STEM Experience Report - Sarah R. Johnson

Resource *STEM Experience Report - Sarah R. Johnson (/resources/report/stem-experience-report-sarah-r-johnson)* has been updated.

The PolarTREC Field Experience

After two years of anticipation due to Covid-19 derailments, I spent 12 days in Utqiaġvik, Alaska as the education officer with the International Arctic Buoy Programme (IABP) from March 28-April 7, 2022. This was the 2022 IABP Utqiaġvik Spring Deployment under the National Science Foundation Award #1951762 Collaborative Research: Coordination, Data Management and Enhancement of the International Arctic Buoy Programme, and US Interagency Arctic Buoy Programme (USIABP) led by Dr. Ignatius Rigor, University of Washington and Professor Cy E. Keener, University of Maryland as co-primary investigators on this campaign. Also critical to the team is John Woods from the Office of Naval Research Global International Cooperative Engagement Program for Polar Research. Both of the University of Washington, Jim Johnson and Ben Cohen were also part of our team though Jim did not travel on this campaign.

Resource Details

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9 June 2022

Resource Type:
Report

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Arctic

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Arctic Ocean, Utqiaġvik, Alaska

Expeditions
International Arctic Buoy Program (/expeditions/international-arctic-buoy-program)

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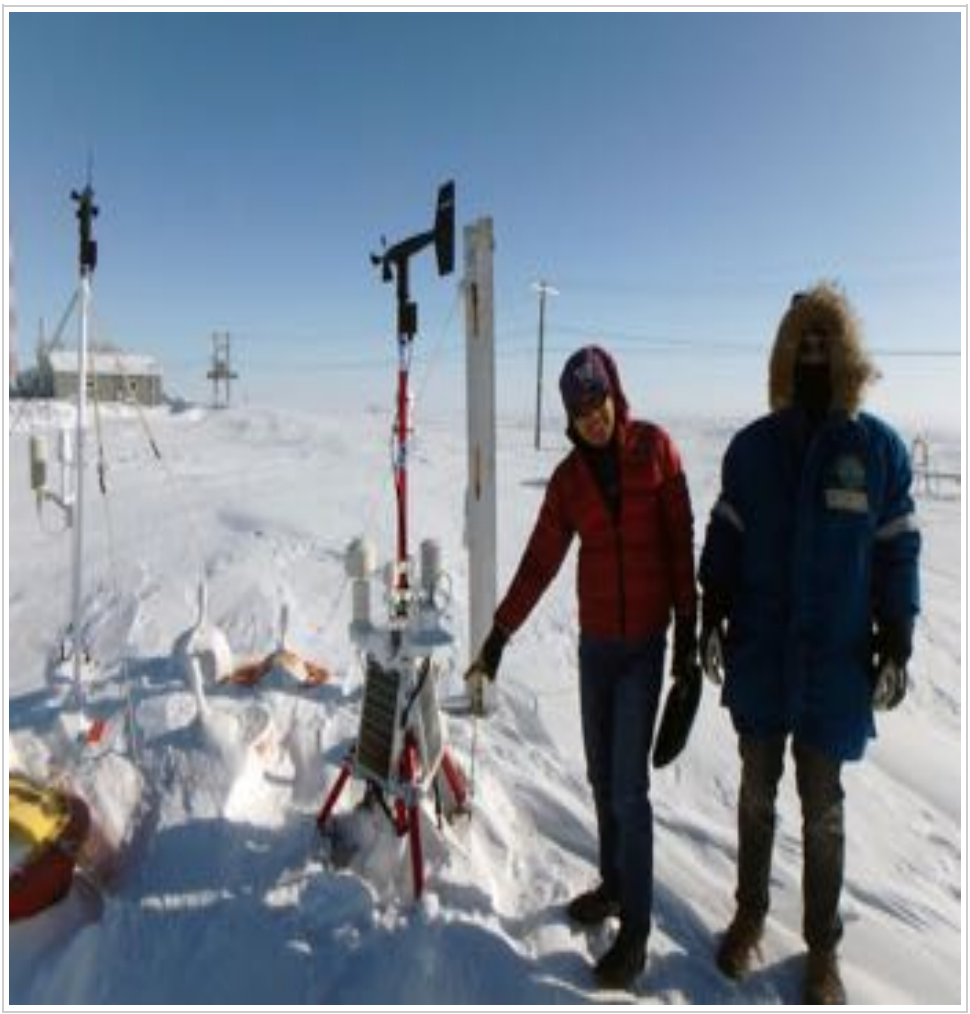
Sarah R Johnson collecting snow samples for Purdue University Shepson Atmospheric Chemistry Group's 2022 Chemistry in the Arctic: Clouds, Halogens, and Aerosols (CHACHA) campaign 100 miles offshore of Point Barrow Alaska on the Arctic Ocean. Photo by John Woods.

