 2009; Murphy

and Fuller 2017). While environmental archaeology and archaeological science more broadly have blossomed as subfields of archaeology in the latter part of the twentieth century, the emergence of processual archaeology, cultural ecology, systems theory, and other frameworks for conceptualizing the past led to the post-processual movement's rejection of simplistic or monocausal climate-based explanations for changes in human behaviour. While the last twenty years has seen a revival of climatic explanations for social change (e.g., the extreme weather events following the AD 536 disaster, see Büntgen et al. 2016; Gräslund and Price 2015; Löwenborg 2012; Widgren 2012), environmental archaeology has evolved to include more holistic, humanistic, and less deterministic dimensions to human–environmental relationships (Rosen 2007, 2). There is also an increased recognition that these relationships are not singular in direction or passive. There are countless examples from archaeology of humans shaping their environments, from smaller scale or regional impacts to large-scale and even global climate modifiers. For example, the methane emissions associated with early rice agriculture thought to have triggered the Anthropocene (Li et al. 2009; Ruddiman et al. 2008), or the theory that the colonization of the Americas led to the deaths of so many Indigenous people that it influenced global CO₂ levels and led to global cooling (Koch et al. 2019). These case studies emphasize that humans are not external to, but are part of, their environments, and that human–environmental relationships are co-created.

The reconstruction of past environmental change is now central to modern archaeology, and a variety of methods are employed to reconstruct past climatic dynamism on a range of scales. Many of these methodologies have been borrowed from the natural sciences, and data generated from the analysis of natural archives (such as lake varves and pollen cores) can provide a backbone for the investigation of climate change within the archaeological record, as well as revealing anthropogenic impacts and interactions (e.g., Dräger et al. 2017; Leroy 2010). The study of human–environmental interactions in archaeology now goes far beyond temperature reconstruction or “spikes in pollen diagrams” (Smith and Zeder 2013, 13). Increasingly, the influence of climatic change on the broader ecosystems of the past is also being considered, including how such shifts may affect productivity, biomass, biodiversity, and animal behaviour. It is through the appreciation of a more holistic, ecosystem-level understanding of climatic change that human responses to those changes can be reconstructed (Jones and Britton 2019).

With its focus not only on reconstructing the nature of climate change, but also the varied ways in which humans responded to, or even caused, these processes, archaeology is well placed to provide long-term perspectives on human–environmental interactions in the broadest sense. Through this, we can seek to better appreciate the complex impacts and interactions of climatic

change on the ecosystems that humans are part of, as well as their societies, experiences, and mindsets. Thus, archaeology has a major role in the coming period of climate crisis by showing us how human cultures responded to past crises, and illuminating variability in behaviour, flexibility, and resilience. The record of the human past offers us numerous examples of how change or diversification have typified human responses to external change, which can offer guidance for the present day (Anderson, Maasch, and Sandweiss 2013, 247; Costanza, Graumlich, and Steffen 2007). For example, archaeological data can illuminate how variations in past rainfall or temperature can affect agricultural productivity, and past agricultural practices documented in the archaeological record, such as water management, can be applied today to enhance sustainability and resilience (Cooper and Duncan 2016; Isendahl et al. 2013; Kaptijn 2018; Kendall 2005). Archaeological case studies may also highlight new biotic ranges that may currently be underexploited but may have been utilized in the past and could again be favourable to human habitation and protect biodiversity (Anderson, Maasch, and Sandweiss 2013, 247; Crumley 2013, 273). Significantly, archaeological research demonstrates that climatic change, and its impacts, need not be uniform or identical everywhere and that insights into regional climatic effects and local variability can be as important as the reconstruction of longer-term climatic trends (Anderson, Maasch, and Sandweiss 2013, 252). Through the examination of different archaeological and palaeoenvironmental records, over long and short periods, across broad areas, or in geographically isolated contexts, we can hope to understand not only global repetitive patterns but also less predictable events (Crumley 2013, 273). In this sense, the past is our “laboratory” in a time in which we urgently require data, but for which “experimentation [would require] time we no longer have” (Crumley 2013, 269). Thus, the past can be proactive; records of past human–environmental interactions can contribute to the development of predictive models and of theory, providing information for deriving strategies for sustainable management of human-dominated landscapes in the future (Dearing 2007).

