Time Is Melting: Glaciers and the Amplification of Climate Change

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Time Is Melting

Glaciers and the Amplification of Climate Change

MELODY JUE AND RAFICO RUIZ

Environmental representatives from around the world gathered in Paris in November 2015 for the twenty-first meeting of the "Conference of the Parties" (COP21). On the outskirts of the city, participants enacted their now-routine performance of recounting our ever-worsening ecological crisis and its symptoms: the acidification of the oceans, the toxicity of air pollution, and the melting of ice sheets the world over.[1] Part of the reason for reciting, illustrating, and performing the litany of symptoms of climate change, as Ursula Heise observes in *Sense of Place and Sense of Planet*, is that it is not an immediately perceivable and everyday threat to many Western populations—for them (for us), climate change occurs at a geographical distance.[2] While COP21's historic "climate deal" seemed to vindicate and acknowledge a novel sense of ecological foresight on the part of the world's carbon emitters,[3] it nonetheless obscured the ways in which climate change is still very much a contested discursive process. As such, establishing the reality of climate change relies on making the distant material and ecological proxies noted above—acidifying and warming oceans, toxic air, and, of particular interest for us in this article, melting ice—sensible to a broader public. Environmental artworks often participate in making the distant effects of climate change sensible to a broader public, provoking open-ended affective responses.

One of the most charismatic figures to circulate beyond the historic Conference of the Parties is the figure of the melting glacier, signifying as a melancholic index of global warming patterns. Although there

have been many attempts to amplify the urgency, scale, and stakes of global climate change, contemporary art practices have enfolded visual and audio records of melting glaciers into new persuasive works as a tactic for establishing the reality of climate change. Here, the melting glacier figures as a particular kind of doomsday clock: take action now, before time runs out and the glaciers are gone.

In this article, we discuss artworks that center on the figure of the melting glacier as a symptom and index of climate change, foregrounding the fact of its melting in order to make the abstraction of climate change immediately felt on a human scale. We focus on two sets of artwork—Olafur Eliasson's sculptures and Katie Paterson's acoustic recordings—that imagine glaciers as entities capable of "life" in their sonic and aesthetic expressivity and "death" in their melting. As media objects, glaciers are unstable aesthetic indexes given both that they store time and release it and that they are themselves variably recorded across media.[4] Yet the affective encounter with melting ice has an immediacy that many data-driven arguments for the reality of climate change lack. This feeling of immediacy is, on the one hand, intensified through sensory engagements: a slippery touch, visual deformation into a puddle, and (for larger glaciers) the bubbling sound of its melting recorded underwater. On the other hand, this sense of immediacy can also emerge through forms of digital interaction and participation (as in Eliasson's work), foregrounding the contentious scalar and temporal stakes of melting glacial ice as an index of global warming.

As sensuous objects with life spans of their own, glaciers seem to have the unique power to amplify the urgency of climate change to global audiences. This amplification occurs not only through a sonic register (as in the amplification of a voice) but, crucially, occurs through multisensory encounters with melting glaciers that are also visual and tactile in nature. In contrast to the commonplace understanding of "amplification" as a means of extension or enlargement,[5] we theorize "multisensory amplification" as an aesthetic and as a tactic that emerges out of the particular use of glaciers in contemporary artwork to bring the effects of climate change into proximate contact with viewers. Beyond a directional politics with specific goals in mind (to limit global warming to 2°C), the tactic of multisensory amplification channels a more open-ended aesthetic sensibility that relies on an analogy between the

mortality of human beings and the glaciers themselves. Glaciers have something to tell us, but perhaps hearing their raspy, bubbling, slippery message depends on seeing and feeling their dissolution.

Melting Ice, Climate Time, and the Problem of Amplification

COP21's arts-outreach wing, artists 4 climate, worked toward bridging the geographical and temporal distance of climate change's effects with the human scale through multiple installations, performance pieces, and mixed-media artworks from established and emerging artists, such as Janet Laurence, Pavel Pepperstein, and Ernesto Neto.[6] The conference's mobilization of artistic practice served to foreground the cultural and inherently cognitive dimensions needed for climate action. Artistic practice demonstrated how addressing climate change was not only about changing policy but also a matter of building affective narratives of potential ecological loss, human responsibility, and urgency in the face of anthropogenic environmental change. Olafur Eliasson and Minik Rosing's *Ice Watch* exemplifies the conference's efforts to render the urgency of climate change through commissioning forms of artistic expression. In the context of COP21's Paris summit, Eliasson and Rosing's artwork embodies the experiential and visual amplification of narratives of potential ecological loss, showing how glacial ice serves as perhaps the most emblematic proxy of a climate-derived understanding of crisis and urgency.

