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ARCTIC ICE

A visual archive of a unique collaboration among Cy Keener, Justine Holzman, Ignatius Rigor, and John Woods.

Integrating field data, remote satellite imagery, scientific analysis, and multimedia visual representation to document Arctic ice that is disappearing due to climate change, this artwork is the outcome of a four-year collaboration involving art, design, and polar science between artist Cy Keener, landscape researcher Justine Holzman, climatologist Ignatius Rigor, and scientist John Woods. With this work, Keener and Holzman's goal is to make scientific data tangible, visceral, and experiential. They ask how artistic and creative practices can contribute to scientific endeavors while making scientific research visible to the public.

What is unique about this art based on scientific data is that Keener and Holzman were involved in the design and construction of the tools that collected the data as well as their placement in the environment. According to Ignatius Rigor, "the data-collecting instruments are themselves hybrids of art and exquisite engineering." Rigor is a polar scientist at the University of Washington who has long worked with John Woods, the country director at the Office of Naval Research. Together, they manage the International Arctic Buoy Programme, which is responsible for coordinating the deployment of weather and climate instruments on the Arctic Ocean to maintain a 30-year-record of Arctic climate data.

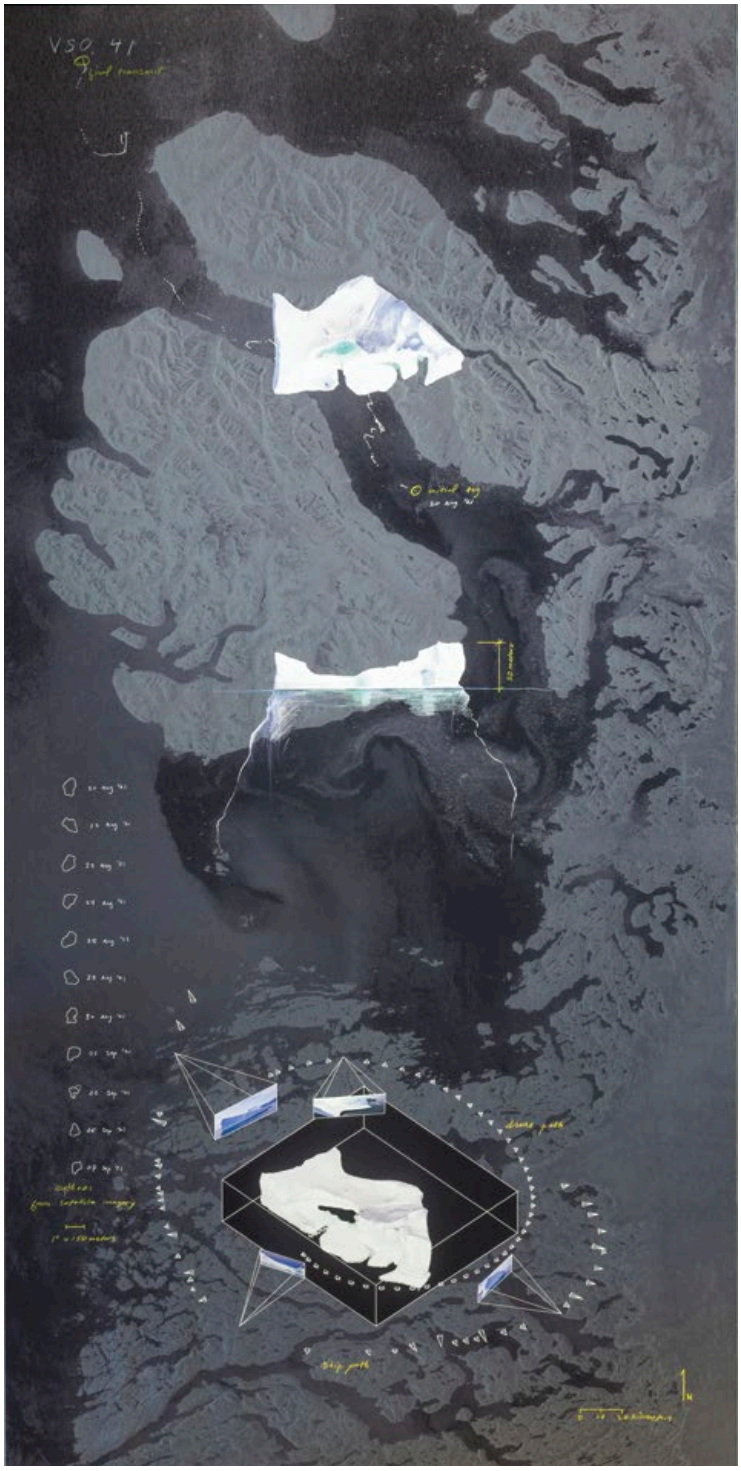
In 2018, Keener reached out to Woods, who brought Rigor into the conversation, to discuss their mutual need for drifting buoys. The two scientists required the buoys for scientific research, but Keener wanted to gather source material for an artistic investigation. Over a six-month period in 2019, the artists worked with the scientists to develop a Light and Ice Mass Balance buoy that could take measurements in floating sea ice along a string of sensors. Light and easy to deploy—befitting the extreme conditions—the buoy gathers data on sunlight, air pressure, and temperature as well as depth, which are used to estimate the growth and melt of sea ice, called ice mass balance. Rigor admired the buoy: "The hull that protected the electronics of the LIMB buoy was so exquisite, I thought it was a crime to leave this instrument on the remote confines of sea ice to never be seen again."