As well as reconstructing past conditions (and responses to those conditions) from the material record, archaeologists now also have a broader appreciation for the role human perceptions of nature, environment, and climate change have in their understanding of, and adjustment to, past climatic change (Rosen 2007, 2). This includes diversity in the conceptualization of “change” and “resilience,” as well as perceptions and social meanings of climate and environment more broadly. The incorporation of human perception into climate change archaeology has great potential to strengthen and enrich our understanding of past ecocultural dynamics. “Animistic” (Fuglestad 2014, 42) and “ecological life” attitudes (Ingold 2000), for example, highlight that human cultures and worldviews can be shaped by the

environment in the widest sense of the word. The separation of human and environment is often considered a Western, “scientific” perspective and represents a radical separation that is meaningless not only in many non-Western and Indigenous cultural contexts but also in the reconstruction of the past (Gosden 2013). Indeed, the dichotomy of the natural and cultural worlds, or of an “inert” nature is now being broken down even within the scientific literature. Recent discourses on the Anthropocene (e.g., Crutzen and Steffen 2003; Ruddiman 2003; Smith and Zeder 2013), on domestication as niche construction theory (e.g., Laland and O’Brien 2010; Zeder 2016), and the evidence for gene-culture co-evolution in human foodways and adaptation (e.g., Beja-Pereira et al. 2003; Laland, Oldling-Smee, and Myles 2010; Perry et al. 2007), all reflect the breaking down of traditional academic lines drawn between the cultural and natural.

Non-Western perspectives often emphasize the fundamental similarity between humans and nature (Scott 1989, 194–95). For example, among many northern hunting peoples, animals are often described as having reciprocal relationships with humans and the agency to choose whether or not to give humans what they need to live (Fienup-Riordan 1990; Hill 2012, 2013; Ingold 2000, 48; Krupnik 2018; Scott 1989, 195). In the past, particularly in pioneer contexts, and during periods of environmental flux, high dependency on game hunting would arguably structure and reinforce such animistic attitudes (e.g., amongst the reindeer hunters of post-glacial northern Europe, see Fuglestad 2014). Through considering psychological as well as physical entanglements within human–environment relationships, archaeology can attempt to access the ephemeral as well as the materially demonstrable. In this sense, social and ecological relationships can be seen as inextricably tied. When human and ecological worlds are integrated and co-dependent, the environment is a broader community that people are just one part of, but also synonymous with. Accessing past perspectives on the environment or climate from the material record is a challenge, but one archaeologists are uniquely placed to address. Key to this challenge are approaches that begin with the idea that human beings create meaning about the world through their embodied experience of places and landscapes. For example, the consideration of late Palaeolithic blade technology in Scandinavia from a phenomenological perspective, alongside other archaeological and environmental evidence, can permit new insights into pioneer mindsets (Fuglestad 2012).

In addition to new theoretical perspectives, cross-disciplinary and multi-method integrated approaches to the same questions can permit more comprehensive insights. For example, the integration of zooarchaeology, with the study of human stable dietary isotope data and the analysis of technoculture, can obtain more nuanced insights into subsistence and diet than any one single method can offer. At the precontact Yup’ik village site of Nunalleq,

this approach has proved productive for the examination of changes in resource availability and use during the Little Ice Age, and for illuminating key roles of some species beyond diet (Masson-MacLean et al. 2019). This research demonstrates that central to understanding the economic aspects of past societies and their environments, it is also essential to acknowledge the other ways in which human–environment relationships may be experienced and understood.