Ice Watch consists of twelve Greenlandic glacier pieces arranged in the shape of a clockface on the Place du Panthéon, with observers able to witness the melting of the ice over the duration of the conference.[7] When *Ice Watch* launched on December 3, 2015, the presence of the twelve blocks of ice on a Parisian square belied the logistical feat required to bring them from Greenland's coastal waters to such an unlikely urban context. The blocks, totaling eighty tons in weight, originated from icebergs found in the Nuup Kangerlua fjord near Nuuk, Greenland, and required the work of divers and dockworkers from the Royal Arctic Line to secure and transport them, in six refrigerated containers, from Nuuk to Aalborg, Denmark, with the final leg of the journey to Paris being undertaken by truck.[8] Given our era of carbon footprint sensitivity, Eliasson and Rosing worked with a British arts charity, Julie's Bicycles, that specializes in measuring and managing the

environmental impacts of art installations.[9] The *Ice Watch* web platform included a minutely detailed carbon footprint report that broke down the logistical process that underpinned the production of the artwork. For example, in totaling the carbon emitted for the acquisition of the blocks of ice, the report cites the use of a crane for a period of twelve hours, at 18.8 KW, and an emissions factor of 2.167614 kg CO2e per liter of diesel, thus producing 202 kg of carbon.[10] With the total carbon footprint amounting to thirty tons, this quantitative and ethical accounting is a significant lens through which to apprehend the site specificity of the installation—one that also served to reframe a third iteration of the installation in 2018 outside the Tate Modern in London, which was meant to coincide with COP24 taking place in Katowice, Poland.

Ice Watch self-conscientiously puns on the verb "to watch" (to lookout for) and the noun "watch" (timepiece). While Eliasson has described the work as a "compass" for navigation and an orienting and open "circle," he specifies that "it is a mistake to think that the work of art is the circle of ice—it is the space it invents."[11] Perhaps the oddity of finding large chunks of ice in the temperate climate of Paris produced a form of environmental alienation in the space of the Place du Panthéon. The proximity of actual blocks of melting glacial ice closed the gap between the distant, discursive construction of melting polar regions invoked at the conference and the temperate milieu of the conference attendees. As such, the space it invented was one in which glaciers (or here fragments of glaciers) could figure as indices of larger phenomena, as amplified time markers of the planet's melting ice under the current conditions of climate change.

Eliasson and Rosing put ice as a material to work and, in the process, turned glaciers into climate performers of a kind through their evocation of a sensuous and phenomenological reality that is not conveyed by scientific data alone. Eliasson writes,

> We do not feel strongly enough that we are part of a global community, part of a larger *we*. Giving people access to data most often leaves them feeling overwhelmed and disconnected, not empowered and poised for action. This is where art can make a difference. Art does not show people what to do, yet engaging with a good work of art can connect you to your senses, body, and

mind. It can make the world *felt*. And this felt feeling may spur thinking, engagement, and even action.[12]

This channeling of affect through a form of environmental hapticity, while couched in the usual platitudes of the regenerative and transformative dimensions of capital *A* Art, went some way toward justifying the carbon expense of bringing glacial ice to the site of COP21. While Eliasson and Rosing place glaciers within the domain of an art installation, the ice nonetheless also belongs to what Tema Milstein calls a "performer metaphor" that is often associated with our surrounding "natural" world and the ways in which it enables forms of anthropocentric entertainment, diversion, and indirect instruction, notably across sites such as national parks.[13] At base, the performer metaphor posits a necessary distance that separates environmental phenomena from their surrounding human activity—a distance that makes them seem to stand apart from this milieu, rather than acknowledge the ways in which these phenomena are intimately bound up with anthropogenic processes. For Miltstein, making natural phenomena perform for us serves to reify human-led definitions of the nature-culture binary. In wanting to go beyond data and toward the material, affective, and haptic dimensions of glacial melt,[14] Eliasson and Rosing align the origin story of the Greenlandic glaciers with a climate change–affected "nature" that can be made available for forms of instructive and performative experience.

The Instagram feed that was integrated into the *Ice Watch* web platform, now defunct and replaced by its 2018 iteration in London, exemplified this drive to make climate change available for experience; seemingly endless time-dated images and videos scrolled by, showing diverse modes of documenting the ways in which visitors to the installation interacted with the melting glacial ice.[15] While these interactions did not necessarily obscure or preclude the climate awareness that *Ice Watch* promotes, as we touch on below, they did suggest how the work reproduces now-everyday tropes of glaciers as indexes "of global climate change, with common representations stripping them of social and cultural contexts to portray ice as simplified climate change yardsticks and thermometers."[16] Through detailed records of carbon accounting and its integration of social media imagery, *Ice Watch* renders glacial ice into a newly available

Figs. 1–3. Screenshots of *Ice Watch* installation on Place du Panthéon, December 2015, Studio Olafur Eliasson.

experience that includes human participants in its self-documentation. Although commissioned with a kind of directional politics and normative outcome in mind—to make climate change immediately felt, to demonstrate the reality of climate change—*Ice Watch* inadvertently succeeded in a less teleological project. The pagan, Stonehenge-like circle of glacier fragments inscribed human onlookers within the ritual of measuring time—a time whose name might be the Chthulucene.[17] Donna Haraway offers this alternative naming of the Anthropocene to highlight how a more-than-human earth is made manifest as manifold, simultaneous phenomena, reminiscent of the "chthonic ones." *Ice Watch* blends together a human-nonhuman temporal horizon defined by ice melt. It is a gesture that figures the open-ended ongoingness that Haraway makes a central part of the multispecies collaborations at the heart of the Chthulucene[18]—present on the streets of Paris as humans witnessing and marking time through the phase transitions of warming ice, an entanglement with a temporal horizon claimed by glacial decline.