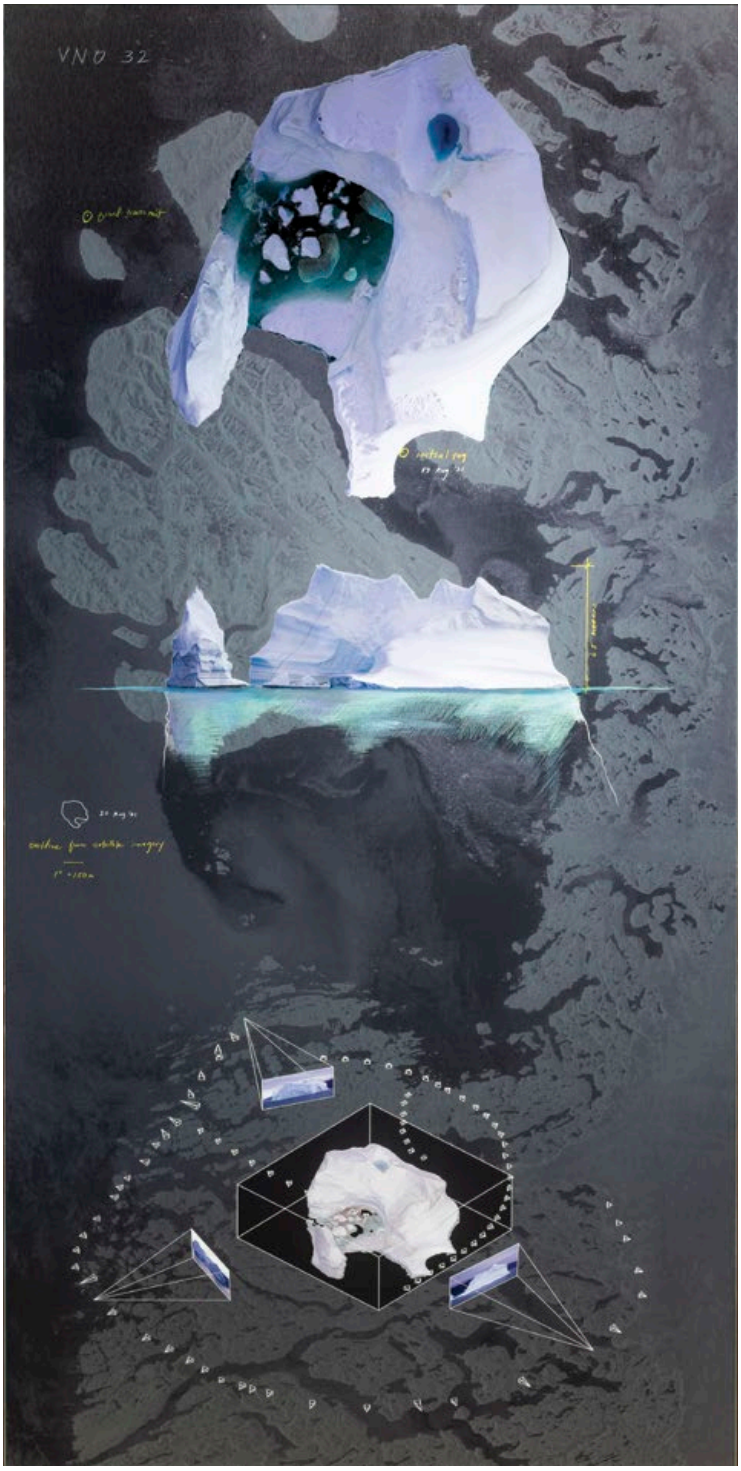
Being deeply embedded in each other's processes created a logic loop that fostered new ideas and unexpected outcomes. Rigor put it this way: "Cy and Justine's work uses science to inform their art, which in turn informs science, creating more questions and a cycle where engineering, art, and science interact to expand our knowledge." This blending creates alternative perspectives on the collection and representation of environmental data that help viewers to better understand the physical, experiential, and technical landscapes of climate science.