Writing of Yup'ik people today, Fienup-Riordan describes human and natural worlds being so intimately connected that they cannot be separated. Weather, the world, the universe (all encapsulated in the word *Ellaa*) are all responsive to human thought and deed (Fienup-Riordan 2010, 57), and treatment of fellow humans directly affects relations with the wider world (Fienup-Riordan 2010, 65). Where human impacts on the environment and natural change cannot be distinguished from one another, the environment is the direct responsibility of, and response to, human actions—the world [will follow] its people (Fienup-Riordan 2010). The environment is not a metaphor for society; it is society, and an explicit part of the Yup'ik social world. It is darkly fitting that, in the Y–K Delta today, climate change is not only threatening environmental resources but society itself. Described as “the world’s first climate change refugees” (Pilkington 2008), Yup'ik villages face climate-induced threats to traditional subsistence lifeways and livelihoods, and are even forced to consider relocation (Bronen 2010, 2017; Fienup-Riordan 2000, 2010). In these contexts, the cultural dimensions of climate change, including multigenerational perspectives, are essential to understanding social as well as environmental change, and to a community’s recognition of and response to risk, and its resilience through adaptation (Adger et al. 2013; Carothers et al. 2014; Herman-Mercer et al. 2016).

Climate Change Archaeologies in Indigenous Arctic Community Contexts

In the Y–K Delta, as in other regions of the Arctic and subarctic and alongside a plethora of other environmental, ecological, and social impacts, climate change is leading to loss of land at an unprecedented rate. This coastal erosion, a result of warming temperatures, decreasing permafrost, reduction in sea ice, and increased storm exposure, is leading not only to infrastructural instability in coastal communities but also to the loss of archaeological and ecological deposits (e.g., Jensen 2017). The Arctic was one of the last places on Earth to be permanently inhabited, and the last five thousand years in particular have seen waves of human colonizations and environmental change such as the Neoglacial cooling event, the Medieval Warm Period, and the Little Ice Age. These climatic excursions, and human responses to and interactions

with them, have great potential to inform the broader scientific community about the history of habitation in the Arctic, the nature of pioneer populations, and of the ingenuity and adaptive potential of humans as a species (Hambrecht et al. 2018). As explored above, these archives, along with those in other areas of the world, have the potential to inform scientists more broadly about the dynamics of ecosystem and environmental change during periods of climatic variability, and even to aid in predictive modelling for action in the face of contemporary climate change (Roscoe 2014; Sandweiss and Kelley 2012; Van de Noort 2011).

The material loss of these anthropogenic and natural archives—which themselves may bear witness to climatic events from earlier periods of human history—is not only alarming for archaeologists and other natural scientists, but more so of grave concern for local descendant groups living in these regions today. For Indigenous communities in the Arctic and elsewhere, the loss of material archaeological cultural heritage goes far beyond scientific enquiry and discourse. Recent environmental and socio-technological change (Ayunerak et al. 2014), within the broader context of historical traumas (Brave Heart et al. 2011), are leading to a sense of imminent cultural loss for many Indigenous groups in Alaska, for example. There is a fear of future cultural detachment, especially amongst younger generations (Rasmus, Allen, and Ford 2014). The critically endangered archaeology of these regions can be viewed as another way in which culture is being lost in a very literal sense, not least for communities where historical infractions and colonial practices have left them feeling disconnected from their material past (e.g., Pullar, Knecht, and Haakanson 2013). However, archaeological material is also increasingly being recognized as having great strength as tangible heritage, and through heritage building, having the potential to reinforce individual and group identities and reinforce community resilience (Laven 2015).

The processes and practice of archaeology—as well its products—have a demonstrable role to play in heritage building, and the transformative nature of community-embedded and/or community-led projects are testament to this, particularly in Indigenous contexts. Indeed, since the late 1990s, community archaeology has entirely changed the face of archaeology (e.g., Silliman 2008; Watkins 2017; Zimmerman 1996) to the point where conducting a project without involving the local community, especially in the case of descendant communities, is now quite unthinkable. Community-based archaeology is not only vital in reducing the distance between professional and public entities (Grima 2016; Oldham 2017), particularly in Indigenous contexts (Pullar, Knecht, and Haakanson 2013), but can also serve as an instrument connecting people to their present, their traditional heritage, and cultural pride. There is even an argument made for the role of community archaeology in a decolonializing process (e.g., Atalay 2006).

