CRYOSPHERE

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Anna-Maria Walter

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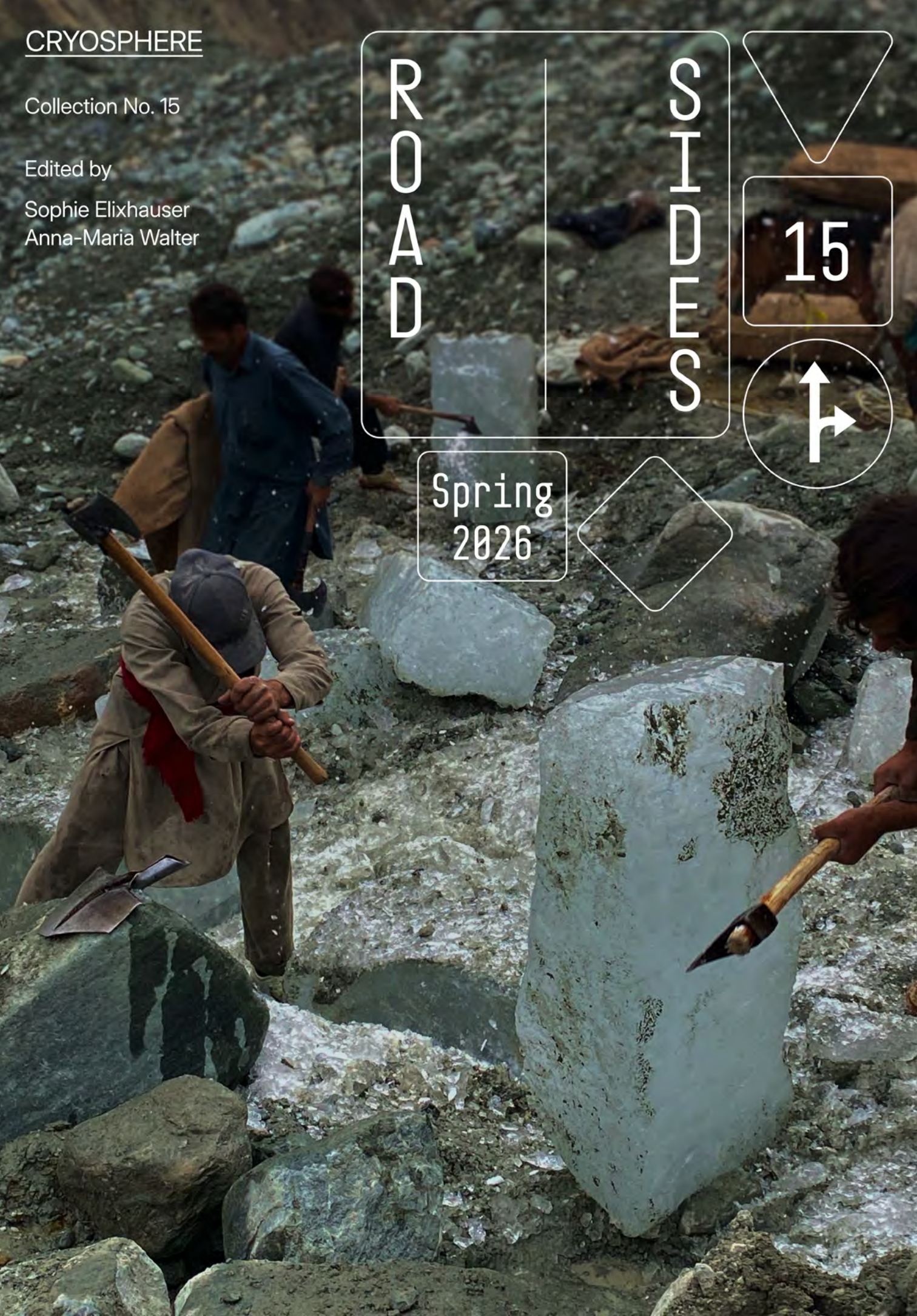

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Cryosphere:
An Introduction

Anna-Maria Walter and Sophie Elixhauser

Back in the day, the village saw two meters of snow.
There's simply no snow anymore, but now there is rain in summer.

Such statements are commonly encountered in many cold regions of the world, be it the Arctic, the Alps or the Himalayas. These particular comments come from the Karakorum Mountains of northern Pakistan, Anna-Maria's ethnographic home. In Asia's arid high deserts, snow not only feeds glaciers but also serves as a water source for local communities to gradually replenish underground resources. Cloudbursts, on the other hand, destabilise barren slopes. In the Alps, rising snowlines and unreliable precipitation patterns pose not so much a hydrological threat as an existential economic one for the tourism industry. In response, ski resorts have turned to artificial snow production and other controversial technical means to keep the businesses alive (Nöbauer 2022). Although snowfall seemingly happens on its own, we cannot think of it without human influence and vice versa.

A deserted German ski resort.
Photo: Anna-Maria Walter, February 2023.

A gradual increase in rain and a lack of snow is also being experienced in the Arctic, as has been evident throughout Sophie's fieldwork in Kalaallit Nunaat (Greenland). In Uummannaq, a town and island in the north-western Avannaata municipality, most of the Inuit residents lament the decrease in snowfall, but the decline in sea ice is considered a much bigger problem. Sea ice plays a vital role in community activities, facilitating hunting, fishing, social events and travel. It provides a habitat and a feeling of home, and is significant for people's sense of belonging and identity (Gearheard et al. 2013). While the ice has been retreating year on year, the winter of 2024–25 was the first in a long time without solid ice cover. The weather was mild and the snow was wet. A resident explained that storms and strong winds kept breaking up the sea ice just as it was about to freeze over. Although fishermen made channels in the ice with their boats, travelling along these was time consuming and tedious. So, most residents had to remain on the island for the entire winter. As there are no roads connecting the island's settlements, people from neighbouring villages who usually commute over the ice by

car or snowmobile to Uummannaq town had to purchase expensive helicopter tickets. An elderly person stated emphatically: "We miss the ice and the cold weather. If there hadn't been so much snow this winter, there certainly would have been ice." In this case, a lot of snow has negative connotations as it represents warmer conditions and a lack of sea ice. At the same time, stable sea ice can also be dangerous in itself. According to locals, the *qivittut*—half-human, half-nonhuman creatures that appear in Greenlandic horror stories—can reach the town more easily over closed sea ice (Elixhauser and Gusenleitner 2025). Thus, ice can act as both a barrier and a facilitator, arising from an interplay of atmospheric and hydrological dynamics. These are increasingly being altered by anthropogenic climate change.

The integration of all physical and meteorological processes related to snow and ice is the achievement of the Polish geophysical scientist Antoni Dobrowolski (1904–2012), who coined the term cryosphere in the early twentieth century. The cryosphere, defined as "a zone extending from the upper part of the troposphere, where ice crystals occur in clouds, to the base of the permafrost" (Barry, Jania and Birkenmajer 2011: 76), enables us to connect different scales along the axis of frozen water. Our understanding, however, extends beyond that physical definition. Drawing on the interdisciplinary field of Ice Humanities (Dodds and Sörlin 2022), we use the term cryosphere to encompass the epistemic, cultural and scientific practices that produce icy realities for various actors and beings along the continuum of frozen water.

Uummannaq surrounded by unstable sea ice. Photo: Andreas Trügler, April 2025.

This collection focuses on the changing cryosphere as a form of infrastructure that is utilised and co-created by humans, other species and a variety of beings. Rather than concentrating on the built environment or the often-unpredictable effects of infrastructural projects, the contributions here address the co-production of cryospheric structures and processes. Framing the cryosphere as infrastructure means understanding glaciers, (sea) ice, snow and permafrost as dynamic, more-than-human assemblages that organise mobility, livelihoods and social relations. Our thinking is inspired by Canadian Indigenous scholars, and their critical deconstruction of modernist takes on infrastructure, such as of LaDuke and Cowen's (2020: 263) notion of "infrastructure otherwise," Spice's (2018: 40) account of Indigenous "critical infrastructure," and Pasternak et al.'s (2023) decolonial reframing of infrastructure. We push further along these lines to foreground cryospheric processes that unfold through non-built yet highly relational environments as infrastructural formations within which jurisdiction, care and resistance take shape.

Lack of precipitation forces women to do laundry in the river, Gilgit. Photo: Anna-Maria Walter, February 2014.

Shifting the focus to non-built or hybrid infrastructures reveals the inherent anthropocentrism of existing infrastructure studies in the social sciences and humanities (Larkin 2013; Harvey et al. 2017; Anand et al. 2018; Schweitzer et al. 2026). While acknowledging the "simultaneity of the material and the social in the coming-into-being of infrastructural forms" (Reeves 2017: 713), our approach recognises the power asymmetries that global climate change produces in manifold local realities. Water and food security for many people, especially Indigenous and remote communities, is already severely compromised and geopolitical interests prevail (Hovelsrud et al. 2011; Hastrup 2013; Hoffmann et al. 2022; Strauss-Mazullo and Tennberg 2023).

This collection brings together a variety of geographies, scales and temporalities. Long considered 'frozen in time', the vast glacial masses now vividly demonstrate that they are constantly in motion. In their "dys-appearance" (Leder 1990: 87), glaciers and other frozen matter attract attention and bring the cryosphere to the fore from its oft-overlooked "background-ness" (Rippa 2023: 26, referring to Hetherington 2019). Place-based narratives, embodied memories or historical accounts provide insights into the long-term management of cryospheric change (Cruikshank 2005; Watt-Cloutier 2018; Bennett 2019; Heggie 2019; Ruiz et al. 2024). Although ice is often imagined as empty and inert, such a perception is the result of a long colonial history, during which ice became a setting for masculine, imperialist projects of control, scientific authority and resource extraction (Carey 2016; Smith 2025). Viewed in this way, ice facilitates the systematic erasure and dismissal of alternative histories and knowledges. Instead of reducing the current conditions of snow and ice to a narrative of melting, we focus on the slow and careful processes that stem from the interactions between humans, animals and other beings and entities. Contributions explore the diversity of experiences, memories and multi-sensory perceptions through which science, local populations and visitors have developed practices and strategies for engaging with – or disengaging from – snow and ice. To grasp their intimate and emergent character, it is crucial to consider the materiality and the affective dimensions of snow and ice as vital matter (Simonetti 2021; Krause 2022; Gagné and Drew 2024).

The tensions between dying ice and changing livelihoods appear as a common thread running through the contributions. These dynamics reflect the ephemeral quality of snow, ice and glaciers, while underscoring the reality of accelerated environmental change. Craney's exhibition considers the dis/comfort of ice in the everyday lives of Arctic communities and newcomers, portraying it as both familiar and unruly. This resonates with Schaub and Carey's description of dead glacier infrastructures that captures the strange attraction of a prolonged dying process. Focusing on glaciological research in Antarctica, an exploratory piece by Case, Hoffman, Mode and Rai examines the viscous texture of ice and human knowledge about this material. Bakhmetyeva and Weaver describe a similar process for imperial Russia, where scientific explorations tried to gloss over the vitality of glacial landscapes by freezing them within a rigid spatial order. In her playful contribution, Bowman situates cryospheric change within an inescapable maze of climate engineering – yet no satisfactory solution has emerged so far. Challenging the Euro-American success narrative of science and technology, Wang critically examines knowledge transmission from China to the West with the example of icehouses that once lined the banks of the Yong River in Ningbo.

Navigation through difficult sea ice conditions, Tasiilaq, East Greenland.
Photo: Sophie Elixhauser, spring 2007.

All of these contributions indirectly argue that a reversal of epistemological direction is needed. This approach challenges fixed preconceptions by redefining the various components of the cryosphere as dynamic, living infrastructures rather than static landscapes or assets. Gagné's account of a Himalayan folktale showcases a local person's competent intervention to harness the vitality of water and ice. Set in the Peruvian Andes, Shutkin's contribution highlights the relationship between communities and their cryospheric environment through an annual festival for a mountain deity. Meanwhile, Hasina's case study from the Pakistani Karakorums uncovers how young musicians, who grew up partially alienated from local ecologies, recognise the need to restore spiritual connections with the environment to acquire a sense of belonging. Rohr's piece reflects a similar trajectory. Through alpinists' representations in glacier imagery, he identifies the staging of mountaineers in early photography as a predecessor of an "Instagram society."

Thus, it is not so much a question of glaciers exerting an agentive force to haunt humans, but rather the reverse: how is snow and ice haunted by us? This collection invites a pause, encouraging reflection and the cultivation of understanding—like allowing snow crystals to grow slowly—aligning with the elements' ephemerality and flexibility. Cryospheric infrastructures shift the focus from conquest to an open-ended process of intersubjective attentiveness that emphasises the importance of patience, care and reciprocal engagement.

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dis/comfort of Ice

Katie Ione Craney

Ice is consequential always, not only through its melting.
Jen Rose Smith, dAXunhyuu (Eyak, Alaska Native)

In my artmaking and worldview, I see glaciers as verbs—as animate living, breathing, communicating beings.[1] This informs how I participate with my home in Alaska, in my relationships and surroundings, and in experiential learning processes. As part of my Master's degree in Arctic and Northern Studies at the University of Alaska-Fairbanks, I curated *dis/comfort in the North* to examine how comfort and discomfort materialize in Northern-based contemporary art. Through a call for submissions and by invitation, an assemblage of artists considered their own comfort and reflected on the broader contexts of how dis/comfort shapes living in and visiting the North.

As a framework and concept for the exhibition, dis/comfort materialized by attempting to define colonial comfort, where privilege can undermine comfort for marginalized groups, or perpetuate comfort for certain bodies (Ahmed 2013; Dickenson 2022). Comfort and discomfort are multimodal and have different meanings and effects depending on identity, worldview, social status and physical location. For example, comfort could mean exerting control over land and marginalized groups through colonial or political power. Or, comfort could mean the freedom to move through one's homeland and territories in an unfettered way. If comfort is informed by identity and worldview, where do viewpoints, imaginings and feelings about the North split and merge, and for whom does this happen?[2] How does comfort and discomfort shape what is unknown or misunderstood about the Arctic? As an analytical and aesthetic tool, dis/comfort offers some ways of answering these questions.

[1] My relationship with glaciers is informed by living near and with them, and reflects generational Indigenous relations (Cruikshank 2006).

[2] North, Circumpolar North and Arctic are used interchangeably here, as some ideas and concepts stretch beyond strictly Arctic geographical framings.

The Grammar of Ice. Anna Berrino, etching on zinc, 2024.

dis/comfort interrogates how one may be responding to and/or experiencing comfort or discomfort at any given time. In the selected artworks, contemporary and relational art by both insiders (inhabitants of Northern regions) and outsiders (visitors or newcomers from Southern locations) emerge as complex 'anti-spectacle' stories of ice.[3] Anti-spectacle ice relates to or writes towards ice as family and home, as social, or messy and complicated (Smith 2025). The consequentiality and complexity of ice and ice narratives underpin dis/comfort as an analytic and aesthetic framework.

[3] For a description of inside/outside, see Cameron 2015.

dis/comfort as an exhibition also became an analytical tool to interrogate artistic practices by outsiders that imagine the Circumpolar North from a distance or through brief encounters. Within this framing, the exhibition became a multidimensional tool for considering how one may be responding to and/or experiencing comfort or discomfort at any given time in Northern contexts, and in relation to land and ice. This is visible in the activated worlds found in *The Grammar of Ice*, a zinc etching by Italian-Scottish artist Anna Berrino. Familiarity and relationship with ice is felt through careful attention to her processes, where nuance translates as layers of memory. Some layers are well defined, while others are subtle, muted, yet still have shape and presence. Similarly, Alaska-based painter Klara Maisch gestures towards place-based care, deep listening and layered conversations in *Mass-Balance*, from her repeat C'ulc'ena' Łuu' (Gulkana Glacier) painting series.

I paint here to sit with time, listen to the ice, and reckon with the discomfort that always shows up. It's not the cold winds or the hard ground, or sleeping on snow or being soaked to my core... What unsettles me is the sudden sensation that the tempo of change in this place has skipped a hundred beats ahead. The cold, wet feeling in my bones is that everything is connected and everything is at risk. All I know to do is to sit with my friend. To feel as I paint. To crack open and weather together. (Maisch 2025)

Mass-Balance. Klara Maisch, C'ulc'ena' Łuu' (Gulkana Glacier), the first year of a ten-year repeat painting project. Photographs: James Smith, 2020.

