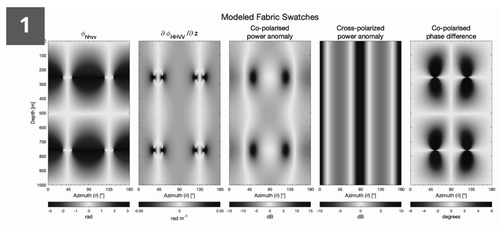

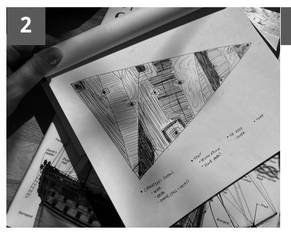

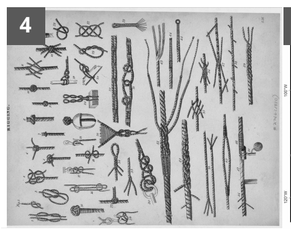

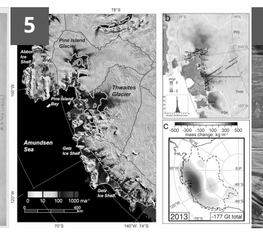

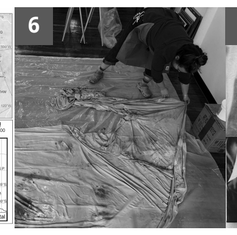

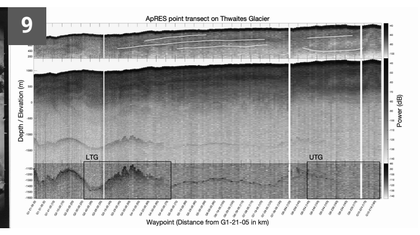

Glacial Hauntologies *is an interdisciplinary collaboration between early-career scientists from the International Thwaites Glacier Consortium (ITGC) - Elizabeth Case and Andrew Hoffman - and two New England-based environmental artists - Hannah Mode and Tyler Rai.*

Interweaving glaciology with artistic practice, we translate, subvert, and repurpose tools from many disciplines to explore geophysical data and glaciological archives. We are interested in how ice reoccurs as a persistent hauntology across 21st century landscapes, scientific data, and day-to-day life.

Our work confronts male-dominated, colonial histories of Antarctic research by centering expansive, embodied, collaborative practices that create alternative relationships to, histories of, and ways of doing research about glacial change. We are funded by NSF OPP #1738934.

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You can follow our work at www.glacialhauntologies.com

Sails[2,14]
Drift, lift, rig, hoist, navigate, tension

Bodies of Water
Humans, Glaciers, Ocean

Entanglement
Revealing connections between human and climate/Earth science systems - we are tied into these systems

Signal flags + patterning
Warning for climate, communicating across distance, repeat behavior, sewing patterns, safety & refuge

Sea level rise
The climate crisis raises sea level regardless of local contribution to climate change. When ice sheets melt, local sea levels fall (less gravity to pull in the ocean), while distant sea levels rise. Coastlines are connected to ice and glaciers through the ocean, regardless of local relationships or familiarity with ice.

(Long-form) Witnessing
Observations over time through generations of data collection and archives recorded in millenia of snow, how our witnessing and understanding is implicated in the future

Tied into the system[4]
Mountaineering knots, rope teams, climate & community systems

Textiles[2, 6, 7]
Fabric, tarps, memory quilts, sails, flags, fold, stitch, hold

Thwaites & Laurentide[5,19]
Mobius strip between past and present and future; Thwaites = looking down to map bedrock & Laurentide = looking up from bedrock, imagining past ice

Glitch
((incidental/accidental?) disruption of a signal, code, or pattern; a failure to function; see also Glitch Feminism (Russell, 2020)

Ice core science[16]
Studying glacier ice layers to learn about past climate histories

Archives
How do we create records of pasts, presents, and futures of glacier ice? How do we document field experiences studying glaciers?

Hauntology
From Derrida's *Spectre of Marx* (1993),

Signals
Flags, bells, windchimes, warnings, repetition, thresholds (responding to environment)

Critical glaciology
Glaciology's history is white, male-dominated, colonial, and imperial. The tools we use were often developed closely with the U.S. industrial military complex, and we remain dependent on the military for much of polar science. Scientific research is also a form of soft power for the United States, especially in Antarctica.

Deformation
How a material changes shape, usually due to external stresses/forces, but also changes in state (moisture content, temperature, etc); stretching, squashing, flowing

Ghosts & Hauntings
Positive + negative space, what remains, felt but not seen, etc

Ice memory
Ice as archive; hysteresis, deep time

Glacier calving events
Recorded in passive seismic data

Viscoelasticity
Ice can flow, bend, and break

Feminist frameworks for glaciology
Carey, M., Jackson, M., Antonello, A., & Rushing, J. (2016). Glaciers, gender, and science: A feminist glaciology framework for global environmental change research.

