REACHING OUT FROM THE TOP OF THE WORLD

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It was a cold dark morning. Or perhaps it was the afternoon; looking outside, it was impossible to tell. The sun never broke over the horizon the day before, and it wasn't going to that day either. It was November 20 in the western Arctic and we were a few degrees above the north slope of Alaska, steaming east as the *R/V Sikuliaq* broke through freshly formed sea ice, on our way to the next research station (Fig. 1).

I was in the main lab, diligently ignoring my surroundings—the lack of sunlight, the bustle of activity around me, even the loud growling of the ice grinding down the hull. My focus was trained only on a little black box of sporadically updated statistics, the buffering rate of our measly satellite internet connection. I stared at it intensely, whispering positive affirmations to my computer, as if by my soft encouragement alone the numbers would perform better.

We were there in the Western Arctic in the late autumn with Dr Jim Thomson, an Oceanographer from the University of Washington's Applied Physics Lab, and his team of researchers to study the physical interactions of waves with the newly formed coastal sea ice. The goal was to explore a potential positive feedback loop between dwindling sea ice and increased wave heights and better understand how these elements impact the shoreline. More accurately, Thomson and his team were doing the studying; my partner and I were the outreach team, onboard to learn, document, and share the stories of their science with others.

Which is why I was so focused on that little box of numbers. We were about to be streaming a live video, at least I desperately hoped we would be streaming a live video, from the ship to classrooms all over North America via satellite internet (Fig. 2). The nearest satellite was due south of us, just barely peaking over the horizon, its timidity not making our job any easier. To maximize connection strength, we firewalled every other device onboard and directed all of the little kilobytes of internet into a single computer, hardwired to the network. And then we crossed our fingers.

On this end of the live stream was Thomson, explaining how he uses autonomous buoys launched from the ship to collect data about waves and ice and answering questions about life and work aboard a ship in the cold dark Arctic. On the other end of the live stream were 800 students, 11–18 years old, spread all across North America, wiggling in their classroom seats.

With a 3–2–1, we were live and Thomson introduced the students to our main lab space before walking them out on deck to see the equipment and snowy conditions. My partner and I followed behind with a tangle of wires connecting cameras, computers, microphones, and a very long cat5 cable.

It was a huge success. Thomson captivated his audience as he showed them hands-on science research and talked with researchers at work throughout the ship (Fig. 3). The students asked relevant and astute questions about the changing conditions in the Arctic today and why this science is important. The satellite connection held with few latency issues. And there was a fresh energy among the science team at dinner that night, despite the exhaustion of a 24-h sampling and observation cycle. It was exciting for them to be able to share their work, to offer a peak behind the curtain.

We hosted three live stream events on that month-long cruise, each one with its own themes and audiences. And each one was well worth the setup time and technology challenges. It felt almost impossibly productive to be able to reach out to so many students at once while so far from civilization. We got to expose them in a tangible and compelling way to the changes taking places in the Arctic, the research happening up there, maybe even some career paths in a field of science.

FIG. 1. The R/V *Sikuliaq* breaks through the ice on its voyage through the western Arctic in November 2019. Photo: John Guillote.

FIG. 2. Live streaming from the Arctic! Scientists discuss their work with students around North America during a live stream event organized and hosted by a professional outreach team. Photo: Mika Malila.

FIG. 3. Dr. Jim Thomson connects an acoustic release to a sea spider tripod, deployed to measure sea conditions at the intersection of waves and ice formation in Beaufort Sea. Photo: John Guillote.

And we, the outreach team, got the joy of seeing both the audience and the scientists energized and excited by the exchange. There seems to be a stronger emphasis on science communication today, an incentive (and in some cases, a directive) for scientists to educate not just their peers but a broader audience about their work. It's difficult for scientists to add another time-consuming task to an already overflowing plate of responsibilities. By having a professional outreach team onboard to manage the outreach component, Thomson and his team were free to focus on their research work without wondering if anyone had taken a picture of it or posted it on social media. It allowed the team to experience the joy and excitement of sharing their work with others—especially energetic students. And it made us all forget about the cold dark tedium, at least for a few minutes.

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