



## The Hearts in the Ice Mission: Lessons Learned From Arctic Citizen Science Partnerships

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# The Hearts in the Ice Mission: Lessons Learned From Arctic Citizen Science Partnerships



AURORASAURUS  
Reporting Auroras From the Ground Up



**HURTIGRUTEN EXPEDITIONS**

Hilde Fålun Strøm, Hearts in the Ice; Dr. Liz MacDonald,  
NASA/Aurorasaurus; Dr. Verena Meraldi, Hurtigruten  
Expeditions

Moderator: Laura Brandt, Aurorasaurus/NM Consortium

# Citizen Science Overview & Statistics

- 2 Women – Hilde Fålun Strøm / Sunniva Sorby  
– Polar Ambassadors
- 1st All-Woman Team to Overwinter at Bamsebu (2019-2020)
- 140 KM Away From Civilization
- 1 Trapper's Hut – No Electricity or Running Water
- 2020-2021 – Another 90 Days of Complete Darkness!
- 7 Citizen-Science Projects
- More than 100,000 Students Connected Globally
- 1 Mission – To Engage our Global Community in the Conversation Around Climate Change and What Each of Us Can Do





## Hilde Fåln Strøm

Sunniva Sorby and Hilde Fåln Strøm spent the last two winters isolated in Svalbard in an historic trapper's hut called "Bamsebu" surrounded by polar bears and total darkness.

In a changing climate, Sorby and Strom aim to provide content and inspiration to reconnect us with the natural world around us, to be curious and to protect it.

They engaged with students worldwide through monthly calls on the YouTube based Exploring by the Seat of Your Pants platform, and collected valuable citizen science data as on the northern lights, marine plastics, cloud formations, ice, ocean water, phytoplankton, and wildlife.



Photo by Hearts in the Ice

“Climate change does not take a break so neither are we. Our work is more relevant and vital during the pandemic with reduced field research being done.”

—Sunniva Sorby, HITI



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Dr. Liz MacDonald, Laura Brandt,  
Dr. Matt Heavner

Hilde and Sunniva made regular aurora & rare cusp aurora observations, and participated in a NASA sounding rocket launch studying aurora.



Artificial aurora, rocket citizen scientist photos by Hearts in the Ice

“When the text came in ‘ready to launch in seven minutes’ we dressed like firemen and we were out the door as quickly as possible....to experience all of that colour in the sky, exposed as we were with the cold, the wind, thoughts of Polar Bears, us in the dark—we felt so very privileged!”  
—Hilde and Sunniva



# FJORD PHYTO

POLAR CITIZEN SCIENCE PROJECT

## Allison Cusick, Scripps Inst. of Oceanography

Hilde and Sunniva sampled phytoplankton under extreme polar night conditions for later analysis by FjordPhyto researchers in the lab.

- Genetic data from samples can track changes in the populations species diversity through the polar night.
- Especially valuable during a time when research data is very limited.



*"We are so thrilled Sunniva and Hilde are bringing awareness to the poles and have partnered as Citizen Scientists with FjordPhyto! The polar regions are dynamic and changing fast. These changes affect the biology of the ecosystem, starting with the food source – phytoplankton." – Allison Cusick, FjordPhyto Project Lead Scripps Institution of Oceanography*

 **SCRIPPS INSTITUTION OF OCEANOGRAPHY**  
UC San Diego



Photo: Allison Cusick



## Marilé Colón Robles, Project Scientist

Hilde and Sunniva made regular groundtruth cloud observations

- When snow and ice are on the ground, it is difficult to distinguish between snow, blowing snow, ice, and clouds
- Satellites also do not report types of clouds
- Some instruments onboard different satellites have a hard time distinguish between clouds and haze



Tweet: GLOBE

# HURTIGRUTEN EXPEDITIONS

## Verena Meraldi, Chief Scientist

Hurtigruten Expeditions facilitates guest participation in 9 Arctic and Antarctic citizen science projects and communicates citizen science to the public

- Has a new exhibit on some ships that features Hearts in the Ice
- Hilde has worked with Hurtigruten Svalbard



Photos: Hurtigruten Expeditions

Next: Q&A

We'll ask some questions  
of each panelist

Then, we'll open the floor  
to your questions!