Nonlinear Rheology
Under additional stress, ice flows more freely

Ice fabric[1]
The distribution of the orientations of crystals in glacial ice

GLACIAL HAUNTOLOGIES

SCIENTIFIC & CREATIVE RESEARCH IN COLLABORATION WITH THWAITES GLACIER

Elizabeth Case, Hannah Perrine Mode, Andrew Hoffman, & Tyler Rai

Listening[18]
To ice, to data, to water, to time, to our bodies

Fluidity
Gender, water, emotion, mantle, river, mechanics

Embodiment
How do we make data felt? In what ways does fieldwork linger or alter the body?

Navigation[17]
What tools, movements, and forms of communication help us to navigate the changing conditions of ice? How do we create a culture adept at navigating transformation?

Glass vessels[18]
How do we hold the uncontainable? What tools and vessels amplify the signals coming from polar landscapes and melting ice?

Softness[8]
Bodies, clay, plasticity, flow

Climate Grief
How do we cope with the emotional toll of studying glaciers?

Experiments in Art and Technology (E.A.T.)
Founded by artists and engineers in the 1970s, engineers worked with artists to push the boundaries of technology in relationship to art

Processing together
Think of artistic and scientific research as to facets of a prism looking at the same phenomena. What do we gain by researching together? How can we qualify/quantify/explain the impact doing art has on doing science, and vice versa?

Stress and strain measurements of ice crystals[11,12]
Nakayo Ukichirō's experiments bending large ice crystals from the Mendenhall Glacier to see how the crystals respond to stress and strain rate

Radar and seismic fieldwork[9]
Geophysical methods & tools for measuring the state of a glacier. Elizabeth, Andrew, and other G.H.O.S.T. scientists collected radar and seismic data on Thwaites in Jan 2023

Aesthetics[10,12]
What role does beauty play in feeling, especially in communicating the emotional impact of the climate crisis? Aesthetics as an access point. Beauty for its own sake.

Ice crystals[11]
Ice is formed from the crystallization of water molecules, which assemble into sheets of tessellated hexagons

Coherence
mesh, collectivity, alignment of (polarized) signals (used in ice fabric analysis)

Records of Transformation[18]
Cyanotype, ice melt, sound, video, data, delO18 records

Interfaces[9.13]
The place at which independent and often unrelated systems meet and act on or communicate with each other, ice-bedrock, ice-ocean

Embodiment
Bodies in data, bodies as data, bodies of ice, embodied ways of knowing, embodied stress, feminist glaciology

Multipass radar measurements
Repeating the same profiles over and over to measure vertical deformation of layers recorded in the ice sheet.

G.H.O.S.T.[17]
Acronym for Geophysical Habitat of Subglacial Thwaites, an NSF- and NERC-funded project to study the interaction between Thwaites glacier and the ground beneath it

Polarimetric radar measurements[1]
Measured ice fabric of Thwaites Glacier using Autonomous phase sensitive Radio Echo Sounder (ApRES)

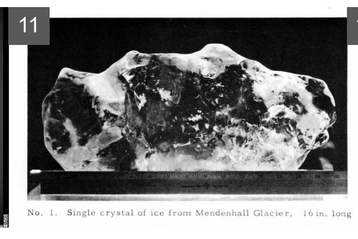
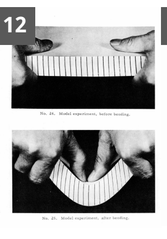
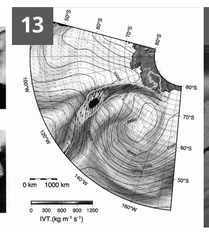
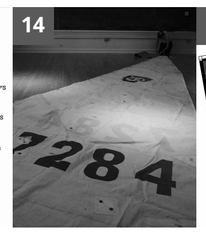
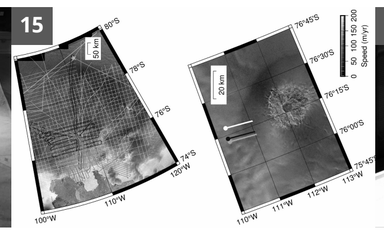
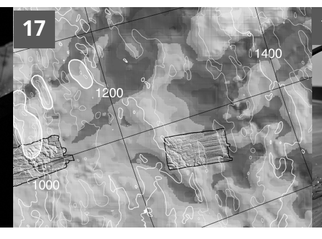
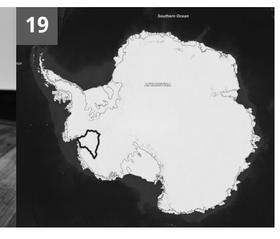
Frozen Bodies
Booklet of body outlines used during 2022-2023 fieldwork to visually document relationships between gender, dissociation, body, and fieldwork; turned into an essay published in the Journal of Autoethnography

Influences
Sources, materials, writing, art, movements that tie into this work

Questions
What motivates this work?

Methods
How are we researching, experimenting, processing, making, exchanging, and communicating?

Concepts
The broader ideas that ground or emerge from our work

Raw Material
Data, code, physics, past research, images, art supplies, etc.

Outcomes & Objects
Outputs, physical and digital manifestations of our work, and new questions/directions