The exhibition *Arctic Ice: A Visual Archive*, opens on September 15, 2022, at the National Academy of Sciences and will remain on view through February 15, 2023.

Images courtesy of Cultural Programs of the National Academy of Sciences and the artists.

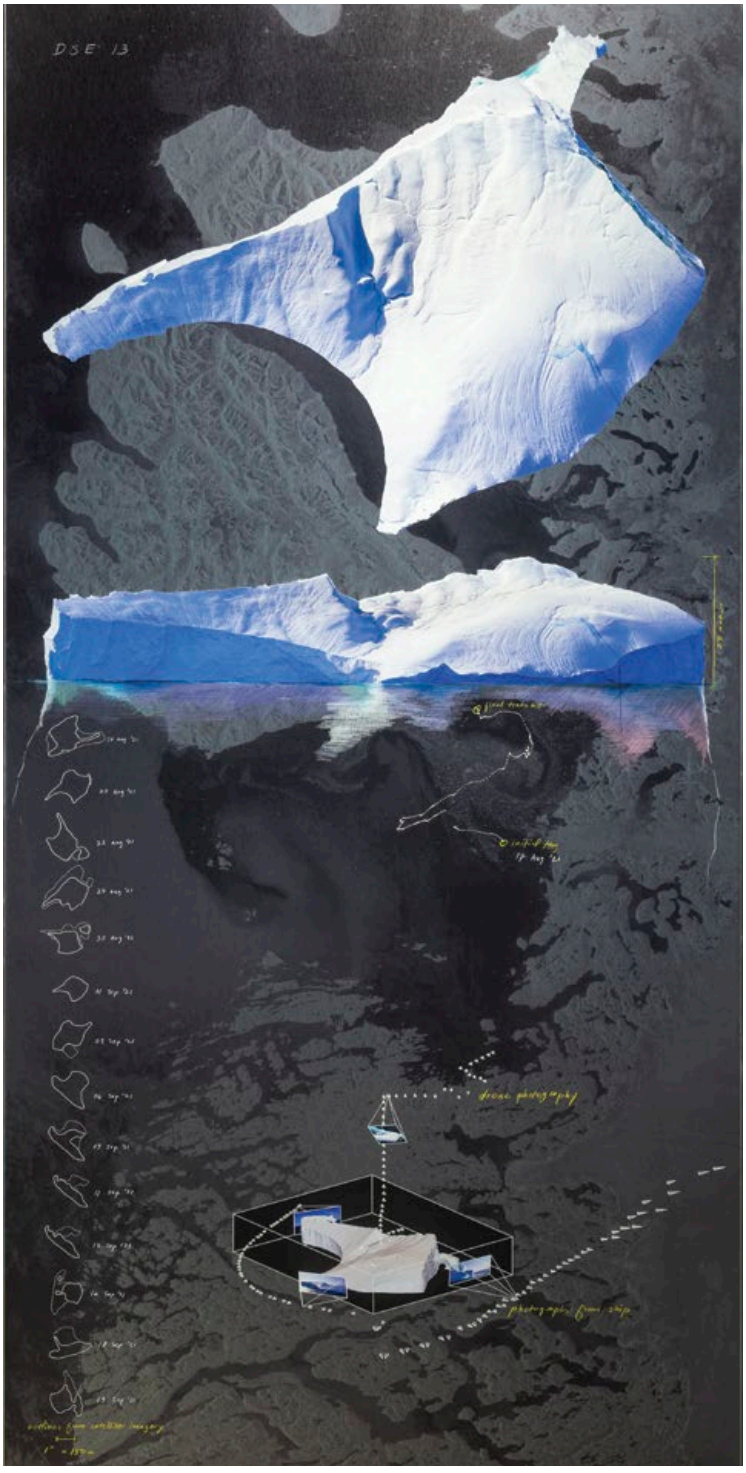
Sea Ice Daily Drawings, 2019–2022, aluminum, acrylic, paper, and ink (detail)





Iceberg Portraiture, 2022, aluminum, ink, and wax pastel, 84 x 42 inches each

The *Iceberg Portraiture* series shows how icebergs undergo constant change as they journey from glacier to fjord to coastal islands to the ocean beyond. The icebergs recorded have vastly different scales and shapes—some the size of a car and others a third of a mile wide. The series combines a range of digital capture and scale



drawing techniques to provide a glimpse into the life of four icebergs observed and recorded in August of 2021 in western Greenland. The background of the drawing is a synthetic aperture radar composite of Disko Bay, where the icebergs were documented and tagged with GPS trackers. The path of each iceberg—from initial tag to final transmit—is geospatially referenced on the map, where their locations can be seen mingling with the flows and swirls of other icebergs in the bay. Scaled outlines drawn from satellite imagery are arranged on the lower left edge, showing an approximated shape of the iceberg above and below (dashed lines) the water as it changes over time.

Sea Ice Daily Drawings, 2019–2022, aluminum, acrylic, paper, and ink, 95 x 16 inches each

The *Sea Ice Daily Drawings* show subtle temperature and color variation throughout a vertical profile of air, sea ice, and ocean in the Arctic, creating an archive of sea ice change over time. Sea ice forms on the surface of the ocean during winter in the Arctic and Antarctic. These drawings represent sea ice that is about 5 to 6.5 feet thick, a measurement meaning that the ice has survived a prior summer and is considered multi-year ice. Before the 1980s, the surface of the Arctic Ocean was covered with this thick multi-year ice. Since then, ice surviving 3 to 5 years has all but disappeared. Multi-year ice of the kind documented here is predicted to disappear by the middle of the century. Behind the daily representations of sea ice cores, inscriptions mark additional data on archival paper. Written in ink from bottom to top: the latitude and longitude coordinates of the device; a line demarcating ocean from ice; the overall sea ice extent in the Arctic on the corresponding date according to satellite analysis performed by the National Ice Service; and measurements of carbon dioxide in the atmosphere.