This performative dimension of glacial ice recalls and updates Mark Carey's trope of the "endangered glacier narrative" early in this century and how "narratives about melting glaciers are much more than evidence for global warming or threats of natural disaster." He specifies that "at the center of the endangered glacier narrative are questions of power—the power to define nature and, in turn, the power to create specific laws and policies (and not others)."[19] Indeed, if Eliasson and Rosing's "climate clock" serves as a microcosm of the global process of anthropogenic change, it does so through a metonymic association that asks us to digitally "watch."

Ice Watch works through the magic of metonymy—where the part (ice fragment) stands in for the whole (glacier). If huge glaciers are unrelatable because of their immense size and scale, perhaps the glacial fragments of *Ice Watch*, brought to the human scale, are more capable of conveying endangerment. Yet human scale need not only be construed in terms of physical proximity—it may also include the presence of ice on social media. Alice Rayner argues that the tandem of performance art and digital technologies often serve to "materialize the 'now.'"[20] In this sense, *Ice Watch* amplifies the plight of endangered ice through social media, visible on the handheld media of smartphones and on human-scaled computer screens. Sarah Bay-Cheng treats self-documenting images (aka "selfies") as performances against the "tem-

poral threat" of a forgetful future and also as a way of having the present come more fully into being:

> Unlike previous visual artefacts that sought to document moments of the past for consumption as memory in the future, these rapidly produced images function less like records or artefacts and more like items of exchange. They are not produced for the future, but circulate in real-time as ever-evolving markers of the self, a fact recognizable in their very nomenclature. Instagram, to cite only one popular example, combines the concept of the instantaneous with the previously (and sometime laboriously) written telegram. If Woodrow Wilson once referred to cinema as history written in lightning, perhaps we can consider Instagram as history written as the speed of light waves.[21]

What *Ice Watch* facilitates, then, is the real-time exchange of glacial images and selfies that perform the now of climate change. As Bay-Cheng specifies, these images were not meant for the future but rather for the "real-time" of digital awareness of COP21. The archive of *Ice Watch* evokes Irmgard Emmelhainz's provocation that "the Anthropocene era implies not a new image of the world, but the transformation of the world into images."[22]

By producing and sharing images of the microcosm of glacial melt staged by *Ice Watch*, COP21's social media users themselves amplify a particular call to look, observe, and feel the forecast of climate change. This practice, however, raises the question of metonymic scale that *Ice Watch* relies on. What Timothy Clark calls "derangements of scale" often obscure how climate change can be perceived beyond its global impacts by bringing it down to the myriad experiential dimensions of the body.[23] The work's blocks of ice, by being documented and shared, should also metonymically call forth their points of origin in a Greenlandic fjord, rather than their haptic, performative bounding in the Place du Panthéon. Yet their spatial scale remains the microlocale of COP21, even if their temporal scale, as the archive of real-time glacial interaction noted above, can be read against the work as a climate-derived form of digital historiography.[24]

Indeed, one danger of interpreting *Ice Watch* as a climate clock is that it obscures the more complex lifeworlds of Northern residents, subsumed under the conditions of melting. As the abstract form of a

climate clock, *Ice Watch* conjures a more generalizable condition of ice melting, rather than the particularities of change occurring in the Greenlandic fjord of its icy origins. By way of contrast, as Amanda Boetzkes relates, it is worthwhile to turn to the everyday realities of residents of Northern Indigenous communities, notably the Inuit of Nunavut, a northern territory of Canada, who are on the ground where climate change is occurring. Many Inuit communities are witnessing firsthand the different paces and distinct environmental conditions that melting ice is producing and, in the process, are experiencing reorientations of their very bodily perceptions:

> Hunters observe that the sun sits in the sky at an unusual angle and that it sets in a different place than it did several decades ago. It casts a different light in the atmosphere, which complicates the practice of spearing fish and seals in the water, a skill that requires a grasp of the relationship between the ray of light and its refraction from the surface of the water. Those experienced at night-hunting note that the stars appear in new positions, and that the tips of snow drifts (tongue drifts) that they have been accustomed to following like points on a compass cannot be trusted. The winds are not as predictable as they were a generation ago. Communities have seen a rise in floods, and on occasion blankets of acid rain. "The world has tilted on its axis," one elder summarizes.[25]

While these Northern phenomenologies of climate change rely on long-standing cultural and ontological norms of environmental coadaptation, they are nonetheless suggestive of the performative limitations of *Ice Watch*. Boetzkes's interest in the alternative phenomenological reality of Nunavut concerns how much climate change discourse displays a "Southern" (or Western) blindness when it comes to apprehending how the visible world has changed under the effects of global warming: "The Anthropocene has changed the way [the Inuit] see; it has altered the terms and parameters of perception itself." She calls for an art in the Anthropocene that "does not simply make ecological information and scale available to the eye, but, more forcefully, it consolidates a cultural orientation—a way of seeing. I call this mobilization of visuality 'ecologicity.'"[26] In contrast, *Ice Watch* presents ice through conventional ways of seeing and perceiving, ways that do not challenge the viewer in the way that the real effects of climate change in the North do. If

Ice Watch falls short of shoring up a fully culture-shifting "ecologicity," it does nonetheless provoke a consideration of figurations of ecological time. As the emergent and unstable phenomenological realities of Northern residents gesture toward, telling time in the Anthropocene is increasingly a matter of recognizing how global warming is resetting the world's ecological clock and, in the process, shifting our attention toward the environmental specificity of lifeworlds where climatic change manifests.

