Emerging Voices

Getting Comfortable with Uncertainty: Lessons from an Arctic research station

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Introduction

Before I started my year of ethnographic fieldwork here in Abisko (68.3495° N, 18.8312° E) at the scientific research station, my plan was to work with Arctic environmental scientists to see what collaboration means to them and how they practice collaborations. My hope was that this could give a picture of how expertise about Arctic climate change is developed and stabilized. Since arriving here, as often happens during a period of extended fieldwork, I have found that there are more reflective strands to follow if I am looking to get a picture of how Arctic climate science expertise is formed, especially if I am interested in also grasping the relationship between Arctic science and society.

Collaborations are everywhere in the production of environmental science in the Arctic, whether that be between scientists, with Sami partners, or even with cooperative or unpredictable weather conditions. With collaborations being so wide-reaching, what becomes interesting is what necessitates, drives, forms, and resists collaborations between those working to know how Arctic environmental systems work. My thinking on this subject is still in process as I emerge from the weeds of the halfway mark of my fieldwork. However, I'm beginning to see how following *uncertainty* brings my attention to the meat in between collaborations tethered to the production of expertise at the Abisko Scientific Research station. So, where is following uncertainty at an Arctic research station bringing me so far?

Uncertainty is arguably what drives environmental science forward. At a field station, uncertainty pushes scientists to get closer to the best possible understanding of environmental phenomena using the tools and methods known and available. While uncertainty drives scientific disciplines forward, it also highlights the limits of all knowledge systems. But rather than being a void, these limits can serve as fertile ground for collaboration—not only across academic disciplines, but across approaches to knowing Arctic environments more broadly. There are signs of some initiatives in

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this direction, as discussions around what it means to collaborate ethically with Sámi and local communities and come to the fore, but there is also an acknowledgment amongst many of the scientists I spoke to that there is a lot of work left to do to build relationships and reorient the environmental science.

In turn, uncertainty in science shapes scientists who must learn to form judgments, whether that is choosing which variables to include in a model, deciding where to take a soil core, or fostering diverse collaborations. Moreover, even the most basic decisions in the field, such as which day to go out, remain uncertain until the weather is known, and even then, it can change, requiring adaptability in research plans.

While evidently a condition of the practice of science, uncertainty is notoriously difficult to communicate. As one ecologist at the Abisko Scientific Research Station shared in an interview, "The public cannot handle the degree of uncertainty that exists in the science we do". In the environmental sciences, a lot of work goes into the practice of assigning and managing uncertainty, which also requires training to do well. However, in public communications of science, findings are often presented as pure fact, and pass over the uncertainties or limitations of scientific findings, reflecting the sell-ability of attention-grabbing headlines and fears that uncertainty will make people doubt science. Arguably, this gap between environmental scientists and the public places the relationship between science and the public on fragile terrain, as uncertainty is an inherent part of science for those inside the scientific world and potentially an indicator of scientific incompetence for those of us on the outside.

While many scientists I interviewed equated good scientific practice with an ability to speak with uncertainty in scientific papers, seeing uncertainty as a constant companion rather than a failure to be eliminated, some shared that uncertainty is sometimes glossed over in scientific papers as well. At the same time, the rise of scientific meta-analyses points to a growing reflexivity within science. For example, Metcalfe et al.'s 2018 paper, "Patchy field sampling biases understanding of climate change impacts across the Arctic" which shows that thirty percent of citations on Arctic climate change come from just two locations, Abisko and Toolik Lake, highlights that there is a need for more diverse sampling locations across the Arctic for climate projections to represent the diversity of the Arctic. At the same time, the extensiveness of scientific research in Abisko has made it possible to understand mechanisms of Arctic ecosystems more deeply than would be possible in less accessible and equipped Arctic field science locations. Fundamentally, uncertainty is an inherent part of environmental science, and something that within and outside the scientific community, requires willing engagement.Moreover, in the career of an environmental scientist, access to funding is another type of uncertain terrain, leaving projects and the people behind them in sometimes precarious positions as funding applications become an ever-greater part of a scientific career. There are many approaches for increasing the chances of receiving funding, many of which lean on perceived uncertainties in society, be that the effects of climate change or more specifically how the Arctic tips the scales. The Arctic is often referred to as a "bellwether region" or "harbinger" of climate change, which in turn also attracts funding. As one interlocutor shared in a presentation, "In the funding world, Arctic is the new climate change". The environmental scientists I spoke to often mentioned finding a way to speak to funders' priorities while maintaining their scientific values.

While the buzz around the Arctic attracts funding to Abisko, some of my interlocutors were uncertain over whether Abisko is actually in the Arctic. Abisko is located at the border of tundra and boreal ecozones, making it neither if looking for the pure forms of either. This is also why Abisko is such an interesting place for scientists. Within a few kilometres of Abisko, it is possible to be in so many diverse micro-climates, some resembling inland Siberia, while others reflect ecosystems typically found at much lower altitudes. In turn, in scientific papers, arctic, subarctic, boreal, alpine, high altitude, and tundra are all used, reflecting the focuses of various scientific disciplines (Hustich 1979). At the same time, Abisko sits above the Arctic Circle, but as a Norwegian scientist who works at the station said to me, "As a Norwegian, it is difficult to classify Abisko as Arctic". The classification of Abisko as an Arctic place is much more uncertain than I knew and is tethered to political economic and scientific positionings of the place.

Finally, uncertainty describes not just scientific inquiry, but the broader socio-political and ecological conditions that characterize our world today. These uncertainties direct funding and inspire scientific projects, which transform the uncertain into the more predictable, despite retaining varying degrees of uncertainty. On the flip side, geopolitical uncertainty may also amplify scientific uncertainty. The loss of access to Russian permafrost data, for instance, has widened the margin of uncertainty in permafrost research (López-Blanco et al. 2024). As one interlocutor explained to me, "without Russian permafrost data, the margin of possibility is narrower than the margin of uncertainty" when predicting greenhouse gas release from the thawing ground. What this shows is that uncertainty in the world provides direction to scientific inquiry while geopolitical struggles also increase uncertainty in science.

Clearly, following uncertainty pulls our attention in many directions. Tracing uncertainty at the Abisko Scientific Research Station makes it possible to paint a grounded picture of what comes together to carry out the project of attempting to anticipate the future of Arctic environments and the far-reaching systems they impact. Hopefully, it can also tell an intimate and even relatable story of uncertainty that can make us all a little more comfortable with it, opening space for finding the generativity within it or what moments might require more critical attention.

Acknowledgements

This article is based on research funded by the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation program (Grant agreement No. 856543). This research has also benefitted from transnational access to the Abisko Scientific Research Station funded by the European Union HORIZON EUROPE through the EU Project POLARIN Grant Agreement ID: 101130949.

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