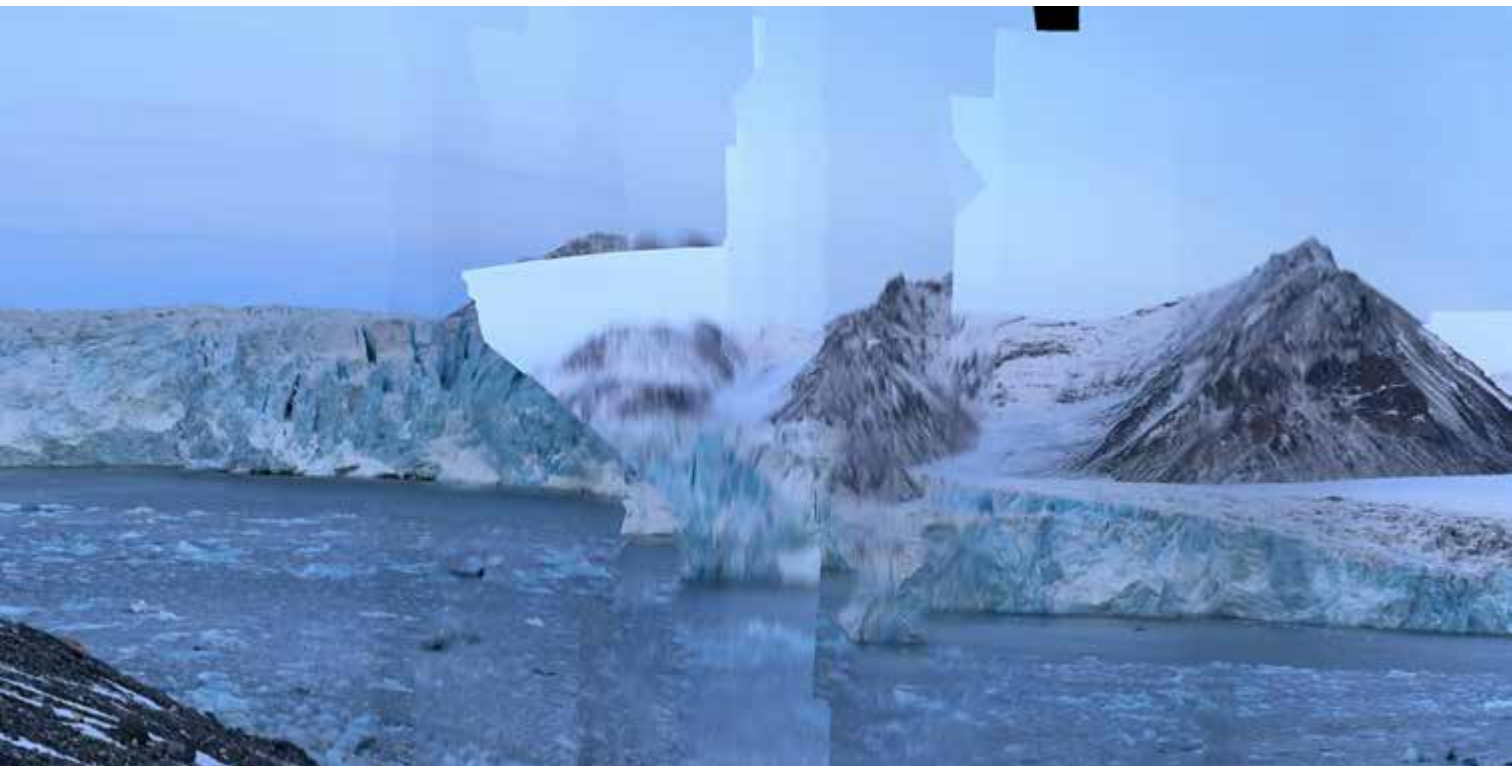
Comfort and ice/scapes are in relation by their complexity, subjectivity, measurement, how they are socially engaged with, and by how their definitions change depending on one's race, gender, identity or physical proximity to each (Fennell 2011; Hobart 2023; Cao 2025). Ice can be comfortable by providing life-supporting systems such as a substrate for food availability, safe travel conditions, and the basis for cultural and spiritual practices. Alutiiq art historian and scholar Nadia Jackinsky-Sethi (2025) finds "comfort in knowing" Kachemak Bay (Alaska) "takes care of us," a place that has sustained her family for generations. In her photograph *Sibylle's Place*, glacial ice holds generational memory as it does cultural identity. A sentient ecology or Indigenous epistemology sees ice as alive and communicating; therefore, ice acts accordingly when dis/respected (Cruikshank 2006). Relationships with—and the comfort found or made by—ice, influence humans as much as humans influence the many lives and bodies of ice.

Sibylle's Place.
Nadia Jackinsky-Sethi, digital photograph, 2023.

The physical presence and effect of ice, including how its melting affects a temperate world, can be uncomfortable (Smith 2020). Ice is embodied by its positionality within the cryosphere; life on Earth, as humans have come to know it, is directly and indirectly dependent on ice in some form. In her glitchy *Spliced Glacier*, New York-based artist Ada Pilar Cruz provokes viewers to question what they are seeing. Interrupting familiarity challenges the viewer's relationship with both the image itself and the romanticized and crisis-driven narratives of ice, where ice is only considered by its melting (Whyte 2020; Smith 2022). This tension elicits the physicality of ice-albedo, the heating and cooling of the planet by ice reflecting the sun's heat. In this way, ice viscerally regulates planetary and bodily comfort. The glacier's visual disruption asks viewers to sit with the discomfort of what cannot be known and, perhaps, be okay with not knowing. The tidewater glacier is confusing yet recognizable and offers space to question who has access to such living and lived-in places, and how these places experience an ongoing colonial gaze by how they are visited, viewed and extracted from in our current digital age.

Through these ice-windows, exhibition viewers were encouraged to feel and question their own dis/comforts. Asking who dis/comfort is for in any given setting reveals the possibilities of the concept as a survival mechanism. dis/comfort enhances modes of active, dynamic presence and resistance towards imposed outsider narratives and pressures. Anti-spectacle ice narratives offer a sense of comfort to 'weather' ongoing colonialism, geopolitical posturing and the impacts of a rapidly changing climate.[4] Comfort, in this way, creates space to move through ongoing colonial conditions, while discomfort offers a reflection on why certain places, conversations, actions and cultural practices are or are not comfortable, and for whom.

[4] On the concept of weathering, see Belcourt 2020.



Spliced Glacier. Ada Pilar Cruz, digital photograph, near Ny-Ålesund, Spitsbergen, 2023.

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Discussion Questions

1. What truth makes you comfortable or uncomfortable?
2. Whose bodies or politics are allowed to be comfortable, and whose are not?
3. How do you define dis/comfort?
4. Does dis/comfort influence how you imagine or understand ice, climate change or the Circumpolar North?
5. What comforts would you be willing to live without if it meant sea ice, glacier ice and cold could flourish?

Exercise:

dis/comfort reveals similar layers and overlapping descriptions, demonstrating the complexity of the concept as it explores how ice is felt, imagined, remembered and cared for. Reflect on how ice makes you feel or how you imagine or remember your encounters with ice. Write down descriptive words for how or when ice makes you comfortable or uncomfortable. Compare your list to see if there are overlaps.

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Katie Ione Craney (www.katieionecraney.com) is an interdisciplinary artist and researcher working with found materials, photography, text and scrap metal to reflect on the connections between memory, accessibility and survival in the rapidly changing North. She is MA Candidate in Arctic and Northern Studies and Adjunct Instructor for "Visual Images of the North" at the University of Alaska-Fairbanks.

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Dead Glacier Infrastructures

Nicole Schaub and Mark Carey

A luxury spa is a weird place to find a glacier, especially one that is dead. Spas are about relaxing and rejuvenating; dead glaciers are about environmental apocalypse. Spas are comfortable; dead glaciers are not. Maybe that is why Iceland's Krauma Spa only mentions Okjökull's glacier funeral online, their use of its famous waters credited on their blog, but not in person (Herrera 2020). The 2019 funeral, when organizers declared the Okjökull Glacier deceased in a high-profile ceremony, mostly vanishes within Krauma's comfort-driven space. The spa's calm, dark-modern aesthetics—slate-grey lobby, somber black woodwork, and stylized aerial photography that include unnamed images of Okjökull—might transform from soothing to foreboding if recast as the home of a dead glacier. The cold-water plunge tank turns from inviting to morose when reframed as meltwater remains.

Of course, this dead glacier lens is out of place at a tranquil spa; it is just melted ice water after all, not a corpse. But there is a gap between what is presented online and experienced in person, the dead glacier disappearing from physical space in ways that reveal certain contradictions: silence and consumerism where there might be awareness and conservation, but also life where death has been declared, new beginnings instead of endings.

Cold-water bath fed by glaciers, Iceland.
Photo: Nicole Schaub, 2025.

An infrastructural approach to dead glaciers exposes the confusion, questions and contradictions that accompany an extinguished glacier in the world of the living (Larkin 2013; Howe et al. 2016). Is a glacier dead if it still provides enough meltwater for a spa? The authority to pronounce glaciers dead or capitalize on their melting ultimately depends upon power, which can play out through infrastructures that prioritize the wishes of some while ignoring, undermining or damaging the experiences of others. Inequalities are everywhere around ice (Carey and Moulton 2023), even in postglacial places. Dead glacier infrastructures, as we call them, consider the physical infrastructures around dead glaciers—hiking trails, sightseeing tours, lodges, roads and spas—in combination with the media infrastructures that promote dead glaciers, including webpages, newspapers and digital media. Viewed together, dead glacier infrastructures and the gaps between them surface hidden power dynamics and reveal what they actually accomplish, and for whom.

Spa lobby with glacier images, Iceland. Photo: Nicole Schaub, 2025.

Consuming Dead Glaciers

The quiet town of Húsafell is the perfect hiding place for a famous dead glacier wanting to avoid all the attention glaciers get these days (Quaglia 2022; Stautner 2025; Zhong et al. 2025). Online, Iceland's first dead glacier to be given a funeral receives consistent coverage, from fresh glacier funerals in new places (Leibman 2025) to a glacier graveyard (McCaig 2024) and a global glacier casualty list (Boyer and Howe 2024). But locally in its hometown, Okjökull's celebrity status is ignored, the trail to its final resting place and commemorative plaque mostly unvisited. Instead, Langjökull—Okjökull's much larger, yet also dying neighbor—buzzes with activity: hiking trails to sweeping glacier vistas, glacier snowmobiling, glacier ice caving, helicopter tours from Reykjavik, an under-ice wedding chapel, and an eight-wheel monster truck adventure to the world's largest human-made tunnel "Into the Glacier" that includes a "ride up to the glacier in a modified NATO missile launcher truck!" (Into the Glacier 2023).

These dead glacier infrastructures attract global travelers whose emissions help hasten the glacier's death (Lam and Tegelberg 2020), even as they mention Okjökull's demise online. Instead of stimulating sustainability, such infrastructures become tools for consumption that do not fulfill the promise of "dark tourism" to create change (Varnajot and Salim 2025). The infrastructure discloses when a glacier's death is convenient and how it is used: at a distance.

Respecting Dead Glaciers

The most recent glacier to have a funeral is not dead yet. Yala Glacier in Nepal is melting rapidly, but is not expected to disappear until the 2040s. Prematurely consigned to the grave, Yala has already been mourned in Iceland as part of the 2024 Glacier Graveyard, its name carved into an ice headstone that melted before its glacier "tribute" took place in Nepal (Leibman 2025). For the International Centre for Integrated Mountain Development and a local Tibetan Buddhist Indigenous community, this tribute was an important cultural distinction oriented towards honor, respect and wellbeing (Leibman 2025; Seldon 2025) that also raised awareness about melting Hindu Kush Himalayan glaciers. Local spiritual leaders offered the glacier blessings and the ceremony was connected to monitoring training for local scientists. This glacier's premature death and the move from glacier funeral to tribute expose how dead glacier media infrastructures can overpower local practices and spiritual beliefs, falsely characterize glaciers as already gone, and ultimately predetermine demise and "ruined futures" (Jackson 2015).

Afterlives of Dead Glaciers

Bolivia's Chacaltaya Glacier is not just dead; it is gone. The ice completely melted and disappeared in 2009 (Kaenzig et al. 2016). For decades before that, Chacaltaya could boast being the highest ski resort on the planet. Now, the once-icy slopes have transformed into barren rock. The old ski lodge, chairlift towers and rusted cables strewn across the treeless mountainside look like detritus—a haunting example of dead glacier infrastructure. And yet, Adolfo Mendoza, one of the Bolivian Andean Club refuge and ski resort caretakers from the icy days, still hikes to the alpine refuge almost daily (Lana n.d.). Tourists continue to visit. He lets them into the old ski lodge turned climate museum to drink coca tea and learn about the former life of the Chacaltaya Glacier. Mendoza dreams of resuscitating the snowy terrain: "We hope to relaunch skiing … to bring the place back to life" (Palomo et al. 2025: 116–17), but the mountain still nourishes him and the glacier lives on in memories, photographs and stories—other types of dead glacier infrastructures.

Others living and working around Chacaltaya feel like life never left, even if climate change killed the glacier. Isabel Moreno has been researching at the Chacaltaya Global Atmosphere Watch station for fifteen years and understands the history of the glacier and its disappearance. But she says Chacaltaya "makes me feel safe" (Palomo et al. 2025: 52). Moreno sees this as a place that made her career and her friendships. She enjoys seeing Adolfo Mendoza, the tourists, and other researchers studying and sleeping on the mountain. She even continued working on Chacaltaya after getting pregnant

with her first child. Simplistic news coverage and attention-grabbing media that focus only on the vanished glacier and troubling images of dead glacier infrastructures like abandoned chairlifts overlook the way this mountain landscape still thrives and supports people. The death of the glacier did not in fact kill the place or the people; instead it is a place of birth, too, of "life-giving beginnings" (Palomo et al. 2025: 52).

Are 'Dead' Glaciers Even Really Dead?

The deadness of glaciers is often contested and contradicted. Glaciologist Allen Pope observes that determining the point when ice transitions from a glacier to a non-glacier is "ambiguous" and "messy" (Pope 2025: 3). Glacier National Park's Siyeh Glacier in Montana was once removed from the park's glacier inventory because it was too small, only to be resuscitated in 2015 when new satellite images revealed substantial areas of debris-covered ice that were obscured in earlier aerial photographs. In 2017, one of Argentina's top glaciologists nearly landed in prison for using an international standard of 1 hectare for the minimum size of a glacier, whereas the environmental group that sued him on criminal charges under the country's glacier protection law sought a smaller size for the legal limit of a dead glacier (Tollefson and Rodríguez Mega 2017). Thus, a man's freedom hinged on the legal and political jockeying over whether a glacier was there, or gone.

Unnamed glaciers disappear but do not get to die because they do not have names. Slovenia lost its glaciers years ago (Camacho 2024), just without the hype. Chacaltaya died too soon for a funeral, before glaciers became celebrities via global media infrastructures.

The dead glacier concept appears useful on the surface, but its contradictions and manifestations show how dead glacier infrastructures actually serve the masters of infrastructures, not the glaciers themselves or local communities. Dead glaciers appear online, but not in person; they promote tourism and consumerism, but mention of them disappears once the glaciers are gone; they stress ice loss, but overlook people's ongoing lives nearby. As a priest in a documentary on Okjökull Glacier admonished: "It is very important to remember that funerals and rituals of grief are not for the dead ones, specifically, they are for the living" (Boyer and Howe 2018: 29:43). Through infrastructures, the cult of personality behind dead glaciers can be mobilized for profit and power, and misrepresent, oversimplify or ignore reality, with unintended consequences for people. The Global Glacier Casualty List, another dead glacier infrastructure, mistakes glacier death as the cause of Tlingít displacement from Glacier Bay National Park, when in fact—quite the opposite—a surging glacier and the US federal government bear responsibility. Here, dead glacier infrastructure conflates diverse Alaska Natives from across the state and the different challenges they face. It glosses over Indigenous and climate histories and simplifies complex tidewater glacier dynamics, all in service of describing "the massive Alaskan glacial decline to come" (Pelto 2024).

Still, dead glaciers tap into important emotions and have power. The priest's reminder applies not just to funerals, but to all dead glacier infrastructures: they are for, and should serve, the living. Given the contested nature of glacial death, clarifying these power dynamics is vital for promoting awareness, directing action to mitigate ice loss, and empowering local communities, people and glaciers.

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Discussion Questions

1. How are dead glaciers a complicated concept?
2. In what ways do different people connect to dead glaciers?
3. How do emotionally charged phrases like dead glaciers and glacier funerals both promote and distract from the intended goal of action to resolve the climate crisis?

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Glacial Till

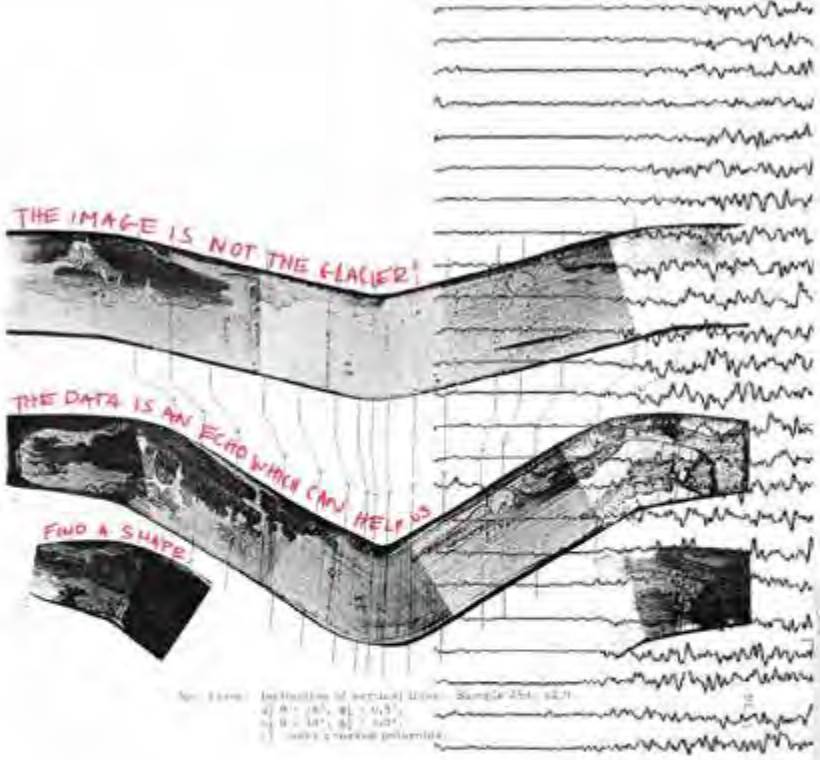
Elizabeth H. Case, Andrew Hoffman, Hannah P. Mode and Tyler Rai

Introduction

Glacial Hauntologies, our art-science collective, is an ongoing effort to dissolve boundaries between contemporary art practices and glacier science research. Through a shared ethos that each field actively shapes and "entangles" with the other (Barad 2006: 94), we exchange methodologies, conceptual knowledge and disciplinary practices through discussion, experimentation, tutorials, processing and making.

In this essay, which draws from Renee Gladman's "prose architectures" (2017), we produce a visual entanglement of artistic and scientific concepts, processes, infrastructures and sources. The content—photographs, video stills, journal excerpts, glaciological data, sketches and fragments from performance texts—relates to the interaction of human and glacial bodies over vast temporal and spatial scales. The images begin as clearly ordered and described, sometimes extremely technically, clarifying meaning to some audiences and obscuring it to others. Then, slowly, like the rocky sediment underneath a glacier, the content is reworked: repeated, glitched and manipulated, with Case's handwritten text from an Antarctic field season, Rai's poetry and spoken word, logistics contracts and quotations. From and within these interactions, material is moved, shaped and mixed. An unsorted, unstratified glacial till emerges, assembling, moraine-like, into this collaboration.