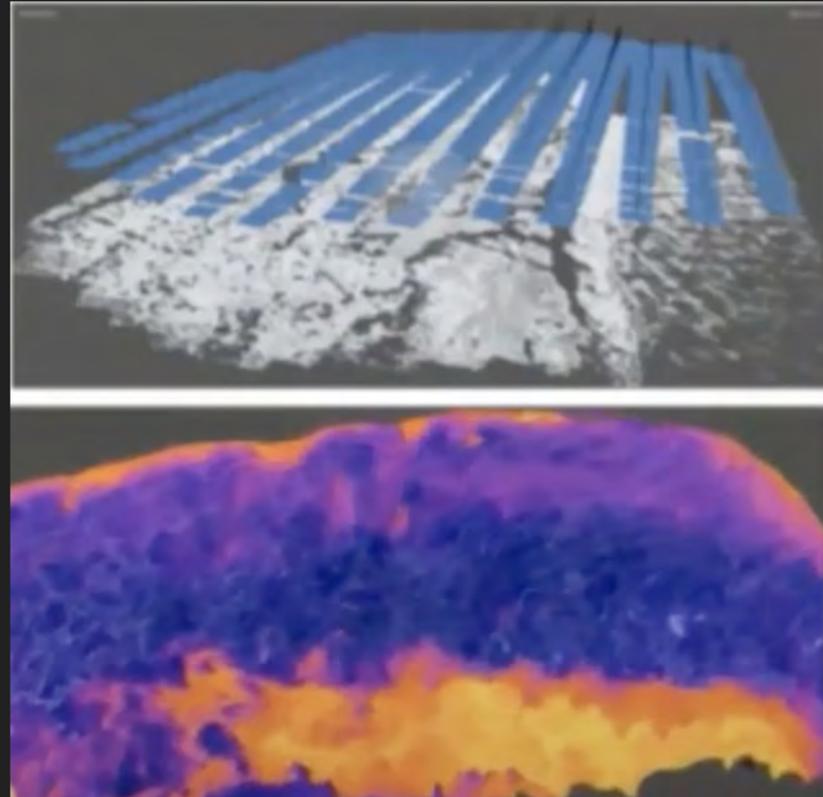


Backup

## Eric Saczuk, BCIT Remotely Piloted Aircraft Systems Hub

Hilde and Sunniva completed regular drone flights from Bamsebu

- Images from pre-programmed flights were stitched together to create 3d terrain reconstructions
  - Both in real color and in thermal
- Mapped glacial surface temperatures over time to track climate change
- Mapped freshwater entering marine environment
  - Attempting to correlate with phytoplankton concentrations





## Jon Aars, Norwegian Polar Institute Polar Bear Monitoring Programme

Trained Hilde and Sunniva to make polar bear observations at Bamsebu:

- Reproduction and condition data for a specific female
- Samples of scats (droppings) from a few bears in the area, for later DNA analysis
- Observations on polar bear predation on reindeer

These and other observations add valuable data increasing our understanding on polar bear ecology and feeding ecology in particular



Photo: Hearts in the Ice

“The Polar Bears have found their way up to our hut, walking along this shoreline scattered with kelp....They must be so hungry at this time since there is no ice → no seals → no food. We know they eat kelp, proof of this showed up yesterday with a clump of Polar Bear poop – so we collected a sample for Jon Aars at Norsk Polarinstitutt.”

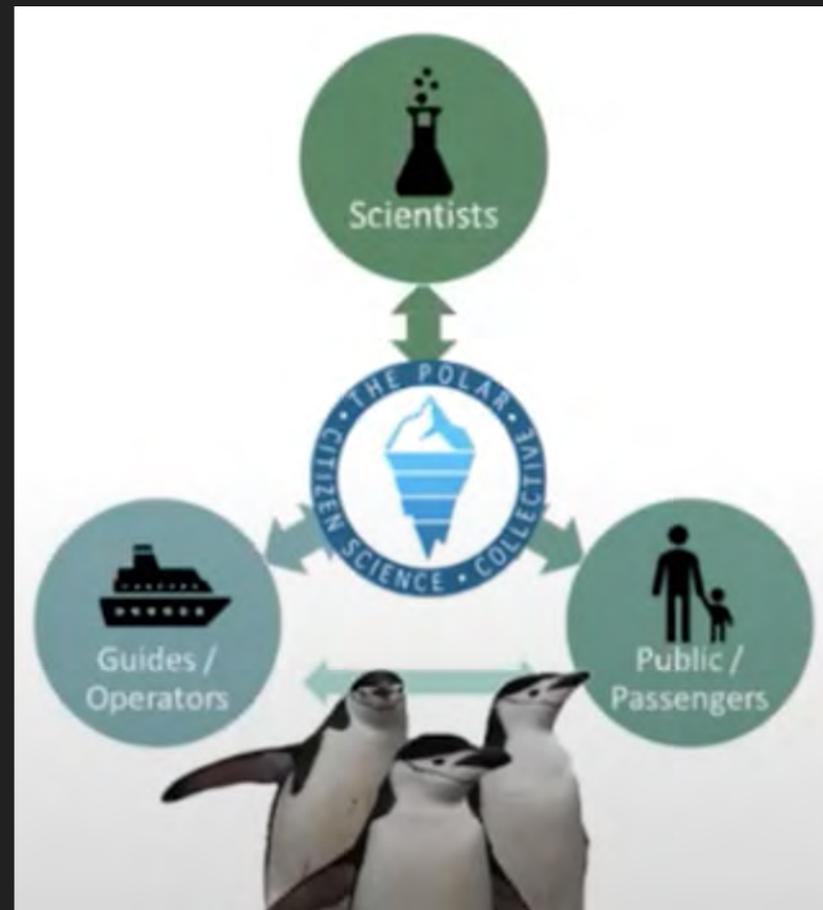
—Hilde and Sunniva, 1.6.2021 blog post



## Laura Smith, Polar Citizen Science Collective

The Polar Citizen Science Collective

Similar to Hearts in the Ice, is polar-focused  
Coordinates citizen science participation in polar regions