If a Glacier Melts in the Arctic, Does It Make a Sound?

Melting glaciers not only present a visual spectacle; they also produce a variety of acoustic phenomena. The tectonic movements of glaciers—fracturing, cracking, booming, echoing, whining, and gurgling in their melt—create some of the noisiest places in the ocean.[27] With a nod to *This Is Spinal Tap*, the blog *Deep Sea News* wryly described the sonic intensity of melting glaciers as "turning ambient noise up to 11."[28] Existing in the ontological space between evidence and affect, the recorded sounds of melting glacial ice from science archives have been mixed into new compositions.[29] It is not a stretch to say that ice performs climate change not only through the visual spectacle of melting but also through acoustic recordings. Recordings of glacial ice melt amplify the urgency of global climate change, functioning as an index in sonic form.[30] Yet we might ask, What are the implications of performing climate change through the acoustic recordings of glacial melt, in contrast to the visual spectacle of their melting?

In this section, we discuss two of Katie Paterson's artworks that explore the possibilities of recording and listening to the sounds of glacial ice melt. In the first of these works, *Vatnajökull (the sound of)* (2007), Paterson placed under a melting glacier a hydrophone that was connected to a telephone number that people could call from around the world. In a second work, *Langjökull, Snæfellsjökull, Solheimajökull* (2007), Paterson took melted glacier water, refroze the water into the form of gramophone records, and inscribed her underwater recordings of glacial melting onto the surface of the reconstituted ice. Through this merger of form (melting ice) and content (deforming sounds), the records bear the inscriptions of their own erasure. Paterson's artworks literally and figuratively amplify climate change by making the acoustic

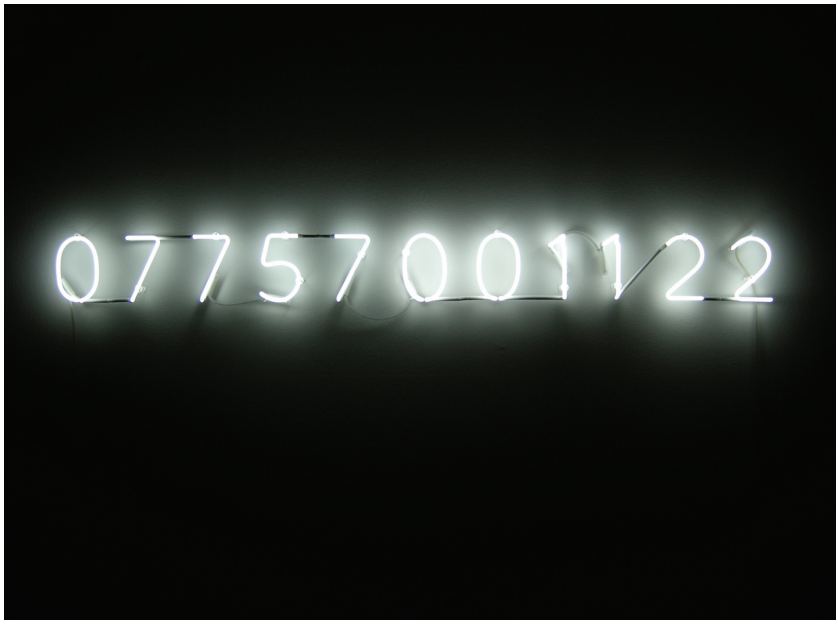

Fig. 4. Katie Paterson, *Vatnajökull (the sound of)* (2007).

phenomena of glaciers accessible through phone lines and web documentation and by putting these sounds into broader circulation framed as indexes of climate change. In Paterson's works, ice performs the ongoing processes of climate change through the perceived immediacy of its melting.

Vatnajökull (the sound of) sets up the following provocation: What if you could call a glacier from a phone and listen to the sound of it melting in real time?[31] In the artwork, "a live phone line was created to an Icelandic glacier, via an underwater microphone submerged in Jökulsárlón lagoon, an outlet of Vatnajökull. The number 07757001122 could be called from any telephone in the world, and the listener would hear the sound of the glacier melting."[32] Its installation at the East Wing Biennial also included a sound recording of the lagoon and a telephone book cataloging ten thousand phone numbers that called over the course of the exhibition. In this countercataloging, Paterson not only archived the ephemeral melting of the glacier but also the response of people dialing in to listen to the glacier, a performance of curiosity or concern itself that has a space-collapsing effect between Vatnajökull and

Fig. 5. Katie Paterson, *Vatnajökull (the sound of)* (2007).

the space of the gallery. Carey et al. write that Paterson's work falls within the tradition of feminist science studies by challenging "the conceits of scientific distance and impartiality: glaciers are no longer remote but just a phone call away," bringing the reality of climate change–driven melt to the ears of any caller.[33] Of course, long-distance phone calls are

not always about exchanging information with a loved one but of affirming each other's presence such that the content of the call matters less than the fact of the calling.[34] Thus, calling a glacier might be viewed as a desire for the affirmation of its presence, a presence troubled by the bubbling, gurgling, and cracking sounds that indicate its dissolution.