Polar fieldwork requires extensive infrastructure: aeroplanes, buildings, tents, polar clothing, sleds, ships, fuel, food, helicopters, skidoos, planning documents, contracts, inventories, emails, tickets, signatures. There are also bodies—ice and human—working, observing, translating and remembering. By entangling glaciological concepts and bodily processes, archival data and performance, this essay exemplifies the overlapping, deforming, transforming infrastructures of human memory, bodily perceptions and glacial change.

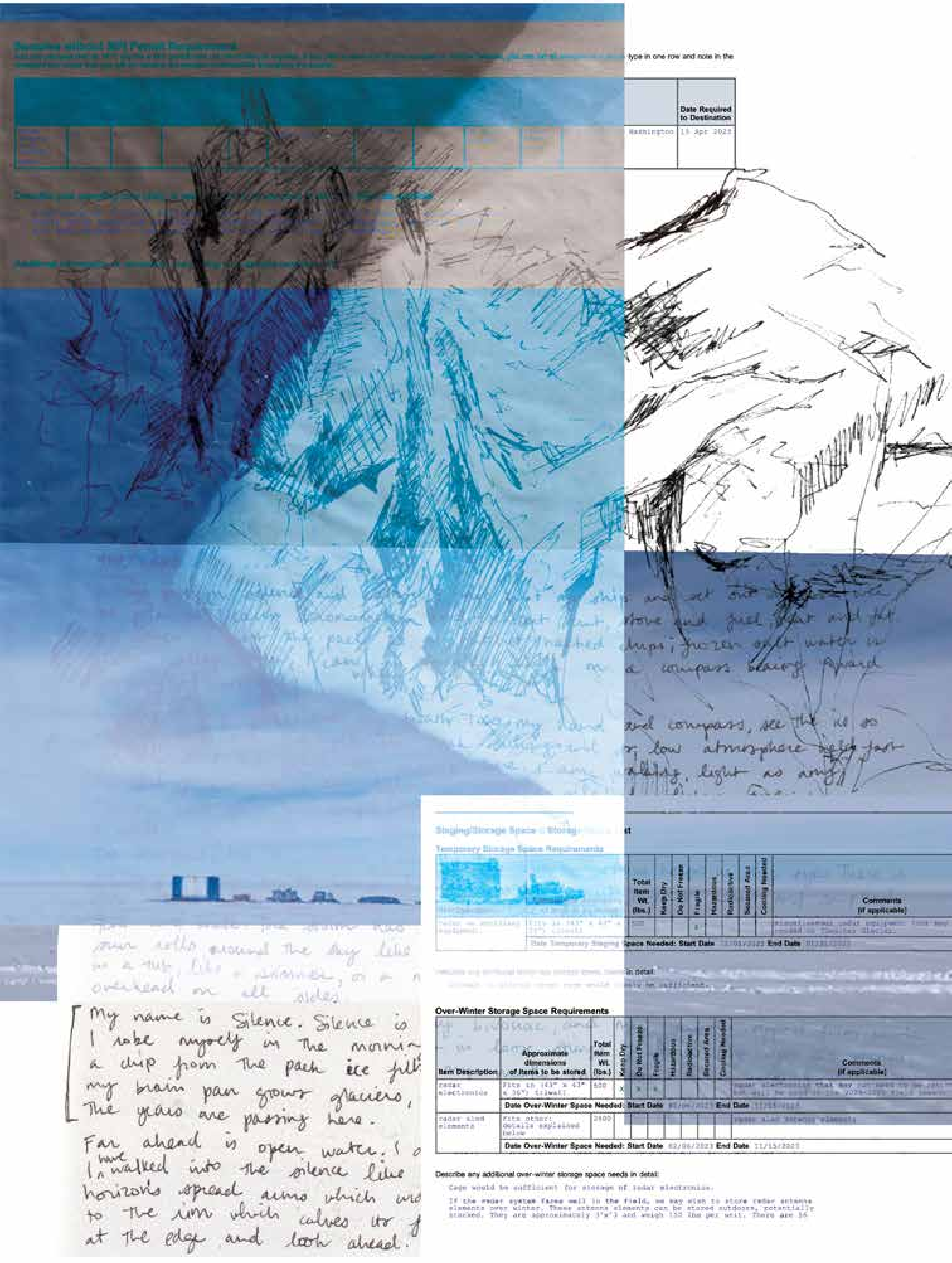


"ice transcends the boundaries of bodies,

ice produces its own order of things."

we start by displacing our voices, fracturing them around the

room like particles. one piece of the whole, one frequency out of a spectrum of sound, re-forming into a choir of disparate waves.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Date Required to Destination
Washington
15 Apr 2023
Over-Winter Storage Space Requirements
Item Description
Approximate dimensions of items to be stored
Total Item Wt. (lbs.)
Keep Dry
Do Not Freeze
Fragile
Hazardous
Radioactive
Secured Area
Cooling Needed
Comments (if applicable)
Date Over-Winter Space Needed: Start Date
End Date
Date Temporary Staging Space Needed: Start Date
Describe any additional over-winter storage space needs in detail:
My name is Silence. Silence is
I robe myself in the mornin
a chip from the pack ice fill
my brain pan grows glaciers,
The years are passing here.
Far ahead is open water. I
I have walked into the silence like
horizon's spread arms which
to the rim which calves its
at the edge and look ahead.


so I will try to explain how partial
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with
/sea/
/shoreline/
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of stress
and strain
along the
this vision
of a glacier is even while I search to


Today we watched the weather come in across the world biggest sky
Storm finally blew in today good
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fracture
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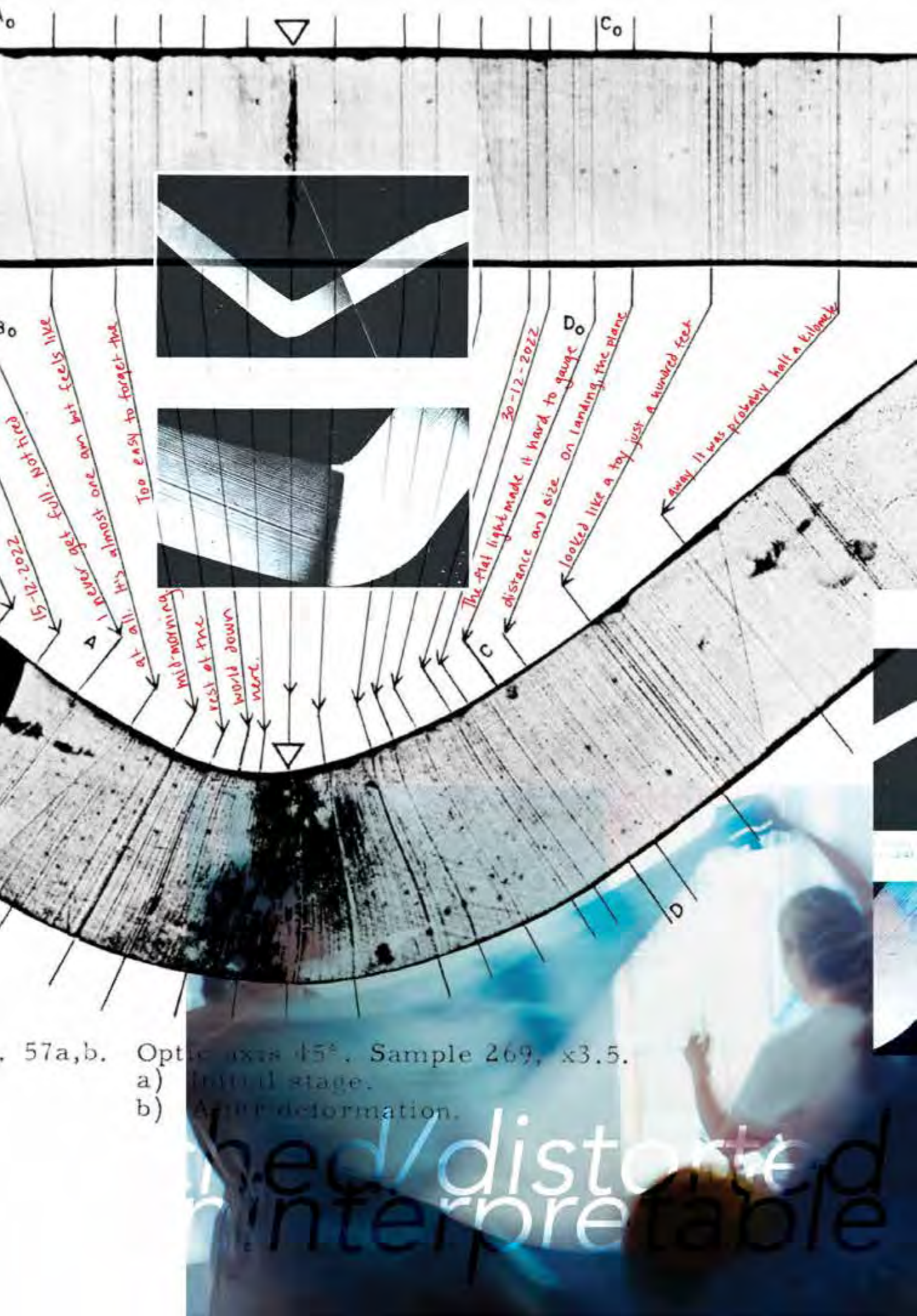
the body of a
room, the body of
a glacier.
the body bears
material witness
a becoming



. 57a,b. Optic axis 45°. Sample 269, x3.5.
a) Initial stage.
b) After deformation.

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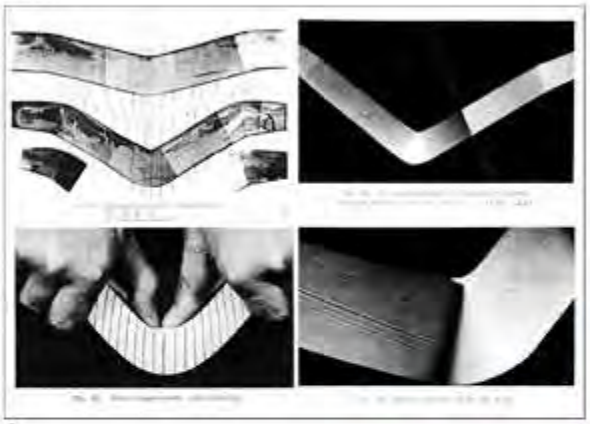
If I don't move all I hear is
the faint ringing in my ears from the echo of the day

Appendix



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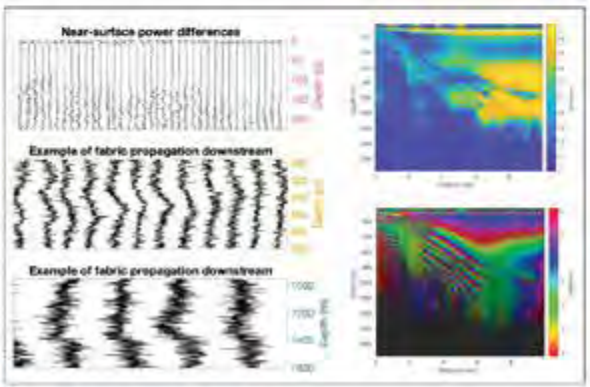

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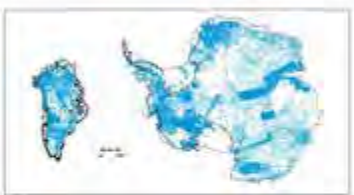

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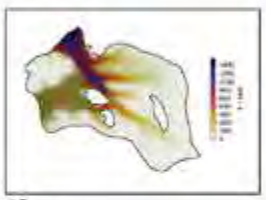

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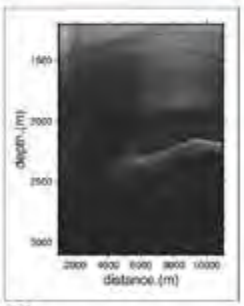

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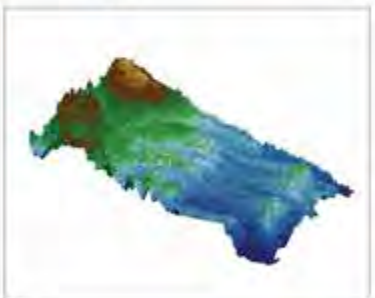

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17

1. Ukichiro Nakaya, a twentieth-century Japanese snow scientist, ran a series of experiments in the 1950s to study how ice responds to stress, or applied force. The strength of ice and the way it responds to stress have implications for how we understand and model ice flow. These images show a sample of single, large ice crystals (up to 40 cm) from the Mendenhall Glacier, which drains from the Juneau Icefield in southeast Alaska.[1] "The deformation of single crystals of ice shows a peculiarity," he wrote. "The specimen apparently has a structure like a stack of papers and deformation takes place by bending of this 'paper' and gliding between the 'papers'" (Nakaya 1958: 2). Recently, we have begun to be able to measure the stacked, hexagonal crystal structure of ice at larger scales, outside of laboratory measurements of ice cores. In 2022–2023, Case and Hoffman traveled to Thwaites Glacier in Antarctica as members of G.H.O.S.T. (Geophysical Habitat of Subglacial Thwaites) and a part of the International Thwaites Glacier Collaboration. There, they took radar data that recorded the glacier's *ice fabric*, the orientation of ice crystals that is part of a glacier's response to stress that is applied over long timeframes and across large spatial scales. **2.** A declassified aerial photograph of Thwaites Glacier in Antarctica circa 1963, taken as part of Operation Deep Freeze by the U.S. military, which remains the largest deployment of science personnel to the continent. Scientific research in Antarctica is inextricable from geopolitical contexts and military influence and relationships. The military provides much of the infrastructure for the U.S. Antarctic program. **3.** Operated by the British Antarctic Survey, the *Caboose* is a converted shipping container that Case lived out of while doing fieldwork on Thwaites Glacier. It is pulled on skis by a PistenBully, attached between the vehicle and sleds holding fuel and equipment. **4.** A manipulated video still of Rai dancing. Rai reviewed coherence plots from the radar data of ice fabric collected and processed by Case (2024) and improvised short, looping choreographies in response. Stills from the video that Rai took of the choreographies were run through an edge-detection algorithm and are part of an ongoing piece centered on the concept of *coherence*, which can be variously defined as a mathematical measurement of signal similarity, the emergence of sense and/or consistency (e.g., thoughts 'cohering'), and/or different parts fitting together to form a whole, a 'coming together'. **5.** These show observations of ice fabric on Thwaites Glacier, taken with two different ground-based radar systems by Case and Hoffman. In both figures, the difference between two orthogonally polarized, co-located measurements helps us understand the strength of the ice fabric, which affects its viscosity—that is, its internal resistance, the sluggishness of the ice as fluid. Ice with a higher viscosity flows more slowly than ice with a lower viscosity, and is a key property for understanding how quickly Thwaites Glacier may retreat in the future. **6.** Field sketches from the Juneau Icefield by Mode. **7.** The top image shows Mode rinsing a cyanotype fabric print in a stream on the Root Glacier near McCarthy, Alaska, made during a collaborative artist residency that explored embodied research. It is part of an ongoing series of large-scale photographic 'blueprints', of glacial features made in the field to memorialize human connections to ice. The bottom image shows a cyanotype print on paper, made with a glacial erratic—a rock that has been moved by a glacier from its geologic origin to a new location. **8.** Excerpt from An *Expedition to the Pole* by Annie Dillard (1992), handwritten by Mode. **9.** A grayscale map showing the bed topography beneath Antarctica. **10.** *SIGNAL* is a sculpture consisting of a collaged cyanotype sail, glass vessels and suspended ice cores. The sail, a 40-foot collage of cyanotyped fabric, is rigged with a series of pulleys and knots. The tension of the sail's suspension alters as the ice melts, creating real-time shifts in the sculpture.

[1] Case and Mode help organize and teach on the Juneau Icefield Research Program, where samples were collected in the 1950s.

The cyanotype textile collage draws on the communicative logics of flags and the mnemonic intimacy of quilts, echoing how ice fabric records a glacier's deformation history and shapes its future flow. Top: Installation in Mode's studio by Makenna Finch. Middle: Rai adding grommets to the sail. Bottom: fabric details, including a plot from Case's ice-fabric measurements. **11.** Available flight data for Greenland and Antarctica, which comprise the Bedmap2 datasets: an archival dataset of the ground underneath Earth's largest ice sheets, an interpolated interpretation of the airborne radar data (Fretwell et al. 2013). **12.** A text exchange between Mode and Case. **13.** A finite-modeling domain for glaciers that flow into the Dotson and Crosson Ice Shelves, showing the surface speeds that are part of a global glacier mesh, where a mesh is the number and geometry of elements in finite element analysis. By iteratively solving for the stresses in the ice and conveying mass through the domain, we model how glaciers and ice sheets respond to climate. **14.** Glass vessel for ice melt, designed by Rai. Hand-blown between an ice block and granite boulder. **15.** Radargram—showing the return energy as a function of depth within the ice along a profile collected by towing the radar behind a snowmobile—capturing a basal unit from northeastern Greenland near the EastGRIP ice core camp. These basal units, pervasive in northeastern Greenland, are linked to fabric changes with climactic transitions and ice (NEEM community members 2013; Franke et al. 2021). **16.** Map of ice sheet beds in three dimensions using multi-element radar technology. This map was generated from data collected on Thwaites Glacier in 2009, revealing subglacial landforms common in deglaciated environments. **17.** As part of all fieldwork supported by the U.S. Antarctic Program, scientists fill out a Supporting Information Packet (SIP), which defines the scope of the project. This SIP described the work of the 11-165 EAGER project on the McMurdo Ice Shelf.

Glossary

Coherence: Coherence has a multitude of definitions, ranging from mathematics to philosophy to everyday parlance. Mathematically, coherence defines the relationship between two orthogonal, co-located radar signals and is one measure we use when processing and analysing the ice fabric data from Thwaites Glacier. To calculate the coherence, we compute the cross-correlation and autocorrelation between the two radar measurements to understand the similarity of those measurements, given a lag or offset in time or space.