Until recently, in the Y-K Delta, archaeological investigation was not only rare but also rarely conducted in community contexts. However, investigations at the precontact Yup'ik site of Nunalleq—a partnership between the University of Aberdeen and the village of Quinhagak—have proven transformative for archaeologists studying the precontact western Arctic and for local descendant communities (Hillerdal 2017; Hillerdal, Knecht, and Jones 2019; Knecht 2014). The community has gained an enormous sense of pride from both the archaeology conducted at Nunalleq, and the vast and impressive material cultural assemblage “saved” from the sea by this rescue excavation (Hillerdal 2018). Here, as elsewhere, involvement in the research process bridges the distance between researchers and collaborators. The practice of collaborative research has been identified as a means of building resilience among younger generations, where active participation has proven transformative: when participants are given room to act as agents, be responsible for what is produced, and are treated as consultants who share knowledge about past and present and participate in decision making (even on a small scale), they are acknowledged as experts of their own communities (Ulturgasheva, Rasmus, and Morrow 2015). An ethos of power-sharing and equal partnership was clear from the inception of the Nunalleq project, and it is the process of doing archaeology (as well as the *products* of archaeology—namely, the artifacts) that has been central to this sense of pride (Hillerdal 2018). The large number of community-led initiatives surrounding and inspired by the excavations and archaeology of Nunalleq are testament to this. For example, in recent years the community has seen traditional dancing return (Hillerdal 2017), an initiative of the Quinhagak youth. The Quinhagak Dancers have even devised and performed songs about Nunalleq. The establishing of the Nunalleq Culture and Archaeology Center in Quinhagak, where the extensive Nunalleq material culture collections are now held, was another community-led program and is a key embodiment of this central tenant of the project (Hillerdal, Knecht, and Jones 2019). The interaction with the archaeology, its impacts on the community, and the actions it has inspired have now become the subject of discourse outside of the project itself, including the archaeological and educational literature (Milek 2018; O'Rourke, Turner, and Ritchie 2018) and an award-winning documentary film (Brandstetter 2019).

Climate change threatens tangible and intangible cultural values, as well as traditional subsistence lifeways and economies. While the loss of archaeological sites and artifacts due to climate change can be seen as the loss of an archive of cultural heritage, it can also be seen as a potential vehicle for its sharing and promoting of the same (see Jensen 2017 for an example from Alaska's North Slope). Thus, through an emphasis on individual and community pride and heritage building, community archaeology within the

context of the critically endangered archaeology of the Global North, also has the potential to address and even mediate some of the socio-cultural impacts of climate change on descent communities (Hillerdal Knecht, and Jones 2019).

Conversely, climate change archaeology (i.e., archaeology conducted in contexts of climate change or focusing on past climatic change, or both) also has great potential to benefit from local community involvement. Indeed, it has long been acknowledged in climate research that local people, especially people with an intimate knowledge of local ecology, microclimate, and weather patterns, can contribute data on a more detailed level than generalized models can provide (Deri and Sundaresan 2015). Local and traditional ecological knowledge not only has the power to inform the present,¹ but traditional ecological knowledge can also feed into archaeological models of past environmental and ecological conditions. Beyond this, Indigenous observations of, and perspectives on, climate change, are also increasingly acknowledged as important for climate research (Bennett et al. 2014, 301). For the natural sciences, but especially to archaeology, the holistic and entangled perspectives on human-environment relationships often represented in non-Western perspectives and belief systems can also make a vital contribution to climate change research, past and present (Cochran et al. 2013, 559; Bennett et al. 2014; Deri and Sundaresan 2015).

Significantly, it is also becoming increasingly evident that if climate change policies and mitigation strategies are to be effective, culturally meaningful, collaborative approaches must be adopted (Brugnach, Craps, and Dewulf 2017). In the Arctic, as elsewhere, Indigenous communities must be involved in designing climate change solutions appropriate for their communities (Behe and Daniel 2018, 160), and scientists are increasingly working with Indigenous communities to co-design research schemes (Krupnik and Jolly 2002). Globally, these initiatives can all be seen as part of the ambition to “localize” climate change: after all, distance between individuals/communities and climate change is one of the main recognized obstacles to adaptation to it (Gifford 2011; McDonald, Chai, and Newell 2015; Spence, Poortinga, and Pidgeon 2012).