Yet in Paterson's work, there is a disjuncture between the novelty of calling a glacier and the ordinary bubbling sound actually heard at the end of the line. Unlike the uniqueness of humpback whale vocalizations, there is nothing—no signature, so to speak—in the recording itself that suggests that it comes from a glacier. We would be hard-pressed to pick out the sound of a glacier melting from the sound of running tap water or a bubbling fish tank. It is for this very reason that musician and scholar Steven Feld, when setting out to record the sounds of melting glaciers for a composition he was making for a Finnish radio broadcast, opted instead to record something more recognizable to his audience: the sounds of rushing water in the month of March, which is highly unusual in the northern reaches of Scandinavia that typically do not experience snowmelt until May.[35] What is perhaps novel in *Vatnajökull (the sound of)*, then, is not so much the sound of melting but the participatory act of calling a glacier, of connecting with an entity in the active state of disappearing. Although the gesture of calling a glacier affirms its presence, it only does so through the sonic signatures of its dissolution.

Paterson's second ice work, *Langjökull, Snæfellsjökull, Solheimajökull*, also plays with the aesthetics of ephemerality and recording. Paterson took sound recordings from three Icelandic glaciers and pressed the recordings into three LP records made of the frozen meltwater from those very glaciers. She then placed each chiseled record on a turntable and played the records until they completely melted, recording on film an event that could happen only once. Paterson has described what this recording sounded like: "The turntables begin playing together, and for the first ten minutes as the needles trace their way around, the sounds from each glacier merge in and out with the sounds the ice itself creates. The needle catches on the last loop, and the records play for nearly two hours, until completely melted."[36] The recording on Paterson's website replays this phenomenon, beginning with a noisy static that gradually becomes overlaid with the louder sound of bubbling, before that too melts back into the noisy static that began the recording. In this way,

Fig. 6. Katie Paterson, *Langjökull, Snæfellsjökull, Solheimajökull* (2007).

Langjökull, Snæfellsjökull, Solheimajökull plays with the physical record and act of recording, seeming to collapse the distinction between signifier (the ice record of glacier melt) and signified (the fact of glacial melting). Paterson shows that ice is an uncertain archival medium, one that can bear acoustic inscription and yet cannot withstand the heat and friction of being played or read by the gramophone needle.

Paterson's glacial LP records place us squarely within Friedrich Kittler's theorizations of sound recording. One of the more notable scenes in *Gramophone, Film, Typewriter* involves a passage from Reiner Maria Rilke called "Primal Sound" (1919) in which Rilke recounts attending an anatomy lecture and staring at the grooves of a skull, which suddenly remind him of the grooves on a gramophone record. What if a needle were placed on the grooves? Kittler notes that before Rilke, "nobody had ever suggested to decode a trace that nobody had encoded and that encoded nothing," thus ushering in the possibility of "writing without a subject."[37] Rilke thus celebrates "the very opposite of his own medium,"

the "duped needle" producing a "white noise no writing can store."[38] What do we make, then, of *Langjökull, Snæfellsjökull, Solheimajökull*, where glacial ice is forced to bear the inscribed marks of its own melting and then, upon being played, undergo the second death of another melt? Is this the elegy of its last dying gasps? If so, what kind of witness are we? If a glacier melts in the Arctic, does it make a sound?

One response to such questions would be to consider the milieu-specific contexts for sonic production. In *Sensing Sound: Singing and Listening as Vibrational Practice*, Nina Sun Eidsheim revisits the old philosophical question, "If a tree falls in the forest, does it make a sound?" to make the point that "aural experience is predicated on our physical contact with sound waves through shared media—in this case water and air, flesh and bone."[39] Taking Juliana Snapper's underwater opera performances as a case study, Eidsheim argues that "air has been naturalized as a material transducer for sound."[40] In contrast, underwater sound "resonates in the body, going directly to the inner ear and circumventing the eardrum. Like air and water, the eardrum and skull bones are media through which sound passes, and by which its character is affected."[41] By studying how the experience of sound changes when the listener is underwater, Eidsheim puts forward a theory of sound not simply as a signifier but, following Clifford Geertz, as a "thick event" that depends on the embodied listener and their surrounding milieu.

Eidsheim's work positions us to reconsider the milieu in which we experience the sound of glacial melt in Paterson's artwork, which takes air as the normative environment for sound, even though the sounds purport to be from ice melting underwater. What goes uninterrogated in her work is the fiction that the listener is listening as if underwater, even though both *Langjökull, Snæfellsjökull, Solheimajökull* and *Vatnajökull (the sound of)* are actually experienced in the medium of air. This signal traffic between air and water depends on a process of transduction, which Stefan Helmreich has theorized as the way "sound changes as it transverses media, as it undergoes transformations in its energetic substrate (from electrical to mechanical, for example), as it goes through transubstantiations that modulate both its matter and meaning."[42] The transductions in *Langjökull, Snæfellsjökull, Solheimajökull* involve the transfer of sound from the conducting medium of glacial ice, to ocean water, to hydrophone, inscribed back onto the refrozen glacial meltwater, and then finally into the air and our

ears. The performance and performativity of hearing the glacier melt in Paterson's work, then, have both a durational and transductive quality; they happen only once but take different amounts of time to coalesce and dissipate across the media of water, hydrophones, and air.

Yet our earlier question—If a glacier melts in the Arctic, does it make a sound?—not only involves questions of media transduction but also engages questions of affect and voice. Both Paterson's artwork and other artistic engagements with glacial voice bring to mind the case of humpback whale music in the 1970s.[43] By literally giving voice to the uniqueness of (male) humpback whale vocalizations, the recording launched the save-the-whales movement, helping to personify and establish the intelligence of the animals.[44] Similarly, Paterson's glacial records lend poignancy to the ephemerality of glaciers in a time of anthropogenic climate change. When we call the glaciers, it is only to confirm that they are disappearing; when we play the icy records of these melting sounds, the records themselves are melted and destroyed in the playing.