Cyanotype: Originally used by the nineteenth-century botanist Anna Atkins to document plants and algae, cyanotype printmaking involves applying UV-sensitive chemicals to fabric or paper. When exposed to sunlight, these chemicals turn the material a vibrant blue. Atkins' botanical cyanotypes signify historic artistic approaches to researching and communicating scientific phenomena.

Hauntology: Hauntology is a word adapted from the social sciences. It was popularized by Jacques Derrida (1994). It is a compound word—haunt + ontology. Ontology is a branch of philosophy focused on the nature of being and how entities relate to one another. Hauntology describes how the present is affected by the culture, concepts and context of the past, as well as the weight of failed futures. These past and future 'ghosts' reach through time, changing meanings and relationships in the present.

Ice Fabric: Glacial ice has a hexagonal crystal structure. The orientation of the ice crystals affects the physical and electromagnetic properties of ice. The bulk orientation of ice crystals in a glacier is called the ice fabric.

Till: Unsorted glacial sediment.

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Open-ended Questions:

1. How does the architectural imaginary and the entanglement of data, glacier imagery, artworks and notes make seemingly intractable climate losses tangible and visible?
2. In the appendix, you can find all of the images in the collage. Which images stood out/were relatively easy to identify? What was obscured?
3. How do you make a scientific concept or mathematical equation visible and/or transform it into a process?

Practical Exercises:

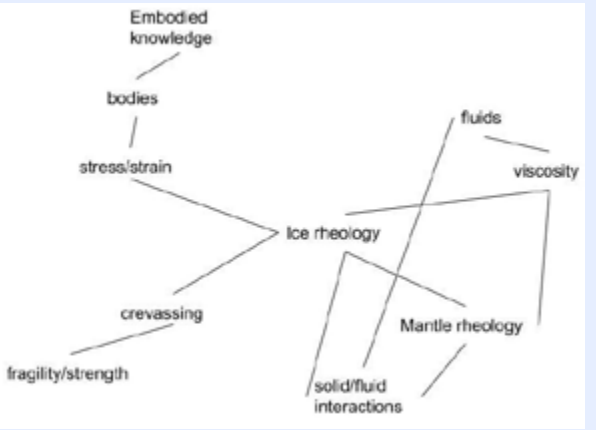
I. Print out one page from an academic article or report about a topic related to the earth and climate sciences. Particularly good options are review articles, including reports such as those by the IPCC, which focus on one subject at a time. Choose a word that appears many times on the page (usually something that the article is about, like 'climate' or 'ice' or 'action'). Circle each instance of this word, then connect them together using a colored pencil or highlighter. You may also choose to connect all the corners and centers of the page to each other using a different color. What did you notice when searching for the words? What did you glean about the topic and/or the way it was written? What is left, when we draw over these words, when we connect them together? Inspired by Sol Le Witt's "From the Word 'Art': Blue Lines to Four Corners, Green Lines to Four Sides, and Red Lines Between the Words on Printed Page."

II. Place a piece of tracing paper over one of the pages of this article. Trace at least three elements (shapes, words, lines, etc.) that catch your attention. Find in the appendix the images that correlate to the features you have traced. Based on the image descriptions, write about what new connections you can form between these elements.

III. Cut out each image from the appendix. Arrange them according to a logic that only you know (by color, by similar shapes, by scientific concept, etc.). Share your arrangement with a partner and discuss the interconnections you each formed through your image compositions. How can this process of rearranging and generating connections inform art–science collaborations?

IV. Scientific and artistic collage: this article weaves together scientific, artistic and humanities concepts in a glitched collage, and in doing so communicates the ways art and science can come together to allow something new to emerge. This can be done digitally using, for example, Affinity Designer or Affinity Publisher (which are free), or on paper, using scissors and glue.

1. In groups of 2–4, choose a topic you know something about, e.g. that you have been studying in class or that you have been doing research on. Ideally, this is a concept that has been or could be examined from many different points of view.
2. Define this concept using a variety of different types of sources, as well as your own phrasing—try for at least five. Record your sources so you can find them again.
3. Write the central concept in the middle of a piece of paper. Start writing down words that feel related to it. This should be quick, off the top of your head, without research. Start drawing lines to the connected ideas, to map out how your initial concept could or does interact with something other than your primary discipline.



4. Find two articles on this topic, including figures. Older scientific journals are particularly good for this, as the images are often more abstract, simpler and/or less text heavy, and the text is often also simpler. Many have been digitized and so are readily accessible. The 1940s–80s are great for glaciology, for example.
5. Collect related materials (quotes, images, your annotations, email exchanges, equations, file structures, etc.).
6. As you start your collage, it may help to set an intention or keep a particular connection or phrase at the forefront. Let this guide where you place each image, piece of text, etc. This can be driven entirely by intuition, or if you want to try to impose some structure related to your concept, then do so and note the constraint explicitly.
7. This work does not all have to be done as a group; it can be iterative and overlapping. Perhaps you each begin separately and then try to bring your work together into a single aesthetic. Perhaps one person starts, and then passes it to the next person. There should be an element of exchange throughout. If you are doing this on your own, give yourself a day in between drafts of the collage—time here is your collaborator.

8. Finally, each member of the group reflects on the process by writing about 250 words on the concept, what they learned about it, the sources they used, and how the process helped them (or not!) engage with the topic. What connections did you find? What did you learn about related work? What surprised you? What left you unfulfilled?

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The Infrastructure of Ice:

Mapping the Fedchenko Glacier

Tatyana Bakhmetyeva and Stewart Weaver

From the edge of the Fergana Valley in Kyrgyzstan, where the town of Osh marked the last traces of settled life, a huge expedition began its ascent into the Pamir Mountains in the early summer of 1928. The venture brought together German and Soviet researchers—twenty-two in all—supported by soldiers, guides and porters, as well as two filmmakers documenting the undertaking. The line of men and animals stretched for miles, camels and horses burdened with nearly eighty tons of provisions and scientific instruments: tents and food alongside cameras, barometers, theodolites and other equipment. A flock of sheep trailed behind as a mobile food supply. The Soviet filmmaker Vladimir Shneiderov later wrote that the caravan looked like "a great migration of peoples" (Shneiderov 1929: 16).

This was the German–Soviet Alai-Pamir Expedition, organized by the Soviet Academy of Sciences and the Emergency Association of German Science. Its task was to conduct a comprehensive study of the Western Pamirs, one of the most-unmapped and least-governed regions of the Soviet Union. In pursuing this goal, the team anticipated encountering ice, but they were struck by the sheer scale of what proved to be one of the world's longest alpine glaciers, the Fedchenko—renamed Vanch-Yakh in 2023

The 1928 German topographic map of the upper reaches of the Fedchenko Glacier. Source: von Ficker and Rickmers 1932 (map pocket)

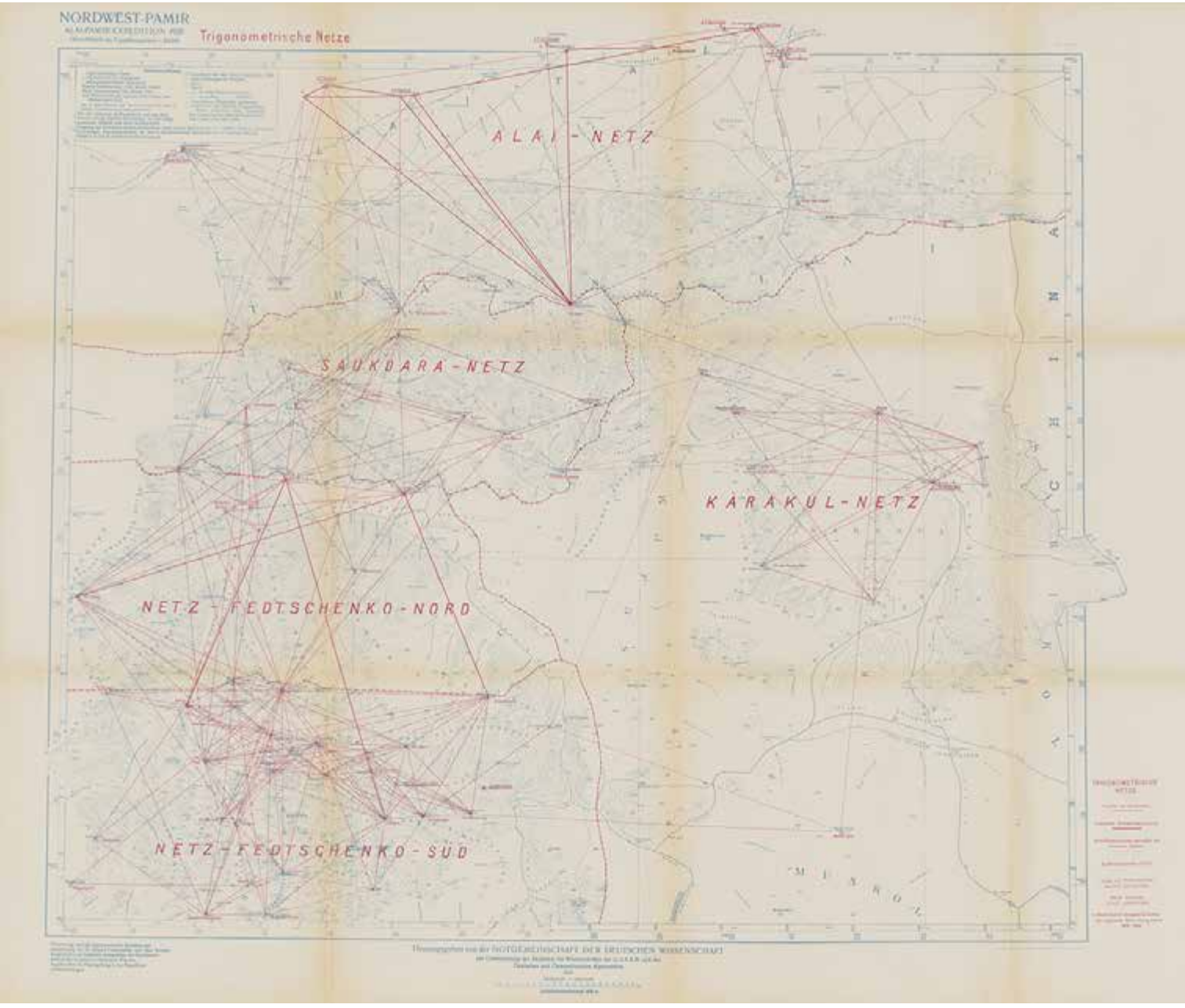
by the Tajik government as part of ongoing post-independence efforts to rebrand the national territory. Among the expedition's many achievements, the most enduring was the translation of this 77km giant into a topographic map, which remains a landmark in glacial cartography (Brun et al. 2025). By converting vast fields of ice and rock into precise coordinates, the map operated not only as an instrument of cryospheric construction but also as foundational infrastructural work, enabling future observation, movement and governance in the Pamirs. Ultimately, beneath the rhetoric of scientific knowledge for its own sake, this expedition emerges as a profoundly infrastructural endeavor, establishing new lines of movement, communication and knowledge across a region that had long resisted both comprehension and integration (Gorbunov and Scherbakov 1928: 19–20).

Seeing Like a State, Moving Like Infrastructure

In 1928, the Western Pamirs lay within the Tajik Autonomous Soviet Socialist Republic (SSR), still administratively subordinate to the Uzbek SSR. Despite decades of imperial-era expeditions to this crossroads of empire, the high-mountain interior of the Western Pamirs remained, well into the 1920s, a classic 'blank on the map'. The Russian Revolution and the creation of the Tajik SSR in 1929 reconfigured the region's political status and intensified Soviet efforts to know, survey and administer the mountainous margins of the state (Bergne 2007). The call for what the expedition considered a scientific conquest of the Pamirs captured this colonial dual imperative: to render the territory legible while integrating it into socialist development. It was within this political and epistemic framework that the German–Soviet Alai-Pamir Expedition of 1928 took shape.

The expedition was as much a logistical undertaking as a scientific one. Traversing the Pamirs demanded an entire infrastructure of mobility—animals, porters, supply chains and communication lines. To "see like a state," to borrow James C. Scott's (1998) helpful metaphor, one had actively to construct the very means of vision: building the instruments, tracing the routes and establishing the practices through which knowledge could circulate. Nowhere was this need more evident than in relation to the Fedchenko Glacier. Long known by name but little more, the glacier fell largely outside both scientific knowledge and everyday awareness. Its remoteness and inaccessibility meant that even local populations attached no particular significance to it. Although it was a vital water source, its precise location, length and hydrological profile remained uncertain—an illuminated lacuna on official maps. The 1928 expedition set out to give form to that absence.

The Germans brought photogrammetric theodolites and a new system of high-altitude surveying, first developed by the German scientist and mountaineer Sebastian Finsterwalder in the Alps and applied in the Pamirs by his son, Richard Finsterwalder. The Soviets provided institutional authority and logistical coordination. Together, they established base camps and observation towers from where the surveyors could capture the all-important sightlines on which the rendering of the map depended. Ultimately the product of both arduous physical climbing and intricate mathematical calculation, the map thus represented a sophisticated fusion of mountaineering and technology as it translated a shifting, unpredictable glacier into legible form. Building on this foundation,



by photographing and mapping the glacier onto a carefully laid out geometric grid, the scientists transformed it into a node within an expanding network of scientific observation and state oversight. At the same time, cameras, glass plates and measuring instruments extended human vision across the vertical and horizontal extremes of the Pamirs, collectively producing an apparatus that fundamentally reshaped how scale itself could be apprehended (von Ficker and Rickmers 1932). From the ground, the glacier appeared enormous and unstable, fractured by crevasses and obscured by rocky debris. Seen through the elevated perspective of photogrammetric imagery, however, it resolved into a smooth, continuous and intelligible surface—one that could be measured, monitored and ultimately managed (Gorbunov and Rastsvetaev 1934).

The net of sightlines thrown over the Pamirs by the 1928 expedition to calculate distance and altitude.
Source: von Ficker and Rickmers 1932 (map pocket)

Through this process, the glacier became an infrastructural object. Measurements taken on the ice traveled by pack animal and train to Dushanbe, Tashkent, Moscow and Munich, where they entered circuits of calculation, analysis and publication (Rickmers et al. 1929; Rickmers 1930; Borchers 1931). Furthermore, the map that emerged from the expedition functioned as a blueprint for intervention, allowing planners to imagine—and impose—a new spatial order on what had previously been an opaque and little-known frozen landscape. Once rendered into a stable measurable object, the glacier could be connected to other infrastructures: irrigation systems, hydroelectric plants and transportation routes. As one Soviet observer noted, the glaciers of the Pamirs "contain in themselves the electrical energy of Dneprostroi and will satisfy the thirst of fruit gardens and cotton fields" (Romm 1936: 429). Through mapping, the glacier was repositioned within a chain of socialist development: glacier → river → canal → cotton field. In this way, the cryosphere became a point of departure for both hydrological planning and economic exploitation.

Within a few years, dozens of scientific detachments crisscrossed the Pamirs, covering the region with what one account described as "a net of routes"—human and animal paths linking deserts, valleys, peaks and glaciers into a single system of exploration and development (Romm 1936: 429). The 1928 expedition therefore served as a harbinger, the infrastructural spark that animated the Soviet state's spatial imagination in Central Asia (Gorbunov and Rastsvetaev 1934: 15). The work extended beyond mapping alone, laying the epistemic and material foundations for a future in which the region's glaciers would be harnessed as reservoirs of productive energy—a transformation of ice into economic resource.

The Glacier's Counter-Infrastructure

But even as the map sought to establish infrastructure, the glacier constantly unsettled it. Survey poles sank into snow, markers disappeared overnight, instruments froze, tumbled or were buried by avalanches, all a relentless reminder of the glacier's power. Its flows, ruptures and seasonal shifts resisted fixed cartography, revealing the limits of the infrastructural imagination and the impossibility of stabilizing the cryosphere within the rigid coordinates of a map. The instability persisted even after the Soviets had built a permanent observatory at 4,300 meters on the Fedchenko in 1933 and installed a portable meteorological station at 6,850 meters on what was then Stalin Peak and is now Ismoil Somoni—the ultimate statements of conquest (Gorbunov and Rastsvetaev 1934). Construction workers and researchers suffered frostbite, snow blindness and, in some cases, death, as the glacier's hazards continued to defy human control.

The infrastructure of observation—designed to discipline and measure the ice—was thus continually undone by the forceful materiality of the subject. The glacier refused to stay still long enough to be fully known. Nor was this tension between infrastructure and ice simply metaphorical; it exposed the instability within the very concept of infrastructural control of ice. The glacier was both the foundation and the undoing of the systems built upon it. Its melting and movement were reminders that infrastructures, no matter how robust, are always made on shifting ground (Bennett 2019).

One of the glass-plate photographs that framed the Fedchenko Glacier and became raw material for the 1928 topographic map.
Courtesy of Christoph Mayer, Bavarian Academy of Science.

Conclusion: The Infrastructural Life of the Cryosphere

The 1928 map of the Fedchenko Glacier was more than a scientific accomplishment—it was an infrastructural act. Mapping the glacier meant building the logistical, optical and institutional systems that bound it to the Soviet state. The expedition caravan, its instruments, the labor it required, the data it produced and the later observatories that it maintained all constituted an infrastructure through which the cryosphere became measurable and, in theory, governable. But the glacier itself, with its perpetual viscous motion, which the scientists closely observed and measured (Fersman et al. 1933), was a disruptive agent that resisted the imposition of infrastructure and reminded Soviet planners that socialist modernity had its limits and could not fully subordinate nature to ideological ambition. The Fedchenko could be mapped and measured, yet it could not be fully stabilized within human systems of understanding. Its very materiality—melting,

shifting, flowing—was a form of counter-infrastructure, one that continually reasserted and still reasserts the autonomy of the cryosphere. The 1928 expedition thus marked the beginning of a new relationship between science, infrastructure and the frozen world: here maps rendered glaciers intelligible, infrastructure gave maps material form, and the glacier, in turn, unsettled both.