As explored above, in traditional Yup’ik culture, the environment, climate, and humans are viewed as intimately integrated and inseparable from each other (Fienup-Riordan 2010). This is mirrored in the belief systems of other Alaska Native peoples. For example, in the Gulf of Alaska, the Tlingit people traditionally view glaciers as intensely social beings. Other

1. Although it should be noted that, despite the clear value Indigenous knowledge and experience has to the climate change debate, it is rarely factored into national and international climate change assessments (Crate and Nuttall 2016; Ford et al. 2016), which are largely done about, rather than with, Indigenous people (Cochran et al. 2013, 558).

commonalities often include beliefs that humans and nature mutually make and maintain their habitable world. However, research has shown that forced dislocation has led to these beliefs becoming disaggregated resulting in a more fragmented (Western) understanding of the world (Cruikshank 2005). Many Native Alaskan communities are now facing threats of dislocation from traditional lands due to climate change (Hamilton et al. 2016): for some, this may be in the immediate future (Maldonado et al. 2013; Marino 2012; Marino and Lazrus 2015), while others have already been forced to take the decision to relocate (Bronen 2010, 2017). Attachment to land, the annual cycle, and practices of subsistence hunting and gathering are central for Yup'ik identity (e.g. Fienup-Riordan and Rearden 2012; Worl 2010): it is essential that policies and process are sensitive to culturally appropriate mechanisms, so that loss of land does not come to equal loss of culture and traditional values (Adger et al. 2013; de Sherbinin et al. 2011; Figueroa 2013; Ford et al. 2010; Marlow and Sancken 2017). Archaeology is well placed to play an active role in these negotiations. Not only does archaeology have a key role in heritage building, and, through this, creating resilience (Laven 2015), but cultural heritage can also serve as a motive force for translating the archaeological record into the lived experiences of climate change (Samuels 2016), encouraging adaptation and even mitigation (at least, of some of personal and group socio-cultural impacts) through the embracing of change (Holtorf 2018). Archaeology can also serve as a vehicle for bridging the distance, not only between academics and the community, or the past and the present, but also the local and the global.

“Distance” between communities and climate change is multifaceted and complex. While it can include physical distance, it also, as argued above, integrates conceptual and psychological distance, of which spatial, geographical, or temporal distance are only one part. While it is known that, currently, the Arctic region is experiencing more pronounced and accelerated rate of climate change than the global average, it is perhaps only a partial truth that physical distance between circumpolar Indigenous Peoples and climate change is significantly lower than in other areas. After all, economic, political, or social privilege can all serve to insulate against the immediate impacts of climate change to an extent, mitigating physical impacts (e.g., flood defences, strict seasonal water management, etc.). This privilege, coupled with representations of people in developing countries or Indigenous communities suffering as “victims” of natural disasters and climate change, can feed into mainstream perceptions that climate change is an issue for other people. Psychological distance from an object or event is directly linked to the ways in which people mentally represent it (Spence, Poortinga, and Pidgeon 2012, 958). The different ways in which people perceive climate change risks are thus comprised of all these elements: spatial, geographical,

and/or temporal distance from climate change risk, coupled with the conceptual distance between the perceiver and the perceived social target.

At a time when “archaeologists are questioning how best to contribute to multidisciplinary climate change knowledge” (Samuels 2016, 142), it is clear that archaeology can contribute in many ways and on different levels—from the local to the global. This includes not only the modelling of past and future climate change, but also—through cultural heritage—contribution to adaptation and resilience, and even mitigation (Samuels 2016). Where we recognize the significant cognitive and psychological barriers that limit climate change risk awareness and impede behavioural choices that facilitate adaptation, mitigation, and environmental sustainability (see Gifford 2011), we propose archaeology also has a significant role to play in the public perceptions and awareness of climatic change more broadly. This includes community-embedded approaches in regions more acutely and adversely impacted by climate change, but also within communities whose ecological, economic, political, or social privilege insulate them from the immediate impacts of climate change.