In an even more explicit fashion, the website Iceberg Songs, which debuted at the COP21 conference in November 2015, advertises the sounds of glacial melt as a form of political action: "Scientists recorded them crying. And artists made them into songs." They continue, "The more the people listen to these songs, the higher the demand for action. . . . Now it's up to you: listen, understand and share the Iceberg Songs. Demand answers and actions—for the icebergs and against global warming."[45] Journalist Brian Anderson recently asked, "In the end, the question shouldn't be, *If a glacier melts, will it make a sound?* But rather, *As glaciers melt, what are they telling us?*"[46] The implication is that, yes, glaciers make sounds; they are telling us that the planet is warming. Yet following Boetzke's discussion of ecologicity and the way that climate change is changing parameters of perception, we might also ask, What else do the sounds of glacier melt signify beyond the carefully channeled message of climate change?

What Are We Telling the Glaciers?

Perhaps we can add yet another dimension to the question of how glaciers amplify the urgency of climate change through multisensory means, by turning to Julie Cruikshank's ethnographic study *Do Glaciers Listen?* During fieldwork in the Mount Saint Elias ranges in Alaska,

British Columbia, and the Yukon Territory, Cruikshank reports that her guides "besought us to make no noise while on the ice or the crevasses would open wider and swallow us up. . . . They firmly resented even our whispering, so fearful were they of the consequences," a position derided by one explorer as "superstitious."[47] This work is firmly within the field of postcolonial science studies exploring how indigenous forms of knowledge position the glacier as responsive.[48] Cruikshank discusses the differences in perceptions of agency hardwired into English grammar versus Athapaskan and Tlingit languages that "have comparatively fewer nouns but are verb-rich and hence often define landscape in terms of its actions," as "actions are often attributed to entities, such as glaciers, that English speakers would define as inanimate."[49] This linguistic comparison enables her to playfully reformulate the question "As glaciers melt, what are they telling us?" to instead read, "As glaciers melt, *what are we telling glaciers*?"

What would the glacier hear if it called us? Would the sound of freeway traffic (implying a steady stream of carbon emissions) figure as a particularly harrowing Peircean index to the glacier? Is such a question antiscientific, or does it perform a science-fictional estrangement that helps us connect the here of human inhabited areas to the there of glaciers in their melting? Yet this troubling of the agencies of ice serves to remind us, as Cruikshank has also observed, that the Arctic and Antarctic are today zones of amplified (intensified) climate change effects that seem to be perpetually undergoing processes of forecasting, prediction, and calculation.[50] While glaciers are present across the world's latitudes and thus signify beyond the poles, melting ice is increasingly being taken up into narratives about ecological futurity defined by potential loss. In their lives and deaths, glaciers and the broader cryosphere amplify what melting means to human beings. More than a flat index of a warming globe, ice melt figures a multisensory horizon of encounter and call for engagement. However, the strange work of imagining glaciers that listen to us may be the beginning of a necessary speculative fiction that moves beyond nature-culture binaries and the master narrative of the Anthropocene and that, instead, situates human beings within agentive environments.

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Rafico Ruiz researches settler infrastructure building and design in the circumpolar world, with adjacent interests in post–global warming ice as a material form of political economic and cultural communication. Ruiz holds an interdisciplinary PhD in communication studies and the history and theory of architecture from McGill University. He was recently a Social Sciences and Humanities Research Council of Canada Banting Postdoctoral Fellow in the Department of Sociology at the University of Alberta. He is the author of *Slow Disturbance: Infrastructural Mediation on the Settler Colonial Resource Frontier* (Durham, NC: Duke University Press, forthcoming). Ruiz was the 2018 Fulbright Canada Research Chair in Arctic Studies at Dartmouth College. His work appears in the *International Journal of Communication*, *Communication +1*, and *Continuum*, among others. He is also the coeditor of the open-access journal *Culture Machine*.

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NOTES

1. For example, one can routinely monitor Beijing's air-quality index and find that it is more often deemed unhealthy than healthy; see "Beijing Air Pollution: Real-Time Air Quality Index," World Air Quality Index Project, http://aqicn.org/city/beijing/, accessed April 11, 2016.

2. See Ursula Heise, *Sense of Place and Sense of Planet* (London: Oxford University Press, 2008).

3. To consult the "Paris Agreement," see the United Nations Framework Convention on Climate Change, Adoption of the Paris Agreement, FCCC/CP/2015/L.9/Rev.1 (December 12, 2015), https://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf. The formal signing of the agreement took place on April 22, 2016, at the United Nations Headquarters in New York City; see United Nations Framework Convention on Climate Change, "April 22 Paris Agree-

ment Signing Ceremony in New York," news release, April 7, 2016, http://newsroom.unfccc.int/paris-agreement/april-22-paris-agreement-signing-ceremony-in-new-york/.