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Activity:

Ask students to look at the map and imagine everything had to happen for this image to exist—the people, animals, instruments and necessary food supplies moving across the Pamirs. Have them jot down what the map makes visible and what it smooths over or hides.

Discussion Questions

1. How does mapping the Fedchenko Glacier turn ice into something that the state can govern?
2. How does the Fedchenko Glacier 'resist' or 'disrupt' the expedition's attempts to measure and control it?
3. What does it mean to think of a map as infrastructure rather than just a scientific representation?

Authors:

Tatyana Bakhmetyeva is a Modern European historian and Associate Director of the Humanities Center at the University of Rochester, New York. Her research explores the intersections of gender, environment and science in Russia, the Soviet Union and Central Asia. Her book in progress, *The Politburo Goes Hunting: Masculinity, Nature, and Power in the Soviet Union* (Cornell University Press), examines hunting as a site of masculinity and power reproduction within the Soviet elite. She is currently co-authoring *The Fedchenko: Ecobiography of a Glacier* (White Horse Press), an NEH-funded project, and serves as a consultant on the Swiss National Science Foundation project "Myth of Equality: The Gendered History of Science in Central Asia (1870–1970)."

Stewart Weaver is Franklin W. and Gladys I. Clark Professor of History at the University of Rochester, New York. He is co-author of the prize-winning *Fallen Giants: A History of Himalayan Mountaineering from the Age of Empire to the Age of Extremes* (Yale, 2008) and author of *Exploration: A Very Short Introduction* (Oxford, 2016). In 2019 he won an Andrew Carnegie Senior Scholars Fellowship to support his work on the history of climate change in the Himalayan region of Ladakh, India. His new book, *Magnetic: Erebus & Terror and the Last Great Voyage of the Age of Sail*, will be published in 2027 by Yale University Press. With Tatyana Bakhmetyeva and other colleagues, he is also working on a collaborative eco-biography of the Fedchenko Glacier in Tajikistan.

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Fissures:

A Choose-Your-Own-Adventure Story

Annika Bowman

Introduction

In 2024, a group of scientists published a landmark report on glacier geoengineering. The group recommended further research into technological interventions to stop or slow glacial melt and subsequent sea-level rise. This piece of speculative fiction uses their report as a point of departure, taking the format of a choose-your-own-adventure story in which readers navigate potential solutions for preserving ice, some technological, others artistic. *Fissures* treats experiments in reflection as both the form and the object of critique. The piece considers the illusion of personal choice in navigating climate catastrophe, the techno-optimist logics of many geoengineering solutions, and the importance and limits of imagination for alternative climate futures. To proceed through the story, read the titled pages as directed.

She Lies

In the Oslo fjord, in front of the opera house and the docks, where people sprawl on the decking of the promenade—although it's winter, they wait for the sun—floats an iceberg. Passersby who are unfamiliar with the iceberg point at it. There should not be an iceberg in the Oslo fjord. They wonder where it came from. The locals, who see the iceberg often, remark upon its position in the harbour, different from yesterday and the day before, as it shifts with the wind and currents. You glance up for a moment, noticing how the iceberg reflects the sky and water, and the city behind it, all blurring together. You don't linger; you're late.

*Go to **Body of Work**.*

Body of Work

The conference room is cold, filled with scientists making small talk. Your colleagues shift uneasily in their chairs and fidget with paper coffee cups and name tags. You've read their work, and they yours. The small room overlooks the fjord where the iceberg floats listlessly; from this angle, you realize, it is only an obtrusive hunk of metal and glass panels—a sculpture, not ice at all. Someone closes a blind, and the installation is obscured. You find a seat at the back. A presenter begins a PowerPoint, a plain white screen with an ugly font.

*Go to **Introductions**.*

Introductions

Good morning, the presenter begins, addressing a sea of blank faces. *Welcome to the first annual Global Glacier Geoengineering Summit. We're gathered here to discuss the state of the cryosphere*. The presenter pauses for emphasis. *Since our colleagues first published their landmark report on glacier geoengineering...* The PowerPoint flickers. Since our colleagues... The PowerPoint turns off, a blue power button bouncing across the screen. The presenter, ruffled, fumbles with the remote. *Excuse me, folks. Let me just try...* Another button is pressed. The presenter looks apologetically at the audience. No one offers to assist. The room is filled with the hurdy-gurdy of a house fly, aeroplanes overhead, a radiator. Someone coughs. The presenter presses the power button again, hands clammy, and the screen blinks.

Please turn to the report in front of you, ***White Paper*****.**

White Paper

Report on Glacier Geoengineering Solutions to Slow Climate Change-induced Sea-level Rise
By the International Panel of Cryospheric Experts for Ice Mass Loss Reduction

Our panel of scientific experts has determined that glacial geoengineering—technology which slows the melting of glaciers and ice sheets as climate change intensifies—is the only viable solution to mass ice loss and subsequent sea-level rise. Our comprehensive research on the following schemes shows promising results and a significant reduction in melt. Our teams of scientists are installing and monitoring experiments to slow melt around the globe at this very moment. Successful experiments include: **Hollow Glass Microspheres; Geotextiles; Cloud Seeding; Glacial Curtains.**

Leaf through the report.

You've read through the report, exhausted by the presentation and the news, the speaker droning on, the weather, the enormity and the incredible noise of it all. A headache coming on, you close your eyes for just a moment. Go to ***Landmarks****.*

Hollow Glass Microspheres

A team of scientists has placed a layer of tiny reflective beads over a patch of melting glacier in Iceland. The glacier has been breaking off in large chunks, floating into the sea. The beads are called hollow glass microspheres. They resemble snow but are made from silica, a material 10 times more reflective than regular snow. Many experiments later, many hypotheses, the scientists—your team—hope to find the test square whiter and brighter than the rest of the glacier, if not for the layer of white beads, then for the new glacial ice accumulating. And if new ice forms, well, then, entire glaciers could be coated with silica. You look at the test square before you.

You see the sun, the clear blue sky, and your own features, slightly distorted. The hollow glass microspheres reflect light. Go to ***White Paper****.*

You see dark slush. In a rainstorm, the hollow glass microspheres slid down the glacier, muddied and no longer reflective. Try a different material, go to ***Geotextiles****.*

Geotextiles

The glacier looks like a heaped-up pile of laundry or a child's living room fort. Yet the sun does not discriminate between ice and the thick white tarpaulin now covering the glacier, all the glaciers along the mountain range. Light beamed to Earth bounces back. You wonder if nearby residents blanket the glacier each year. Do they climb up and down the glacier, covering the dirty ice with heavy white fleece? Perhaps they use a helicopter. And each fall, like a giant reptile shedding its skin, the textile is peeled back revealing something both ancient and new.

*You see a promising white surface. Go to **White Paper.***
*You see a pile of rubble. Go to **Whitewashing**.*

Mars

Escape this mess? Nice try!

Come back down to Earth, ***Landmarks****.*

Landmarks

You wake, startled by the movement of people around you. The morning has passed. You must have fallen asleep. You have the sense that the bustling people are all aware of how the day has proceeded. You have the sense that decisions were made. The presenter's monotone voice drones on, though slightly muffled, as if the insulation in the room has changed or the world outside has quieted. It's snowing. The blinds have been raised, and the iceberg appears again in the fjord, turning in the tide, reflecting light which dances across the white walls of the conference room like a disco ball. You flip through the report before you, unable to find where you left off or to discern exactly what the presenter is talking about. Each technology and solution, each page, is equally opaque and certain—*feats of human ingenuity*, the presenter exclaims with practiced enthusiasm, *just imagine!*

*If you're not yet convinced, go to **White Paper**.*
*For a fresh start, a blank slate, go to **Mars**.*
If you're suffocated by the stale air and the bright room, take a break.
*Step outside, **Snow**.*

Cloud Seeding

Title: Scientific public outreach campaigns: communicating geoengineering to the public using AI-generated poems.

Silver iodide

is sprayed across a propane flame.
The iodide particles rise into the clouds and enhance the cloud's ability to convert liquid droplets into ice crystals. The ice crystals

fall
into

targeted
areas

as rain

or

snow

*(go to **Landmarks**)*

Glacier Curtains*

*Below the ice sheet or the glacier, a curtain, anchored to the seafloor. Above it, bright white ice. The curtain blocks warm-water currents and the ice sheet stays cold. To a whale or a fish or small algae, the curtain forms a huge blank wall in the distance. A curtain miles and miles long. A huge dark wall you approach, where warm water pools. Is it heavy? Is it fabric? Do you swim forwards and ricochet off of it like a bird against a clear glass window? On the other side is the water colder, are there different fish? Can you see them, like an aquarium for your own kind? And the glacier curtain, can you swim above it? Around? Where do you go from here? Go to ***White Paper***.

Snow

Outside, the familiar crunch of snow underfoot. The same brightness and quiet. The fjord, the iceberg, the agitated water. You hold your hand in the air. A snowflake lands. It is not cold; it does not dissolve in the warmth of your palm. You shake your hand, startled, and the flake joins the identical others below, reflecting light.

Whitewashing

You paint the rubble beneath you with thick white paint, moving slowly so as not to miss an inch. Brown weeds and grey rocks and green lichen and moss are slathered with paint, now all pale and uniform. You paint over insects, frozen in their path. You wear an orange hazmat suit splattered with paint as you clamber up the rocky mountain slope where a glacier used to be. You paint for hours and hours and miles and miles. The sun touches the now-white rubble and reflects light back up to space and away from the planet and the dark soil that wishes to absorb it. And that evasion of heat and absorption over days and days and years and years creates a cooling. *Yes, a great cooling*, you think, now sweating from the hard work of painting and the sun on your back. You stop to survey your work, thick and blinding white, far into the horizon.

*You imagine a world kept cold. Return to **White Paper**.*
*You imagine a world far, far from this one. Go to **Mars**.*

Further Reading

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Icehouses in Motion:

Knowledge Flows Across the Cryosphere

Zhengfeng Wang

Before the advent of mechanical refrigeration, natural ice harvested from lakes and rivers served as a means of cooling. From the nineteenth century onwards, this frozen commodity was shipped from North America and Norway to colonial tropical regions to satisfy Western desires for comfort and health (Dickason 1991). Recent research has highlighted how imported ice projected Euro-American ideals of purity, hygiene and civility onto non-Western societies, while its consumption as a luxury reinforced class and racial hierarchies (Hobart 2022; Ashutosh 2023; Surland 2025). However, scholarship centered on the ice trade often obscures the role of Indigenous knowledge in shaping transnational encounters during the era of imperial expansion.

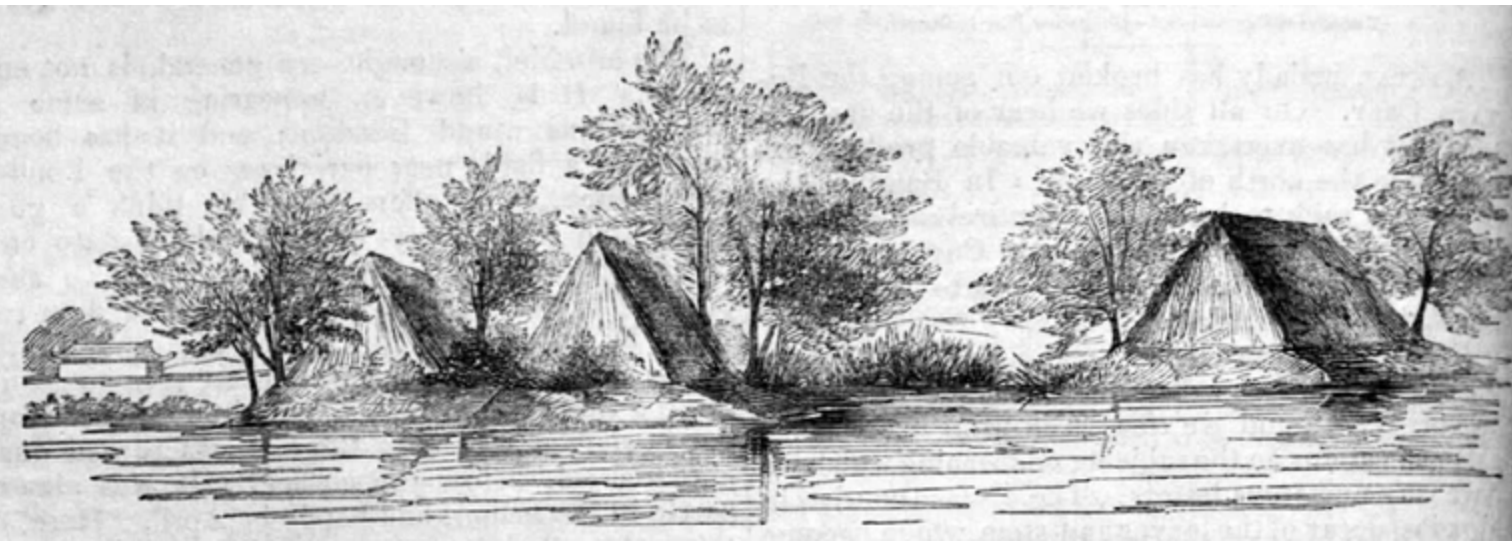
In Ningbo, on China's east coast, a port city opened to foreign trade and residence under the Treaty of Nanking in 1842, visitors and expatriates encountered an abundant and inexpensive supply of ice collected by farmers from their fields. The remarkable number of icehouses lining the riverbanks drew interest from Western and Japanese researchers in botany, geography, architecture and history, who recorded these vernacular landscapes in their travel accounts, which soon reached overseas readerships and served as references for icehouse designs elsewhere (see Carlisle 1872: 134–5; von Richthofen 1907: 6–7; Boerschmann 1911: 4; Saeki 1942).

Mass-media coverage, together with models of icehouses displayed in Chinese pavilions at international exhibitions, further captured public fascination. Drawing on archival sources, this paper traces the circulation of these representations and examines how ice-making and storage techniques in Ningbo were documented, interpreted and adopted by foreign observers as practices of knowledge and interest. Rather than reproducing a narrative of colonial domination, it reveals a more interconnected history of the cryosphere, in which locally grounded practices intersected with global networks and environmental imaginaries.

From Observation to Adoption

Integrated into the seasonal rhythms of agricultural production, ice harvesting in Ningbo, particularly in Yin County, sustained the thriving fishery industry along the Yong River. In winter—generally considered here to span December to February—farmers flooded shallow paddy fields to freeze water, then stored the ice in pyramid-shaped structures made of mud walls and thatched bamboo roofs. These buildings, over six meters tall, featured a roof-level loading door accessible via a sloped ramp or steps, and a smaller ground-level door for retrieval. In spring, meltwater was channeled through gutters to irrigate nearby crops, while during the summer fishing season starting from May, Ningbo fishermen purchased ice from the icehouses as they set out to sea, using it to preserve their catches.

Ningbo icehouses. Photo: Ato Photographic Association. Source: Cressey 1934: 74.



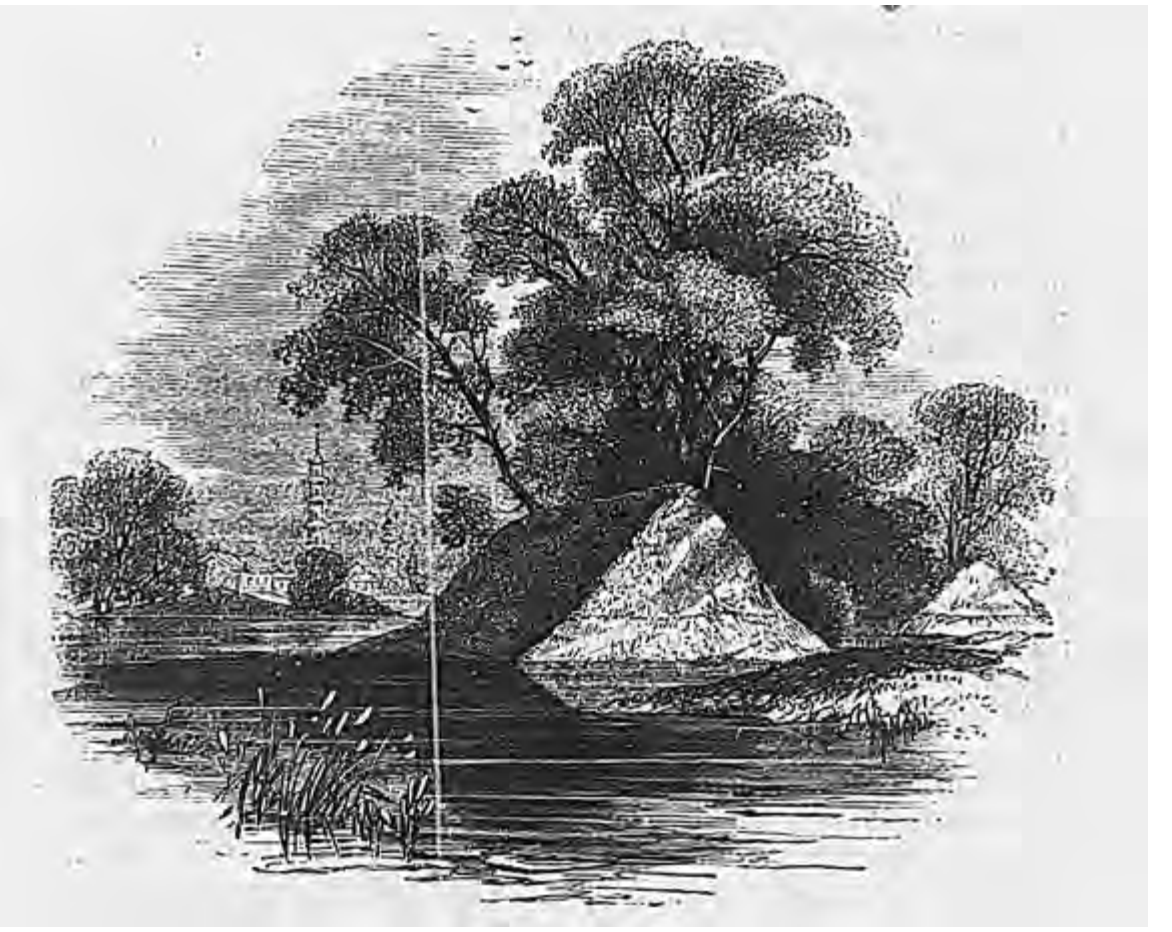
Sketch of Ningbo icehouses by Robert Fortune, August 1844. Source: Fortune 1845.