Concluding Thoughts

The archaeologies of climate change are multifaceted, imbued with, but also necessitating, multiple approaches, epistemologies, and perspectives, and their prospects are consequently multilevelled in their requirements. As an academic field seeking to reconstruct human–environment relationships in the past, the continued and ongoing integration of archaeology with the earth sciences and biosciences is required, improving means of gaining data but also of analyzing it. Modelling of archaeological data, for example, must be more widely and effectively employed if we are to form useful, predictive frameworks for future climate change impacts. However, we should not only be striving to reconstruct environmental conditions, past and future, but also to better understand the socio-cultural impacts, and the human–environment dynamics and interactions at the heart of climate change archaeology (Jones and Britton 2019). As part of this, we must strive to incorporate more holistic understandings of “environment,” and what constitutes change. This may include non-Western science perspectives, the idea that interaction with climatic dynamism is not passive and is a two-way relationship, and that environment and human society are entangled. Cross-disciplinary approaches, but also those that incorporate alternative perspectives and seek to actively involve community stakeholders, especially in non-Western contexts, are central to better understanding the diverse, cultural-specific meanings of climate change and its impacts (Adger et al. 2009; Adger et al. 2013; Hillerdal, Knecht, and Jones 2019; Turner and Clifton 2009).

There is a role for archaeology in mediating the effects of climate change for many groups today, and reconciling communities with change. This includes predictive modelling of future effects or outcomes, but also reinforcing heritage and identities, and strengthening community resilience. In descendant communities living in the circumpolar Arctic, facing the direct and indirect impacts of climate change with acute urgency, the practice of archaeology, as well as its products, can be seen as one way of coping with the sense of finality of change. In encountering the diverse past, an insight of change and dynamism in deep time is gained, along with an appreciation for the experiences, tenacity, and ingenuity of past peoples. Accounts of, and interactions with the past, help write climate change stories, transferring information, but also creating connections different types of information and experiences (Rockman and Maase 2017). Through engaging with material culture, exploring and co-producing archaeology with archaeologists and each other, descendant communities and others can create new paths for interacting with the past, understanding the present, and strengthening the future. While not only applicable in Indigenous contexts, archaeological investigation—particularly that which is community-based—can play a key role in reinforcing group identities and resilience in some of the world’s most climatically vulnerable peoples (Laven 2015).

The archaeological and ecological records of Arctic and subarctic environments are vital to understanding the human past, human ecology, adaptations, and the prehistory of ancient human dispersals. We argue here that the critically endangered archaeological record of the circumpolar north is an opportunity not only to better explore and understand the past but also to enrich the present. However, the sense of opportunity in the archaeology of northern regions, both for academics and local communities, is perhaps only surpassed by the sense of urgency surrounding its potential catastrophic loss. “Preservation in place” is no longer an option (Jensen 2017, 129): instead, this inevitable loss must be managed through programs of research that are culturally appropriate and sustainable, as well as supported by national and governmental funding. However, this is an onerous task, and one that archaeologists are not equipped to cope with alone. Novel models of funding, citizen science and local monitoring projects, the training of local staff, and public engagement must all be developed and implemented alongside research (Hollesen et al. 2018). As demonstrated by current projects in Alaska, and elsewhere in the Canadian Arctic, archaeological and climate change research can successfully work together on a local level, for the benefit of descendant communities and the international scientific community (Friesen 2015; Hillerdal, Knecht, and Jones 2019; Jensen 2012; Lyons 2013).

The publicizing of climatic threats on cultural heritage and the importance of the media coverage in garnering public support for the

allocation of resources to try to combat or mediate these risks has been emphasized before (Hollesen et al. 2018, 583). In a time where distance is a known impediment to readiness to act on climate change (Gifford 2011; McDonald et al. 2015; Samuels 2016; Spence, Poortinga, and Pidgeon 2012), we stress that active public engagement with archaeology through the media or directly within communities can also help to bridge the distance between individuals and/or groups and climate change. We underline that this is not exclusively an issue for Indigenous Peoples or developing countries: indeed, many do not struggle to think of how climate change will affect people in Indigenous communities or developing countries, but do not necessarily think it will affect them (Spence, Poortinga, and Pidgeon 2012). Learning about past climate change, and human adaptations to those changes, in a variety of archaeological contexts or through engaging with the endangered archaeology of the circumpolar north specifically, may become mediums to encouraging sustainable behaviour through limiting this distance. In this way, shared engagement with the past, can help to encourage the major societal transformations that are required in the present to adapt to and mediate the effects of climate change in the future. Archaeology should not be just another causality of climate change: it can be part of the solution.

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