4. We use the term "index" in Charles Sanders Pierce's sense, which Stefan Helmreich summarizes nicely: "a sign that stands for (or points to) its object by virtue of the object having made an impression on the carrier of the sign. A footprint is an index, and so, in a material fashion, is a photograph—an impression made by light on a medium." Stefan Helmreich, *Sounding the Limits of Life: Essays in the Anthropology of Biology and Beyond* (Princeton, NJ: Princeton University Press, 2015), 119.

5. *Oxford English Dictionary Online*, s.v. "amplification, n.," accessed January 11, 2019, http://www.oed.com.login.ezproxy.library.ualberta.ca/view/Entry/6740?redirectedFrom=amplification#eid.

6. "Artists 4 Paris Climate Idea: 2015," artists 4 climate, accessed April 12, 2016, http://www.artists4climate.com/en/idea/. Overall, the initiative gathered some thirty artworks by fourteen artists. The artworks were sold at a charity auction organized by Christie's on December 9, with the proceeds going to "on-the-ground actions" around desertification and climate adaptation conducted by twelve nongovernmental organizations.

7. Limited documentation surrounding the work is available through the Studio Olafur Eliasson web page: "Ice Watch," accessed May 5, 2020, https://olafureliasson.net/archive/artwork/WEK109190/ice-watch. The installation on the Place du Panthéon was preceded by a first iteration in 2014 outside Copenhagen City Hall in order to mark the publication of the IPCC's *Fifth Assessment Report* on climate change for the UN. More detailed documentation, including the project's Instagram feed, was part of the now-defunct Ice Watch Paris website. The website of the latest iteration of the installation, Ice Watch London, includes many of the same features as the Paris website; see "Ice Watch London," accessed May 5, 2020, https://icewatchlondon.com/.

8. "Press Report," accessed April 12, 2016, http://www.icewatchparis.com (site discontinued); see also "Ice Watch," accessed May 5, 2020, https://olafureliasson.net/archive/artwork/WEK109190/ice-watch.

9. *Ice Watch* was funded by Bloomberg Philanthropies; see "Ice Watch London," accessed May 5, 2020, https://icewatchlondon.com/.

10. Catherine Bottrill, *The Carbon Footprint of Ice Watch Exhibited at the UN Climate Change Summit (COP21) Paris, December 2015* (London: Julie's Bicycle, December 1, 2015), http://olafureliasson.net.s3.amazonaws.com/subpages/icewatchparis/press/Ice_Watch_Carbon_Footprint.pdf.

11. Cynthia Zarin, "The Artist Who Is Bringing Icebergs to Paris," *New Yorker*, December 5, 2015, http://www.newyorker.com/culture/culture-desk/the-artist-who-is-bringing-icebergs-to-paris.

12. Olafur Eliasson, "Why Art Has the Power to Change the World," *Huffington Post*, January 24, 2016, http://www.huffingtonpost.com/olafur-eliasson/why-art-has-the-power-to-change-the-world_b_9054158.html.

13. Milstein nuances her understanding of the "performer metaphor" by acknowledging its inherently Western bias: "Perhaps such knowing cannot be adequately put into Western language because doing so would effectively dissolve the humans Westerners have become. While being awed by, and connected to, magnificent beings and ecosystems can provide

posthumanist moments, the performer metaphor reasserts cultural binaries of self–other, audience–performer, reifying boundaries as they momentarily disassemble. Indeed, there may be something terrifying about this dissolve, at least subconsciously, and the performer metaphor could be an ameliorating metaphor." Tema Milstein, "The Performer Metaphor: 'Mother Nature Never Gives Us the Same Show Twice,'" *Environmental Communication* 10, no. 2 (2016): 242.

14. Journalist Cynthia Zarin quotes the well-known ecologist and philosopher Timothy Morton regarding *Ice Watch*: "In our contemporary ecological emergency, there's a lot of data, but at this point we're dumping ecological data on ourselves. It's not helping. We don't need to be doing that for one more minute. Olafur is putting pieces of ice there and saying, 'Let's try to start a conversation.'" Zarin, "Artist Who Is Bringing Icebergs to Paris."

15. "#IceWatchParis," Instagram, accessed April 12, 2016, http://icewatchparis.com/instagram/ (site discontinued); see also "Ice Watch London," accessed May 5, 2020, https://icewatchlondon.com/.

16. Mark Carey, M. Jackson, Alessandro Antonello, and Jaclyn Rushing, "Glaciers, Gender, and Science: A Feminist Glaciology Framework for Global Environmental Change Research," *Progress in Human Geography* 40, no. 6 (2016): 1.

17. Donna Haraway, *Staying with the Trouble* (Durham, NC: Duke Press, 2016).

18. Donna Haraway, "Anthropocene, Capitalocene, Plantationocene, Chthulucene: Making Kin," *Environmental Humanities* 6 (2015): 160.

19. Mark Carey, "The History of Ice: How Glaciers Became an Endangered Species," *Environmental History* 12, no. 3 (2007): 501.

20. Alice Rayner, "E-scapes: Performance in the Time of Cyberspace," in *Land/Scape/Theater*, ed. Elinor Fuchs and Una Chaudhuri (Ann Arbor: University of Michigan Press, 2002), 360.

21. Sandra Bay-Cheng, "'When This You See': The (Anti) Radical Time of Mobile Self-Surveillance," *Performance Research* 19, no. 3 (2014): 50.