Among the many observations of Ningbo's icehouse structures, one of the most widely circulated was a letter from Robert Fortune (1845) to Professor John Lindley, co-founder and first editor of *The Gardener's Chronicle*, which described the construction methods and included a sketch. Fortune, best known for his plant-collecting expeditions to China commissioned by the Horticultural Society of London, highlighted these vernacular structures—situated on a level plain and fully exposed to the "clear, fierce, and burning" sun (Fortune 1845: 576), far harsher conditions than in England—as models of efficiency and economy. His portrayal remained influential long after its publication and was later cited in *Science and Civilisation in China*—a landmark series of volumes begun by the late Joseph Needham that challenges Eurocentric understandings of science and technology by foregrounding non-Western contributions—in discussions of Chinese methods of food preservation (Huang 2000: 435–36).

Yet Fortune's observations went beyond a site-specific record; they resonated with readers in nineteenth-century Britain and the United States, where the rapid expansion of the ice trade had fueled growing interest in effective storage techniques. In Victorian Britain, horticultural journalism flourished as the rising middle class—unlike aristocratic landowners, who valued architectural grandeur—favored practical and economical icehouse designs for their suburban gardens (Beamon and Roaf 1990).[1] Periodicals provided a platform for sharing construction insights, discussing building materials, ventilation, drainage, insulation and site selection, including considerations like the orientation and the shade of trees. One of the most debated questions concerned whether icehouses should be built above ground. The example provided by Fortune sparked responses in later issues and informed similar debates across the Atlantic. While plantation and estate owners generally followed the European preference for subterranean construction, above-ground structures gained popularity for their lower cost, ease of loading and unloading, and improved resistance to dampness and humidity. American agricultural journals and farming magazines cited Fortune's article in support of such designs, which were implemented at key sites in the ice-harvesting industry.[2]

[1] According to Beamon and Roaf, wealthy elites largely owned the country's icehouses, which were increasingly adorned with ornate facades displaying a wide range of stylistic influences.

[2] See, for instance, "Ice House" 1848, which presents content similar to that of other contemporary journals citing Fortune's article.



Sketch of Ningbo icehouses.
Source: SEIH 1855: 243.

Public Dissemination and Display

The growing domestic demand for ice further promoted the dissemination of ice-preservation methods to the public, with popular journals drawing on Fortune's observations. *The Home Friend*, published by the Society for Promoting Christian Knowledge in London, noted the scarcity of ice in England and suggested that "by following the Chinese plan, every village might have its icehouses" (SEIH 1855: 243–45). Although the accompanying illustration carried an Orientalist inflection, placing the structures in a picturesque landscape with Chinese-style pagodas in the background, it underscored contemporary curiosity about technological adaptation. In the United States, ice consumption became widespread among urban populations by the mid-nineteenth century but remained far less common in rural areas. *Godey's Lady's Book and Magazine*, a Philadelphia-based publication with over 150,000 subscribers by 1860, similarly endorsed the cost-effective Chinese method as particularly suitable for butchers and other country food suppliers (CIH 1855).

Meanwhile, interest in Ningbo icehouses derived from their crucial logistical role in the fish supply and was further amplified by their visibility at international fairs. As the city hosted China's largest fish market, a specific Ningbo collection—including an icehouse model—was showcased at fishery exhibitions in Berlin in 1880 as a representation

of China's industrial developments (IGC 1880: 35). Three years later in London, the elaborately decorated Chinese pavilion received extensive media coverage, and the "ingenious details" (CCFE: 6) of Ningbo icehouses were highlighted as advantageous for similar structures in England and America. In the United States, which led the advancement of mechanical refrigeration, the new technology did not displace ice harvesting overnight; direct competition emerged only in the 1880s and persisted for several decades (Rees 2013: 30). The display of an icehouse model alongside other manufacturing facilities at the 1904 Louisiana Purchase Exposition reflected the continued recognition of traditional Chinese practices.

Model of a Ningbo icehouse in the Chinese section of the Liberal Arts Palace at the Louisiana Purchase Exposition. Source: Bennitt et al. 1905: 291.

Icehouses in Shanghai. Photo: Charles Ewart Darwent, circa 1902. Courtesy: Special Collections, University of Bristol Library.

Conclusion

Besides a general interest in China's environment, culture and society—heightened by opportunities for on-site observation following the country's mid-nineteenth-century forced opening up—foreign attention towards Ningbo icehouses was largely driven by the practical solutions that these structures offered to meet the expanding need for "cold infrastructure" (Schönach 2018) and to support food systems (Freidberg 2010; Perera 2025). While ice harvesting relied heavily on bodily knowledge and an intimate understanding of local natural conditions (Robichaud 2022), experiences and models from abroad also served as valuable references, as the underlying principles of storage could be adapted across other regions. Within China, ice storage practices varied geographically, yet similar methods were common around Ningbo. According to a survey initiated by the Ministry of Industry in 1933, Yin County contained the largest number of icehouses in Zhejiang Province, providing livelihoods for tens of thousands of people (SGMJ 1933: 479–84). Among the roughly twenty registered plants, each was estimated to hold on average 200–250 tons of ice. This was followed by the provincial capital city Hangzhou and several coastal fishing towns, while only two mechanical ice plants operated in Zhejiang, where their business remained sporadic. Nevertheless, with the growing popularity of artificial cooling, the landscape of icehouses along the Yong River had vanished from public view by the early 1980s, surviving only in place-names such as Bingchanggen 冰厂跟, or 'site of ice factories' (BG 2016).

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Exercise

Tracing cryospheric knowledge across scales

1. Select Sources
   Choose a small set of materials—such as travel writing, scientific reports, photographs or paintings—that depict cryospheric environments in different social or cultural contexts.

2. Identify Representations
   Examine how ice, cold or cryospheric practices are described. Note recurring themes, metaphors and underlying assumptions, as well as the roles that different actors and technologies play.

3. Reflect on Environmental Imaginaries
   Write a short reflection on how these representations shape environmental imaginaries and historical narratives. Consider, for instance:

   - Which forms of knowledge are highlighted or marginalized?
   - Are Indigenous, local or vernacular methods recognized or appropriated?
   - How do notions of efficiency, purity or modernity emerge?
   - What do these materials suggest about the relationships among climate, labor, trade and science?

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Growing Ice:

A Folktale of Resilience and Subversion

Karine Gagné

What can a folk story about growing ice teach us regarding the vitality of this substance, as well as resilience and subversion in the context of climate change? In this article, I build on a folktale about the Chadar, the name given to the Zanskar River when it freezes in winter, to explore the experience of climate change in the Himalayas today. The Chadar has long been a critical infrastructure, serving as the only winter route in and out of Zanskar, a sub-region of the Ladakh Union Territory in India, when regular roads become impassable.[1] Traditionally supporting the butter trade that Zanskarpas conducted with Leh, today the Chadar is mostly linked to adventure tourism.

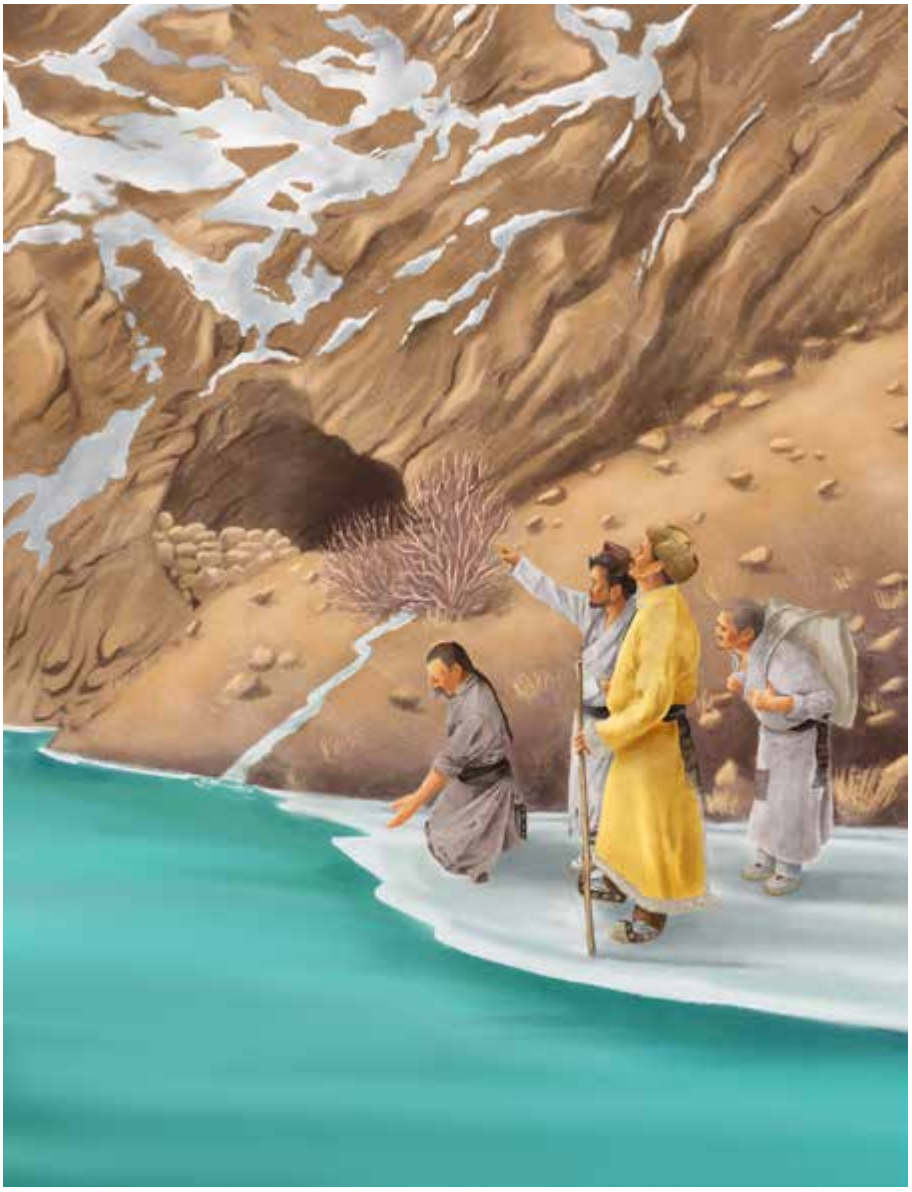
Since 2019, I have been collaborating on a visual project with men who work as porters, cooks and guides, collecting visual materials, interviews and stories about the frozen river. Drawing on a folktale concerning a cook and a king trapped on the Chadar, I explore how local residents of the Himalayas confront the challenges of climate change. I argue that their resilience rests on an understanding of ice as vital matter and that their actions subvert dominant forms of climate expertise.

[1] Recent upgrades to the Padum–Kargil road and the Chadar road (fully opened in 2025) have made winter travel possible.

The Folktale

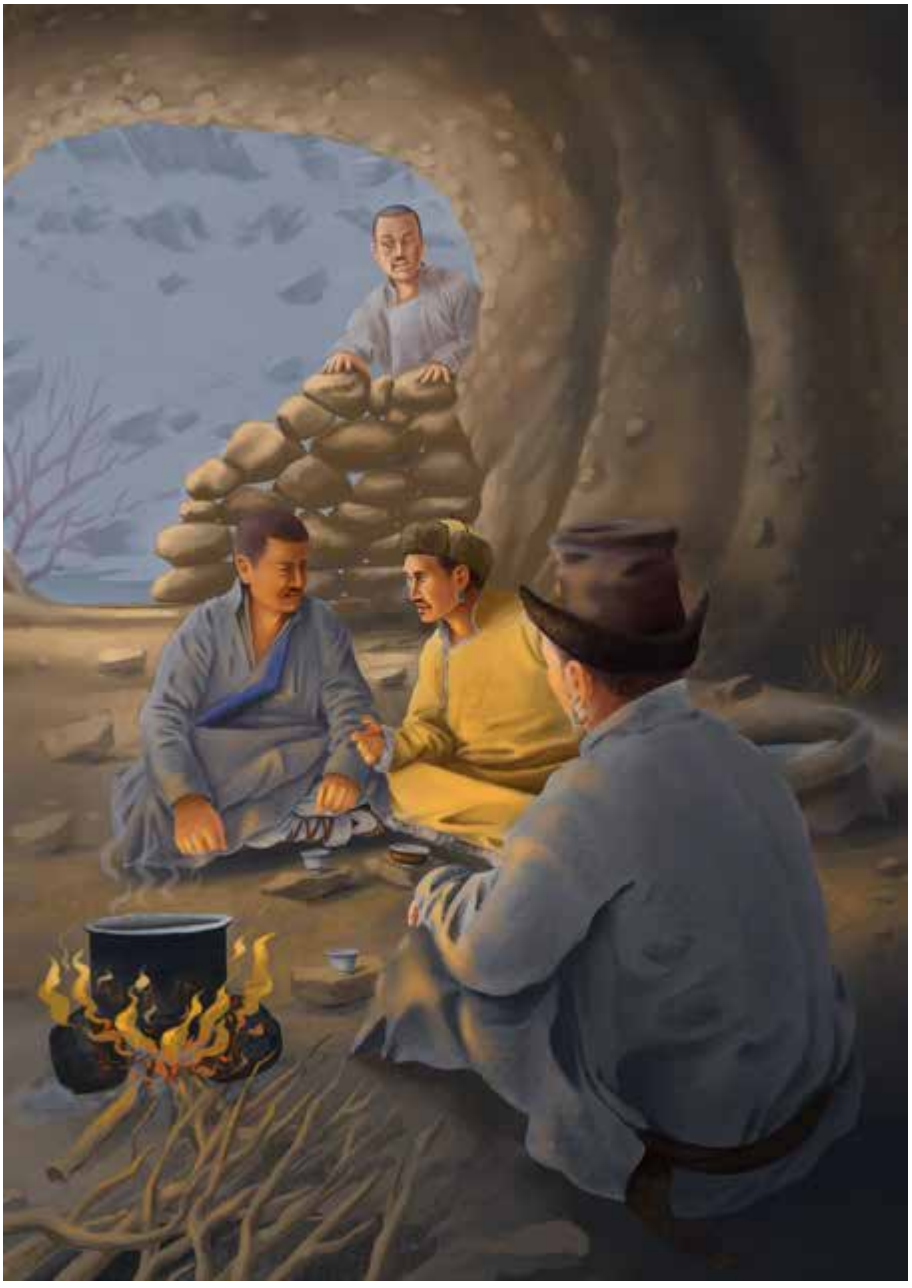
There are many stories about the Chadar and the dangers travellers here have faced. There are also folktales of people trapped by shifting ice or avalanches. Some have known origins, while others are ancient, woven into local lore. One such recounts the story of a Zanskar king named Skyalzos.

The story goes that while returning from Leh, King Skyalzos and his party—a cook and two helpers—faced a grave challenge midway through their journey. One morning, after spending the night in a cave, they awoke to find the river ice completely melted, leaving only bright blue flowing water. Trapped within the steep Zanskar gorge, their sole hope was for the temperature to drop long enough for the river to freeze again.



But the area was surrounded by springs, so there was a lot of warm water preventing the river from freezing. They had no choice but to wait. One day passed, then two days, then three. As time went on, they ran out of food. The cook started using what little remained—sheep and goat skins from their garments—just to keep everyone alive. It was not the tastiest meal, but it kept them going.

More days passed. Eventually, they had nothing left but water from the river. Hunger grew, and their situation seemed increasingly hopeless.



One day, while the cook was out fetching water, the king and the porters made a plan. If the ice was still not frozen the next day, they would kill the cook, just to survive. Luckily, the cook overheard them. That night, he went down to the river, prayed, and then cut a tree branch and placed it in the water. As lumps of ice floated by, they started to collect around the branch. Before he returned to the cave, he prayed again, hoping for the water to freeze so he could escape alive and see his family again.

And it happened! The next morning, the river around the branch was frozen. Miraculously, the cook survived, and the king's lineage was spared the shame of cannibalism.

Vitality of Ice

This story reveals that ice, through its materiality, is alive, capable of growth and transformation like any living being. The cook's survival depended on attending to this liveliness, here activated through human interaction. This is not merely symbolic: on the Chadar, travellers still 'grow' ice by placing branches in the water, allowing it to accumulate and solidify to enable passage.

Recent scholarly attention has been drawn to the vitality of ice as matter. Traditional ideas of ice as inert are challenged by recognition of the permutations of this vitality: supporting organic life within itself (Yip 2024), existing concurrently as both solid and liquid (Simonetti 2021) and transforming into rock (Rider 2024). The vital materialism of ice is also tangible in its ontological agency, which influences both human and nonhuman bodies (Gagné 2024) and can determine human actions (Kangasluoma 2025). Overall, embracing ice's vitality requires conceding human-centric views to appreciate how ice shapes human worlds and actions (Gagné and Drew 2024).

On the Chadar, such vitality makes ice a seasonal infrastructure that shifts with weather and climate, sometimes requiring care to maintain passage. Geographers and anthropologists have shown how nature itself can function as infrastructure—for example, Carse (2012) describes the Panama Canal's dependence on its surrounding watershed (see also Morita 2017; Ballestero 2019). These studies highlight the interdependence of humans and nonhumans that sustain infrastructure, including the affective relations through which they become "co-emergent parts of each other's infrastructure" (Morita 2017: 753). Reflecting on the co-emergence of people and ice—that is, how ice influences human action and how humans, in turn, may participate in its vitality—sheds light on the lessons of the Chadar folktale for understanding how residents of this region of the Himalayas navigate climate change.