Graphic: Laura Smith

# Citizen science as disruptive innovation

- Project to reach out to amateurs as a way to help with our problem of a dearth of data
- eBird in Space
- New audiences

Calling  
Citizen  
Scientists  
Everywhere!

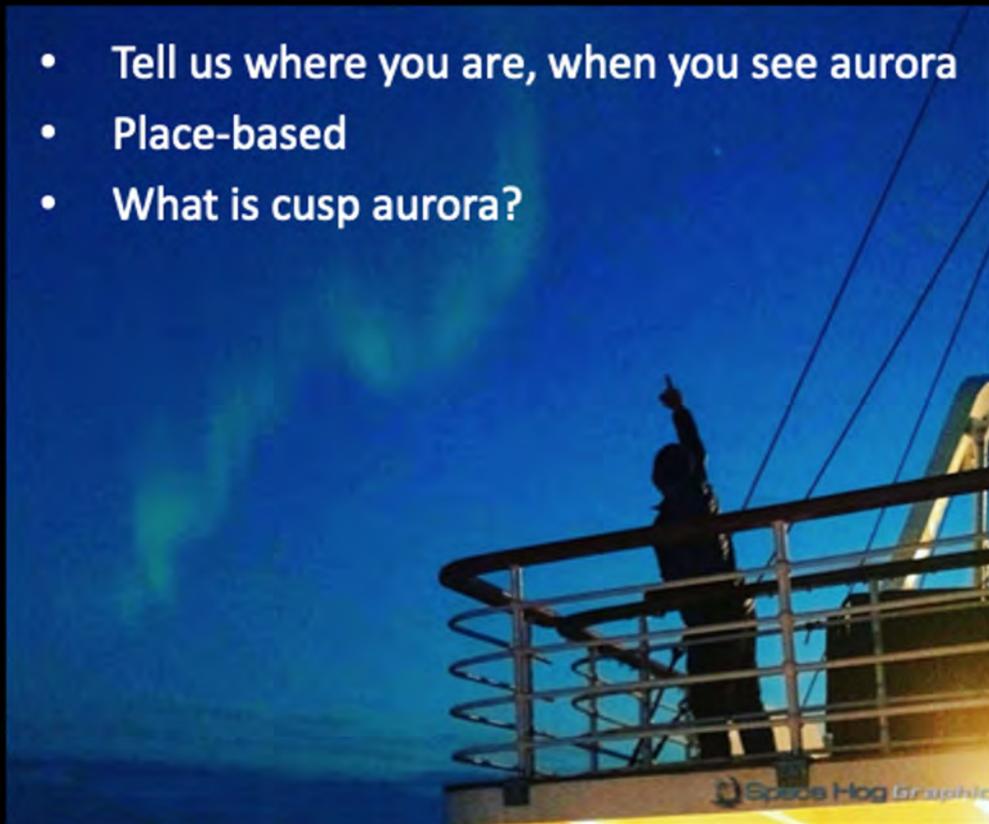
Help NASA track  
the aurora at  
[Aurorasaurus.org](http://Aurorasaurus.org)

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conversation  
with @tweetaurora  
and download  
the iOS, Android apps  
[aurorasaurus.info@gmail.com](mailto:aurorasaurus.info@gmail.com)



# Aurorasaurus observations

- Tell us where you are, when you see aurora
- Place-based
- What is cusp aurora?





Past explorers had measured aurora and magnetism in the north.

Photo of Carl Størmer and assistant

100 years ago - Photos and a network across Norway measured the height of aurora

Now we can measure the particles causing aurora from space and effects on modern technology



# In total 2019-2020

- Auroras observed from 10-24-19 – 3-16-20
  - 400 GB, ~40,000 photos on 30 days;
  - 1 Oct, 9 Nov, 7 Dec, 10 Jan, 2 Feb, 1 Mar
- 8 days of cusp aurora 12-10-19
  - 1-22-20
- Rocket observation 12-10-19

Photo: Hearts in the Ice



**“Each of them in his own tempo and with his own voice discovered and reaffirmed with astonishment the knowledge that all things are one thing and that one thing is all things—plankton, a shimmering phosphorescence on the sea and the spinning planets and an expanding universe, all bound together by the elastic string of time. It is advisable to look from the tide pool to the stars and then back to the tide pool again.”**

**—Steinbeck, *Sea of Cortez*, p.178**



Photo: Hearts in the Ice