22. Irmgard Emmelhainz, "Conditions of Visuality under the Anthropocene and Images of the Anthropocene to Come" e-flux, no. 63 (March 2015), http://www.e-flux.com/journal/conditions-of-visualityunder-the-anthropocene-and-images-of-the-anthropocene-to-come/.

23. Timothy Clark, "Scale," in *Telemorphosis: Theory in the Era of Climate Change*, vol. 1., ed. Tom Cohen (Ann Arbor, MI: Open Humanities Press, 2012), http://quod.lib.umich.edu/o/ohp/10539563.0001.001/1:8/—telemorphosis-theory-in-the-era-of-climate-change-vol-1?rgn=div1;view=fulltext.

24. For a treatment of the relationship between satellite-imaging practices and visualization in relation to sea ice, see Nina Wormbs, "Eyes on the Ice: Satellite Remote Sensing and the Narratives of Visualized Data," in *Media and the Politics of Arctic Climate Change*, ed. Miyase Christensen, Annika E. Nilsson, and Nina Wormbs (Basingstoke, UK: Palgrave Macmillan, 2013), 52–69.

25. Amanda Boetzkes, "Ecologicity, Vision, and the Neurological System," in *Art in the Anthropocene: Encounters among Politics, Aesthetics, Environments and Epistemologies*, ed. Heather Davis and Etienne Turpin (Ann Arbor, MI: Open Humanities Press, 2015), 271.

26. Boetzkes, "Ecologicity, Vision, and the Neurological System," 272.

27. American Geophysical Union, "Melting Glaciers Prove to Be Noisiest Places in Ocean Study Shows," press release, March 5, 2015, http://news.agu.org/press-release/melting-glaciers-prove-to-be-noisiest-places-in-ocean-study-shows/.

28. Dr. Martini [Kim Martini], "Obnoxiously Loud Sound of Glaciers Melting," *Deep Sea News* (blog), April 7, 2015; http://www.deepseanews.com/2015/04/the-obnoxiously-loud-sounds-of-glaciers-melting/.

29. For a variety of experiments with recordings that straddle science and music, see Brian Anderson, "Sounds of the Planet Melting: If a Glacier Melts, Will It Make a Sound?," Vice, August 15, 2014, http://motherboard.vice.com/read/the-sounds-of-the-planet-melting.

30. See United Nations Framework Convention on Climate Change, Adoption of the Paris Agreement, FCCC/CP/2015/L.9/Rev.1 (December 12, 2015), https://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf; United Nations Framework Convention on Climate Change, "April 22 Paris Agreement Signing Ceremony in New York."

31. Katie Paterson posted a number of photographs documenting the live phone calls to the glacier on the following website: http://www.tertium.co.uk/katie/, accessed April 12, 2016.

32. Katie Paterson, "Vatnajökull (the sound of)," artist's official website, accessed May 1, 2020, http://katiepaterson.org/portfolio/vatnajokull-the-sound-of/.

33. Carey et al., "Glaciers, Gender, and Science," 785.

34. John Durham Peters, *The Marvelous Clouds: Toward a Philosophy of Elemental Media* (Chicago: University of Chicago Press, 2015), 13.

35. Melody learned this during a lunch conversation with Steven Feld and wishes to express her thanks for the helpful reference.

36. "Langjökull, Snæfellsjökull, Solheimajökull," Redtory Museum of Contemporary Art, 2017, http://www.rmcart.org/News/detail/id/39.html, accessed January 15, 2019.

37. Friedrich Kittler, *Gramophone, Film, Typewriter*, trans. Geoffrey Winthrop-Young and Michael (Stanford: Stanford University Press, 1999), 44.

38. Kittler, *Gramophone, Film, Typewriter*, 45.

39. Nina Sun Eidsheim, *Sensing Sound: Singing and Listening as Vibrational Practice* (Durham, NC: Duke University Press, 2015), 44.

40. Eidsheim, *Sensing Sound*, 55.

41. Eidsheim, *Sensing Sound*, 45.

42. Stefan Helmreich, *Sounding the Limits of Life: Essays in the Anthropology of Biology and Beyond* (Princeton, NJ: Princeton University Press, 2015), 222.

43. See D. Graham Burnett, *The Sounding of the Whale: Science and Cetaceans in the Twentieth Century* (Chicago: University of Chicago Press, 2010).

44. "Song of the Humpback Whale" sold over one hundred thousand copies. See, for example, Wildlife Conservation Society's discussion, "1970s Whale Songs Continue to Echo Today," *Wild Things* (blog), August 27, 2014, http://www.wcsarchivesblog.org/1970s-whale-songs-continue-to-echo-today/.

45. The Iceberg Songs website can be found at http://www.icebergsongs.com/.

46. Brian Anderson, "The Sounds of the Planet Melting," Motherboard, August 15, 2014, http://motherboard.vice.com/read/the-sounds-of-the-planet-melting.

47. Julie Cruikshank, *Do Glaciers Listen? Local Knowledge, Colonial Encounters, and Social Imagination* (Vancouver: University of British Columbia Press, 2005), 19.

48. See Sandra Harding, *Sciences from Below: Feminisms, Postcolonialities, and Modernities* (Durham, NC: Duke University Press, 2008).

49. Cruikshank, *Do Glaciers Listen?*, 4.

50. Julie Cruikshank, "Glaciers and Climate Change: Perspectives from Oral Tradition," *Arctic* 54, no. 4 (December 2001): 377–78.