Resilience

When discussing the Chadar folktale with Zanskarpas, two key morals emerged. The first concerns resilience: if, like the cook, one has faith and courage, one can overcome even the toughest challenges. This raises a crucial question: could resilience to climate change be linked to how ice is seen?

In climate change research, ice is largely understood through an ontology of decay—treated as a vanishing body whose speed of melting, extent and impacts dominate both scientific and popular narratives. This focus is evident in phenomena such as glacier tourism and glacier funerals, which frame melting ice as a collective loss (Salim et al. 2026). Yet, as Dodds and Sörlin (2022: 5) note, such narratives obscure the diverse relationships that communities in ice-dominated regions maintain with ice, and also strip them of their agency. In many parts of the world, ice remains central to life, and its fluctuation is something communities continue to adapt to (Gearheard et al. 2017; Krause 2022).

In the folktale, as it melts, ice embodies both destruction and possibility: it drives people to hunger and cannibalism, yet also holds the promise of survival through creative intervention. Similarly, in my long-term work in Ladakh and Zanskar, I have never encountered expressions of despair about melting ice. While some interpret glacial retreat as signalling a changing moral order (Gagné 2019), it does not elicit fatalism. Instead, the vitality of ice is expressed through practice: Ladakhis have long harvested and cultivated ice (Gladfelter 2018) and, in recent decades, have developed artificial glaciers and other local infrastructures to address climate-induced water shortages (Mingle 2015; Clouse 2021; Celermajer 2024: 1022).

Subversion

This resonates with a second moral that Zanskarpas associate with the folktale: subversion through the quiet challenging of social order. Historically, Ladakh has been a stratified society in which royal families held political and economic power and defined what counted as legitimate knowledge. The folktale reverses this hierarchy. The king appears useless, even dangerous, while the humble cook, valued mainly for practical labor, possesses life-saving knowledge.

In the context of climate change, subversion similarly takes the form of practices that invert hierarchies of knowledge and authority. Analytically, this resonates with theorization of refusal as a mode of action that does not directly confront power but sidesteps it, rendering its terms irrelevant (Simpson 2014; McGranahan 2016). Through this lens, the cook's action is not merely an inversion of hierarchy but a refusal of the king's authority as the sole source of legitimate knowledge. Survival emerges not from persuading power but from acting in parallel with it.

Echoes of this inversion appear in contemporary Himalayan climate adaptation. Scholars have critiqued top-down, technocratic approaches and the privileging of climate science over local knowledge (Chakraborty, Rampini and Sherpa 2023; Orlove et al. 2023; Sherpa and Puschiasis 2023). Zanskarpas' responses reflect such critiques. In Kumik, villagers built a long irrigation canal after repeated appeals to the state went unanswered. Elsewhere, communities have constructed artificial glaciers with NGO support to address early-spring water scarcity, while in Pishu prolonged delays in a state-led canal project pushed farmers toward alternative technologies and, in 2018, to refuse state help altogether (Gagné and Chostak 2024). These practices do more than compensate for weak intervention; they withhold the state's authority to define the terms of adaptation. Subversion here is material, enacted through practices that operate outside official frameworks.

Subversion thus exceeds resistance or critique. It lies in how Himalayan residents creatively bend the forces shaping their lives, developing locally driven responses that, like the cook's act, often prove most consequential. In working with the vitality of ice, they enact regeneration and an understated form of resistance (Lyons 2016), offering a counternarrative to dominant tropes of loss and expert-led rescue in dystopian climate futures.

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Discussion Questions

1. The folktale portrays ice as both danger and possibility. How does this differ from dominant climate narratives that frame ice only as loss? What effects do these different perspectives have on how people respond to climate change?
2. The cook's knowledge saves everyone, while the king is ineffective. What does this reversal suggest about where important knowledge comes from? How does this relate to climate expertise today?
3. The article argues that Himalayan climate practices are forms of subversion, not open resistance. What is the difference between resisting power and acting outside its terms? Which do you think is more effective in environmental struggles? Why?
4. 'Growing ice' requires care, attention and labour. How does this change our understanding of infrastructure? Can you think of other examples where nature and humans together form infrastructure?
5. The story emphasizes collaboration with nonhuman forces, rather than control. What might change in environmental policy if we treated ice, rivers or forests as lively partners rather than passive resources?

Activity for Students

Here is a series of concepts found in the text: vitality, resilience, subversion, refusal, infrastructure, co-emergence and agency. For each concept, students must provide:

- A plain language definition (no academic jargon)
- An example from the article
- An example from their own world.

Example: *Term: Resilience*

- Plain definition: finding ways to continue despite difficulty
- Example from article: Cook surviving by growing ice
- Example from your life: Going for walks outside with my dog during the COVID-19 lockdown.

Author:

Karine Gagné is an anthropologist engaged in ethnographic research primarily focused on the Himalayas. Her work examines issues such as climate change, ethics of care, human–animal relationships, state formation, citizenship and climate knowledge. Her current research on climate change explores how communities' capacity to respond to environmental challenges intersects with their recognition and inclusion by the state, as well as with the production of climate knowledge. Her research on human–animal relationships investigates how state production in border regions affects conservation efforts and those relationships. She also examines the colonial legacies embedded within wildlife photography. Karine is the author of *Caring for Glaciers: Land, Animals, and Humanity in the Himalayas* (University of Washington Press, 2019), which was awarded the James Fisher Prize by the Association for Nepal and Himalayan Studies.

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Revere or Avoid?

Contested Visions of Glacier Reciprocity

Tal Shutkin

The Closure of Nevado Huaytapallana

The ice-capped Nevado Huaytapallana is a thing of pride for the people of Peru's Mantaro Valley and its principal city of Huancayo, but it is also a source of distress. In late July, marking the beginning of the region's month-long Santiago Festival, hundreds to thousands of individuals from the region and across Peru caravan to the base of the mountain. These Santiagueros, often led by what locals refer to as shamans or healers, dance to the music of saxophone orchestras, the women wearing traditional floral skirts and the men in sombreros adorned with the mountain's iconic flowers. They come to the Huaytapallana, which translates from Quechua to 'the place one goes to gather flowers', to leave offerings to the Apus—mountain deities—in exchange for good luck in the year to come. These oblations traditionally include materials like coca leaves, alcohol and fruits, but as the practice has grown in recent decades, it increasingly involves items containing plastic, glass and candle wax. In addition to the many empty bottles and cans left by participants, this has resulted in a considerable accumulation of waste on the flanks of the mountain and even on its glaciers (Maldonado-Oré and Custodio 2020).

The Santiago season of 2025, however, was different. As July came around, trucks began circulating the city broadcasting the following message over loudspeakers:

> *The Huaytapallana is a source of life. [It] provides water to all the city of Huancayo. The water we drink, and that irrigates our fields is born from this glacier. But today, the Huaytapallana cries for help. Every time we visit it, we leave trash in its lakes, provoke wildfires with our candles, tear apart vegetation, and animals die due to our garbage. This year, don't go up to the Huaytapallana. Let's protect this precious place and leave this heritage for our future generations …*

Heard from within the city and along the road towards the Huaytapallana Regional Conservation Area (ACR-H), this broadcast was part of a campaign led by the regional government of Junín to prevent the pilgrimage. Previous efforts to control festivities inside the ACR-H had failed to curb the accumulation of visitors and their waste. New, stricter measures in 2025 would allow the festival to continue throughout Huancayo and the Mantaro Valley but prohibit the initial activities concentrated within the protected area's boundaries. Entry to the ACR-H was closed to visitors without permits and, as late July approached, government officials were stationed at multiple points along the entry road, ensuring that only vehicles destined for Pariahuanca, the district across the mountain, were granted passage.

The ban on in-situ glacier worship—motivated by a desire to protect essential water resources and the natural environment—offers a glimpse into the layered dynamics of this landscape. In examining the 2025 prohibition, a network of sociocryospheric relations (Carey and Moulton 2023) emerges linking the region's physical and cultural infrastructure. Here, the sociocryospheric lens invites analysis of the differing impacts of, responsibilities for and knowledge about ice loss. In the Huaytapallana range, where the impacts of glacier retreat are widely visible, responsibilities and knowledges remain contested.

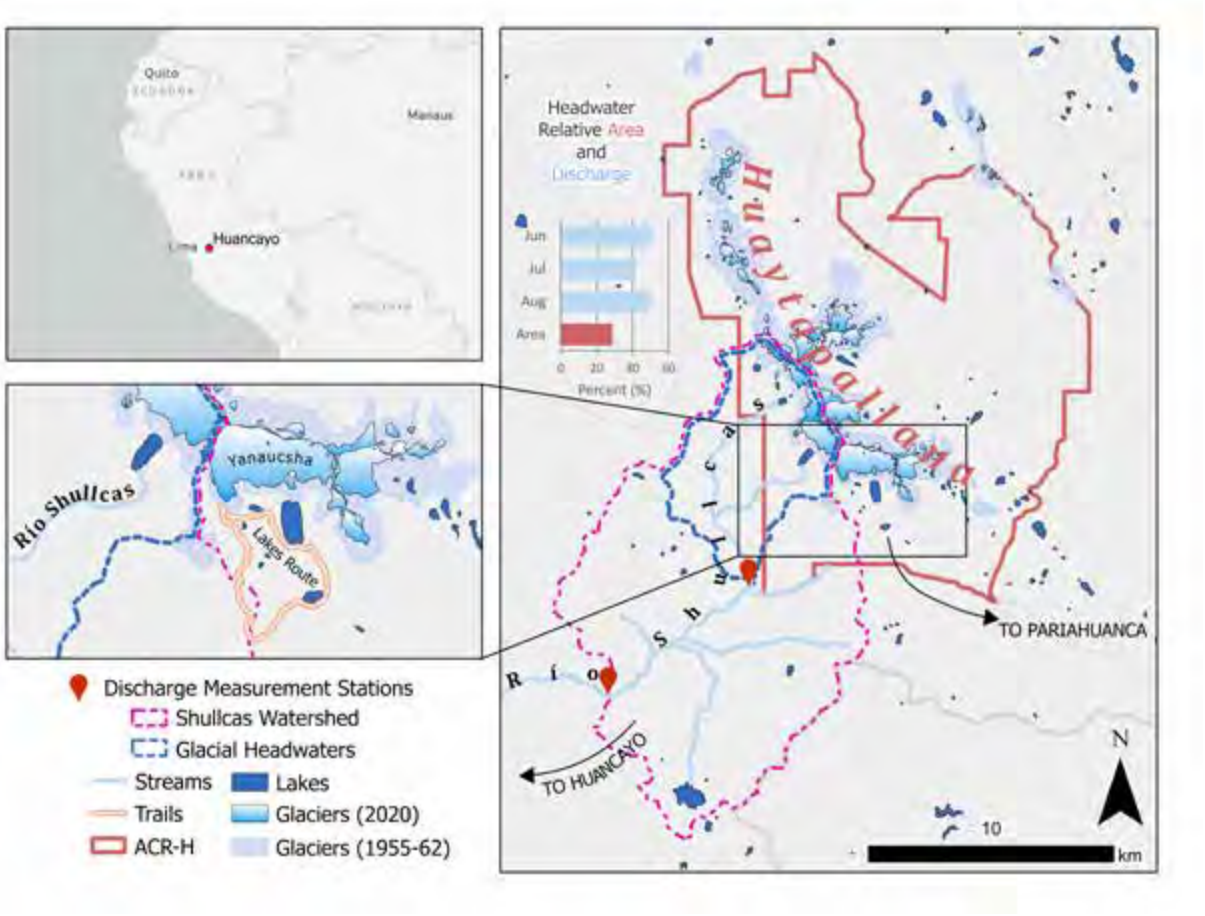
Water in Huancayo

Few homes in Huancayo receive water 24 hours per day and many households rely on tanks to store water for daily shutoffs (Mark et al. 2017). Currently, 60 percent of the city's supply is drawn from the Shullcas River, which flows from the icy peaks of the Huaytapallana. The remaining 40 percent is pumped from various groundwater wells. Their dependence on the Shullcas River creates among the Huancayo public a perception of reliance on glaciers, ancient ice-flows that have receded by more than 70 percent since the early 1960s (INAIGEM 2023). Although the exact quantity of Huancayo's water that derives directly from glaciers—as opposed to groundwater or other sources—is likely overestimated (Somers et al. 2019), hydrological measurements from 2024–25 indicate strong dependence on the glacial headwaters throughout the dry season. Despite covering less than 30 percent of watershed area, these headwaters provide about half of the water that reaches the treatment plant during June through August. Preserving the integrity of the headwaters—glacial and otherwise—is therefore essential to the continuity of Huancayo's drinking water. Within this hydrological context, the motivation behind the closure of the ACR-H would appear legitimate. Indeed, usually

citing issues related to trash, most residents of Huancayo and highland villages with whom I spoke appear to understand or even support the policy. One authority figure in a village near the park entrance expressed strong support:

> *They leave plastics; they leave bottles; they leave glass. That has left a disaster … [Thousands of people] come and leave an immense mess … And this year [the shamans] didn't go, and it's fine. There's not much garbage. Not much pollution … this should be permanent.*

However, the scientific basis of the policy weakens when it is examined more closely.



Site map with graph indicating the headwater region's dry-season streamflow and surface area in proportion to the full Shullcas watershed. Sources: INAIGEM and Esri. Design: Tal Shutkin.

Government Discourse Surrounding the Closure

Most pilgrimage-associated contamination accumulates outside of the Shullcas watershed. Instead, it concentrates along the Lakes Route, a popular tourist circuit leading to Yanaucsha Glacier, whose waters flow away from Huancayo. Due to the presence of a gate that has prevented unauthorized automobile access to the Shullcas headwaters since 2017, Santiago Festival activities that do take place within the watershed generally occur away from glaciers and lakes. Despite the success of this

Official signage at the locked entrance to the Lakes Route in the ACR-H.
Photo: Tal Shutkin, 2025.

previous intervention, government discourse maintains a strong focus on glaciers to legitimize the total closure of the ACR-H. Beyond the public broadcast quoted above, signage links the closure policy to glacier protection, emphasizing this issue over the general problem of litter. For instance, a banner that covered the locked entrance to the Lakes Route during July 2025 declared "the indeterminant closure of the [ACR-H] due to accelerated glacier retreat and exposure of the population to dangers associated with glacier melt and the reduction of water availability. IT IS NOT PERMITTED TO ENTER!"

Although it is probable that local contamination influences the glacier's surface melting rates, the long-term retreat witnessed at this site most likely follows the temperature-dominated trend linked to anthropogenic warming in the tropical Andes writ large (Sicart et al. 2008; Shutkin et al. 2025). Government discourse linking the pilgrimage activities to glacier reduction and water resource loss is therefore misleading in two senses. First, most littering no longer occurs within the Shullcas headwaters. Second, rather than leveraging the widely acknowledged issue of contamination in and of itself, government discourse advances poorly substantiated claims connecting the issue to glacier loss.

Reciprocal and Sentient Glaciers

Even without a firm scientific relation to glaciers, the closure of the ACR-H is couched within two culturally acceptable frameworks that are shared by those who make the annual pilgrimage to the Huaytapallana. First, the regional government recognizes the life-giving capacity—understood as water resources—of the Huaytapallana, and hence the necessity to protect it for future generations. Second, the closure policy is strongly grounded in the argument that local human activity impacts the mountain, and vice versa.

I contend that these same principles, albeit translated through a less technocratic lens, motivate the pilgrimage itself. Although the intensity of the practice is a modern neo-traditional phenomenon (Paerregaard 2023), it stems from the pre-Incan worship of the deity Huallallo Carhuancho, who is said to reside trapped within the Huaytapallana (Villanes Cairo 1978). Since the Spanish conquest, Huallallo, who is associated with fire, fertility and husbandry, has syncretized with Santiago, the Catholic patron associated with similar traits (Matayoshi Matayoshi 2009). In local Huanca (also spelled Wanka) culture, the Santiago festival is closely connected with husbandry. Offerings given to the mountain are traditionally answered with healthy and bountiful cattle during the year to come but have evolved to include modern requests as well.

Signage on the Lakes Route with a carving of the Nevado and some Huaytapallana flowers added later. Yanaucsha in background.
Photo: Tal Shutkin, 2025.

Today's pilgrimage therefore remains grounded in a perception of the Huaytapallana as provider, a perspective that is bolstered by the city's hydrological precarity. It also affirms that communities retain a reciprocal relationship with the Huaytapallana that is maintained through the payment of offerings. In short, the mountain provides vital resources, but only if treated with respect. Paradoxically, the practice of leaving offerings has evolved such that many view it as disrespectful. Those who prefer to ban the pilgrimage are thus motivated by the same perspective as its practitioners.

← ***The city-sponsored 2025 Santiago Festival in downtown Huancayo. Santiagueros carry representations of a bull and Nevado Huaytapallana.*** Photo: Tal Shutkin, 2025.

→ ***A water storage tank draped in a traditional Santiago skirt is positioned before the Huaytapallana. Translation: 'Wanka Pride! Born on this land'.*** Photo: Tal Shutkin, 2025.

Status and Outlook

The ban was largely successful. In 2025, a smaller pilgrimage occurred at a site outside the ACR-H where participants could see the Huaytapallana from a distance. Due to popular recognition of the contamination issue and concern over water resources in Huancayo, the crackdown received little public backlash. However, a small minority continued entering illegally to perform offerings closer to the mountain. Compared to previous levels, this is hardly significant, but it highlights the fact that conflict between cultural and managerial priorities persists to some extent. Whether this will grow in significance or fade remains to be seen. It is clear, however, that as in other icy regions (e.g. Gagné 2024), contested representations of glacier reciprocity will continue informing the ways people interact with and choose to intervene in the changing cryosphere (Stuhl 2016).

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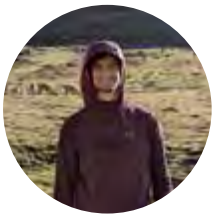

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Sounding the Sacred:

Ecological Spirituality in Gilgit Baltistan

Hasina

Gilgit-Baltistan is home to more than 13,000 glaciers, which have profoundly shaped the region's everyday life, moral values and ways of relating to the world. Long before the spread of organized religion, local communities formed ritual relationships with glaciers, understood not as passive reserves of water but as living, life-giving presences. Elders in the Hunza Valley, where I conducted ethnographic fieldwork, speak of glaciers as beings that breathe and possess souls, sustaining humans, animals, plants and unseen entities, so that daily survival is inseparable from practices of care and respect. Although many of the older rituals have changed over time, such connections have not disappeared; today, some young artists and musicians climb to glacier sites to offer music in acts of gratitude. These rituals symbolize an early form of ecological spirituality in which people recognized a higher, animating force responsible for the continuity of life (Ahmad-Khan 2022). As scholars like Allison (2015) and Millington (2024) have argued for other regions along the Himalayas, glaciers are imbued with spiritual and moral agency, emblematic of traditions that view these ice formations as life-sustaining forces and sacred companions. This perspective emphasizes relational ontologies that attest to glaciers' capacity to interact with human actions and ethics (Cruikshank 2012).

The Baltoro Glacier in the Karakoram range.
Photo: Afnan Karim, 2022.

My observations of young musicians' and artists' practices in musical events at Passu Glacier and Borit Lake demonstrate how such performances produce knowledge about glaciers, climate and relational care that is inseparable from lived experience, improvisation and place-specific aesthetics. These insights offer a model for thinking about music, environment and spiritual ecologies.

Music occupies a sacred role in the cultural and spiritual fabric of Hunza (Schmid 2007). It is both an archive of ancestral memory and a living medium of ecological communication, through which respect for glaciers, moral responsibilities towards the land and warnings about environmental imbalance are expressed. Young residents have recently institutionalized this practice through annual high-altitude music festivals, where musicians and other artists ascend to glacier sites to perform mystic and shamanic compositions as acts of tribute.

Glacier Music Festivals as Atmospheric Infrastructure

In June 2022, I began ethnographic fieldwork out of Islamabad, where I live, accompanied by Abdul, who supported field logistics, and Abrar, who documented the research process. Following a series of interviews with elders, we travelled to the Leif Larsen Music Center in Hunza to engage with young artists who organize the annual high-altitude music festivals. We journeyed with musicians Mujeeb and Jameel towards the Passu Glacier, stopping at Borit Lake along the way. At the lake's edge, they pointed out a site where they had previously performed music facing the glacier, an encounter that crystallized a central insight: artistic practice here functions as an ethical relation, through which glaciers are addressed not as scenery but as participants in an atmospheric infrastructure. The material environment—the cold, crisp air, the reflective lake surface and the resonance of wind across ice—creates an aesthetic and sensory field that enables spiritual and ethical engagement.

This atmosphere is more than just a backdrop; it actively shapes musical performance, listening and improvisation, connecting humans to glaciers and other nonhuman beings across temporal and cosmological scales. For example, during the performances at Borit Lake and Passu Glacier, Mujeeb and Jameel adjusted tempo, volume and melodic structure in response to shifting winds and the acoustic reverberations of the glacial valley. Mujeeb described these adjustments not as technical choices alone but as acts of listening to the glacier and its surrounding landscape. Moments of silence were deliberately incorporated to allow glacial sounds, cracking ice, flowing meltwater and wind to enter the performance, producing a shared sonic space in which human and nonhuman agencies co-shaped the music.

Local artists performing at a high-altitude music festival.
Photo: Afnan Karim, 2021.

This video documents a performance at a high-altitude music festival.
Author: Afnan Karim, 2022.

Musical Encounters and Ecological Attunement

After the performances at Borit Lake near Passu Glacier, Mujeeb and Jameel reflected on how their practice connects them to the surrounding environment. Here, they demonstrated their musical approach, highlighting the interplay between human performance and the natural soundscape. Mujeeb explained that at times he perceives the lake itself as a musical participant, producing subtle, shifting patterns of sound that interact with his own playing. For both Jameel and Mujeeb, the lake and the glacier are not merely a backdrop but active interlocutors, co-creators that shape improvisation, listening and their ethical attunement to place.

In a conversation that took place in summer 2022, Jameel, the young flautist from Hunza, narrates his journey as one of personal awakening intertwined with the glaciers:

> *When I was in 7th grade [13 years old], I developed an interest in playing the flute. My parents did not approve, so I would secretly visit glaciers and lakes to practice. What began as an act of rebellion transformed into a spiritual experience. I realized the glaciers were not silent; they reflected and responded to my music. Over time, I learned to tune my flute to the sound of melting ice and flowing water. The glaciers became my companions, they comforted me when no one else did.*

Jameel's story encapsulates a profound eco-spiritual dialogue, where the glacier is both muse and mentor, a being that reciprocates emotion and art. In this context, it emerges as a participant in social and cultural life, capable of relationality, affect and response. The musicians' testimonies further illustrate the affective dimension of climate change, wherein environmental degradation is experienced not only as a physical crisis but as a spiritual and emotional rupture, both already felt and increasingly anticipated.

↓ Local musicians performing at the 2022 high-altitude music festival on Baltoro Glacier.
Photo: Afnan Karim.

Musical Acts of Resilience: Youth, Glaciers and Ethical Engagement

↑ ***Local youth musicians performing at the 2024 high-altitude music festival at Batura Glacier.*** Photo: Amjad Ali.

Over recent decades, sacred relationships with glaciers and high-altitude landscapes in Gilgit-Baltistan have been increasingly disrupted by processes of modernization, formal education, urban migration and development narratives that prioritize economic growth over local ecological knowledge. At the same time, people's awareness of the value of heritage is expanding (Walter 2022).

The high-altitude music festivals can therefore be understood as deliberate acts of cultural resilience and ecological resistance, reaffirming sacred relations that modernization and development have eroded. Through melodies, lyrics and performance practices, young musicians reclaim glaciers as kin, mentors and co-creators of art and life. Musical engagement becomes both a medium of intergenerational knowledge transmission and a form of ethical attunement to nonhuman beings, reflecting inherited cosmologies while addressing contemporary ecological anxieties.

Zia, a violinist, describes his musical practice as an act of ecological devotion:

> *When people speak of glaciers without respect, I feel deep pain. They are beings with souls, constantly endangered by human negligence, yet they continue to protect and nurture us. During the high-altitude festival, I play shamanic tunes as an offering, and I can feel their acknowledgment, as if they listen.*

Local youth musicians performing at the 2023 high-altitude music festival on Baltoro Glacier. Photo: Afnan Karim.

Such expressions reflect a contemporary form of eco-animism (Haukeland and Fredriksen 2023), where artistic performance becomes a sacred exchange between humans and the nonhuman world.

While the younger generation's musical practices continue inherited cosmologies of glacier reverence, they also innovate by incorporating new instruments, improvisational techniques and performance contexts that were not part of earlier ritual repertoires. These adaptations allow artists to translate traditional ethical and spiritual relationships into contemporary idioms, integrating personal expression, collective performance and environmental consciousness. In doing so, their music functions as both a continuation of ancestral ecological knowledge and a creative reimagining that responds to modern challenges, climate anxieties and changing social landscapes.

Music as Cryospheric Infrastructure: Dialogues Between Humans and Glaciers

At Borit Lake, Mujeeb's *rubab* began with a slow, pentatonic phrase, each plucked note lingering in the sharp high-altitude air, while Jameel's flute wove ascending, airy motifs that floated across the water. The interplay of sustained drone and ornamented melody seemed to trace the undulations of the surrounding glacier, with pauses and crescendos mirroring the subtle shifts in wind and water. In one improvised passage, Mujeeb repeated a line under his breath—"the glacier listens as we remember"—which imbued the tune with a conscious acknowledgment of the glacier as sentient presence. The resonance between the instruments, the lake and the ice created a layered auditory environment in which human and cryospheric agencies co-acted: the glacier's echoes and reverberations became part of the musical texture, while the musicians adapted phrasing, tempo and volume in response to these natural acoustic cues. Mujeeb emphasized this sense of collective indebtedness:

> *We, the people of Hunza, owe our existence to glaciers. They have sustained our ancestors for centuries. Our festivals are expressions of gratitude for their timeless service.*

Through this practice, music functions as a form of cryospheric infrastructure: a medium that sustains intergenerational ecological knowledge, ethical relations and spiritual engagement with glaciers. The performance enacts continuity with ancestral cosmologies while innovating contemporary expressions of care, attentiveness and reciprocity. In this living dialogue, sound becomes prayer, the glacier both audience and collaborator, and the landscape itself participates in shaping and co-creating cultural and environmental understanding. These artistic engagements show how interspecies dialogues reimagine glaciers as ethical co-participants in the ongoing struggle against climate change.

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Glacier Tourists:

The Origins of an ‘Instagram Society’ around 1900

Christian Rohr

Introduction

The history of the Alps is not merely a geological timeline of rock and ice; it is equally a history of human perception. For centuries, the Alpine summits were viewed with apprehension—an inconvenient, formidable barrier that travellers were compelled to cross out of necessity rather than desire. Until the seventeenth century, the high mountains were a *terra incognita* of danger and sterility. Yet European history reveals a profound paradigm shift beginning in the late seventeenth and eighteenth centuries, transforming these high-altitude wastelands into landscapes of the ‘sublime’ (Zuelow 2016). This shift is most visible in the rich corpus of glacier images that have survived to the present day. These images serve a dual, perhaps contradictory, function for the modern scholar: they are invaluable data for historical glaciology, enabling the reconstruction of past climate variability up to today’s warming world, and they are also potent cultural artefacts illuminating the social history of tourism.

By analysing the evolution of humans travelling for pleasure within these glacial frames—from Grand Tour travellers and Enlightenment scientists to the Belle Époque bourgeois tourists—I uncover a surprising prehistory to our contemporary culture of self-representation. We must ask: Did the performative social media trend of today, which I would like to label as *Instagram society*, actually start around 1900? And what made and makes glaciers Instagrammable? This second question concerning the fascination of the cryosphere for tourists is not only relevant to today's visual culture of social media but can also be traced back to the Belle Époque, when bourgeois tourists in the Alps and in other mountainous regions posed on or in front of glaciers for photographs.

The Shift from Avoidance to the Sublime

Until the early modern period, crossing the Alps was a perilous necessity, devoid of aesthetic appreciation. Only in the late seventeenth and eighteenth centuries was the horror of the mountains transformed into fascination. This development is closely linked to the emergence of the Grand Tour, an educational journey to Italy undertaken primarily by the British aristocracy, which was regarded as a rite of passage for young men. On their journey, they often crossed the Alpine passes in Haute-Savoie and south-western Switzerland. Their accounts testify to a significant change in the perception of the Alps. This era witnessed the ascent of medium-altitude viewpoints, such as the Rigi mountain (1,797m), and the creation of the first significant corpus of Alpine paintings.

While isolated examples exist from the seventeenth century, dense production of imagery began around 1770 (Zumbühl 1980; Nussbaumer et al. 2012; Reichler 2013; Zumbühl et al. 2016).[1] Artists focused on accessible wonders, most notably the glaciers of Grindelwald in the Bernese Alps. These early images were not merely decorative; they were attempts to capture the sublime—that romantic mixture of awe and terror induced by the sheer scale of nature. It is important to remember that this artistic fascination coincided with the latter stages of the Little Ice Age; the glaciers depicted were far larger and more menacing than those we see today, extending deep into the valleys and interacting directly with human settlements.

[1] Large samples of historical glacier images from the Alps are publicly available through the Euro-Climhist and Viatimages databases.

Images as Data: A Method of Historical Glaciology

For the environmental historian and the glaciologist, these pictorial sources are more than art; they are evidence. Under the methodological framework developed by Heinz J. Zumbühl since the 1980s, serial iconography allows researchers to reconstruct glacier fluctuations long before the advent of satellite telemetry or even photography (Zumbühl 1980; Zumbühl et al. 2016; Zumbühl and Nussbaumer 2018). However, the evaluation of these sources requires rigorous critique and epistemological caution.

The scholar must navigate a diverse array of image types, from Romantic oil paintings to technical topographic drawings. The challenge lies in the truth claim of the image. For glaciology to benefit scientifically, a sufficient density of images of a specific glacier is required over a long period. This enables the cross-referencing of distinctive landmarks—rock formations or unique valley features that remain constant while the

ice shifts. Furthermore, precise dating is imperative: knowing the year, and ideally the season, is necessary to track the glacier's mass balance. This work transforms the painter's canvas into a climatological record, allowing us to quantify the retreat of the ice over centuries.

The Human Element: Science and the 'Golden Age'

The most telling evolution within these images, though, is not the ice, but the human figures standing upon it. The representation of humans in glacier imagery reflects the sociological development of Alpinism from scientific inquiry to sporting conquest and bourgeois mass tourism.

In the late eighteenth century, the dominant figure was the Enlightenment scientist. Horace Bénédict de Saussure (1740–1799), a polymath from Geneva, epitomised this era. His seminal work, *Voyages dans les Alpes* (1779–1796), and his personal ascent of Mont Blanc in 1787—following the prize he set for its first conquest in 1760—framed the mountains as a laboratory (Sigrist 2001). The imagery of this period depicts figures engaged in observation, measurement and the categorisation of nature.

Male and female tourists on the Glacier des Bossons.
Photograph: Auguste Louis Garcin, 1870s. © Bibliothèque de Genève, Auguste Louis Garcin, JJ 00567

Bourgeois tourists with sledges on the Eiger glacier, 1898. Photograph and picture postcard: Arthur Gabler. © Museum of Communication, Bern

By the mid-nineteenth century, the narrative had shifted to the Golden Age of Alpinism (1850s–1880s). The scientist was replaced by the sportsman, specifically the British elite (Grupp 2008). The founding of the Alpine Club in London (1857) marked the mountains as a "playground" for the wealthy (Stephen 1871). This era culminated in Edward Whymper's competitive ascent of the Matterhorn in 1865, viewing the summit not as a place for barometer readings but as a trophy of physical endurance.

Democratisation and the Scripting of Tourism

The late nineteenth century brought a 'democratisation' of the peaks that fundamentally altered the visual landscape. The foundation of the Austrian (1862) and Swiss (1863) Alpine Clubs, combined with the logistical revolution of Thomas Cook's organised group travels, opened the Alps to the upper middle class. Crucially, the proliferation of mass travel guidebooks, such as those by Murray and Baedeker, scripted the Alpine experience. These guidebooks told tourists where to go, what to see, and importantly, where to stand to get the 'canonical' view (Müller 2012; Zuelow 2016; Rohr 2023).

As Alpinism transitioned from an elite eccentricity to a mass phenomenon, the glacier became a stage for social distinction. This is evident in the explosion of posed photography from 1870 onwards. Due to the long exposure times required by early photography, these scenes were necessarily orchestrated. The candid chaos of exploration was replaced by the frozen tableau of the tourist.

The Instagram Society of the Belle Époque

It is during the Belle Époque that the visual culture of the Alps begins to mirror our contemporary social media practices. Recent studies on social media have highlighted the prominent role of photography of travel and other occasions in self-presentation and network-building (Lambert 2013; Simanowski 2018; Leaver, Highfield and Abidin 2020). The concept of the Instagram society introduced here for historical societies suggests that the value of travel lies in its documentation and dissemination as a means of identity construction.[2] I argue that this dynamic was already fully present around 1900.

[2] The concept connecting postcard communication of the Belle Époque with social media is still in its early stages (Hoffmann and Schönegg 2021).

Cog railway station of Eigergletscher. Coloured picture postcard, 1910s. © Verlag F. Oesch-Müller, Bern, www.zeno.org


Schreckhörner

Consider the images of bourgeois tourists crossing the Glacier de Bossons or posing on the Eiger glacier with sledges. These were not snapshots of exploration; they were carefully curated acts of self-representation, providing a clear distinction from anonymous mass-produced postcards. The presence of tourists in urban attire on the ice, often framed by unseen guides and photographers, served a clear social function. Just as the Grand Hôtel offered a venue for display, the glacier offered a backdrop for projecting an image of adventurous modernity. The infrastructure of the era catered to this desire. The construction of cog railways, such as the line to the Jungfraujoch, was specifically intended to provide desirable glacier views for those unwilling to climb (König 2000; Rohr 2023).

↑ ***Bourgeois tourists at the cog railway station of Eismeer.***
Draft for a poster by Anton Reckziegel, 1905. © ALPS – Alpine Museum, Bern.

Advertising posters of the era, such as Anton Reckziegel's 1905 drafts, promised the bourgeois traveller a seamless integration of comfort and wilderness.[3] The resulting photographs—showing tourists posing at the Eismeer station or on the Grindelwald glacier—conceal the ease of access while emphasising the dramatic setting. This creates an illusion that is idealised to today: the illusion of being alone in the wild, captured for an audience back home. The staff—the guides and photographers—are erased from the frame, much like the logistical support behind a modern influencer's post.

[3] On Anton Reckziegel and his work, see Kneubühl and Aerni 2016

Asian tourists posing on the Jungfraujoch, July 2024.
© Photograph: Sam Buchli, Berner Zeitung

Conclusion

When we view a photograph of Asian tourists posing on the Jungfraujoch in July 2024, distinct against the snow, we witness the continuation of a lineage that began over a century ago. The technology has shifted from heavy plate cameras to smartphones, but the sociological impulse remains the same. The turn of the twentieth century saw the birth of travel as a means of visual social distinction. The bourgeois tourists of the Belle Époque used the glacier as a prop for identity construction, relying on a hidden infrastructure of railways and guides to curate an image of adventurous leisure.

However, a sombre realisation underpins this historical continuity. The glaciers that served as the backdrop for De Saussure's science, the British elite's sport and the bourgeois selfies of 1900 are vanishing. The easy accessibility provided by the cog railways remains, but the visual commodity—the ice itself—is retreating. As we move further into the twenty-first century, with the rising popularity of 'last chance' glacier tourism in the Alps and elsewhere,[4] we must wonder: Can Alpine tourism survive the loss of its primary visual asset? The historical images endure as a testament to what was lost, freezing in time both the sprawling ice of the Little Ice Age and the burgeoning vanity of the modern tourist.

[4] For case studies, see Salim and Ravanel 2023; Salim et al. 2023; Barton and Goh 2025.

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