The mission of this IABP campaign was to deploy over a dozen observation buoys on the Arctic sea ice. In addition to deploying weather and sea ice observation buoys, we also conducted other science observations to assist collaborator scientists and researchers back home. One of these projects was to assist Ruth Branch, PhD at the Coastal Sciences Division of the Pacific Northwest National Laboratory, in doing some proof of concept research on available power in ocean currents just under the sea ice. We also collected snow samples from the surface of the sea ice 100 miles from shore for the Purdue University Shepson Atmospheric Chemistry Group's 2022 Chemistry in the Arctic: Clouds, Halogens, and Aerosols (CHACHA) campaign.

Sarah R Johnson drilling approximately 130cm through the sea ice to create 2in holes to install ocean current tilt meters. Photo by Ben Cohen.

During our spring campaign, we deployed 14 observation buoys, installed and then retrieved 3 ocean current tilt meters, collected snow samples on the sea ice, and maintained the IABP buoy test site on the tundra located between the Department of Energy Atmospheric Radiation Measurement site and the NOAA Barrow Atmospheric Baseline Observatory. These activities were done via snow machine tours out on the fast ice and a helicopter flight 100 miles off shore north of Utqiaġvik Alaska. This experience gave me direct first hand experience of doing field work on the Arctic sea ice.



Ignatius Rigor and Ben Cohen at the International Arctic Buoy Programme test site located between the Department of Energy Atmospheric Radiation Measurement site and the NOAA Barrow Atmospheric Baseline Observatory in Utqiaġvik, Alaska. Photo by Sarah R. Johnson.

The Importance of Educator/Scientist Collaboration

From my perspective, collaboration between educators and scientists is valuable to both parties. This was the subject of my 2016 graduate school thesis project; case studies of connecting educators and researchers through field sciences at biological field stations. Now, being in the shoes of the educator and being part of a science team has reminded me that I too am a scientist. Not only do I have a degree in biology with a strong emphasis in field science, and a masters degree in science education, I am a valuable member of the scientific community. Throughout the daily grind of work as a non-formal environmental educator, it is easy to get caught up in the details of program design, facilitation, event planning, budgets, marketing, and the rest, and forget about what it is that I was so fortunate to choose to study - the natural sciences. Granted, much of my PolarTREC experience has been focused in the oceanography, meteorology, and engineering design fields which have not been my previous expertise. This opportunity to expand my knowledge in these fields has been exciting, challenging, and inspiring to want to know more.

Our IABP team has always had a strong interest and desire to do outreach to share their science and also be part of training the future designers and scientists who will carry this work forward for decades to come. Bringing a PolarTREC educator into the team has expanded the teams' outreach strategies, facilitation techniques, incorporated proven pedagogy practices, and overall improved the effectiveness of all IABP STEM outreach projects. The science team has welcomed me into the team along with my educational expertise as well as my inquisitive curious mind trying to best understand the science and expedition practices. My questions have created numerous opportunities for the team to have to more simply explain things, avoid speaking in acronym soup, and clearly describe the IABP in ways a general audience can better understand.

The Science Explained

The IABP has been collecting weather and sea ice condition observations of the Arctic Ocean since the 1970s using drifting buoys. The buoys contain electronic microcontrollers and instruments that measure and communicate air temperature, air pressure, geographic location, and time. The data collected is transmitted through Iridium satellites and is then incorporated into world weather models that inform the daily weather forecasts around the planet. Some buoys are more advanced and include instrumentation to measure temperatures along a vertical profile of the sea ice and ocean water, in addition to light penetrating and transmitting through the sea ice.

IABP team 100 miles north offshore from Point Barrow deploying buoys with the assistance and partnership of the North Slope Borough Search and Rescue helicopter and pilots. Photo by Art

Dyer.

Buoys are deployed across the Arctic Ocean each spring, summer, and fall in various locations by the participants in the IABP in an effort to collect as much observational data as possible from every region of the ocean. Deployments are conducted via snow machine, helicopter flights, icebreaker cruises, and from large aircraft with parachutes attached to the buoys. The buoys are primarily placed on multi-year sea ice and then drift in the ocean currents and are carried by the wind across the Arctic ocean. Individual buoys continue to transmit data for 2-3 years depending on the environmental conditions and battery life.

Sarah R Johnson ready to deploy an ice ball buoy on the sea ice along a 100 mile transect line north of Point Barrow. Photo by Ignatius Rigor.

This more than 40 year record of weather and sea ice observations is one of the longest consistent Arctic Ocean data sets available for climatologists, weather forecasters, remote sensing experts, and sea ice researchers to utilize in their analysis and research at various geographic and temporal scales.

Connecting Arctic Weather and Sea Ice Conditions to the People

It has been my goal to find relevant ways to connect the science of the IABP to the people living in landlocked intercontinental North America (i.e. Colorado, etc.). As I have come to understand how the observation data is shared almost instantaneously with the World Meteorological Organization and world-wide weather model experts, it has become clear that the data collected in the Arctic Ocean is informing the daily weather forecasts everywhere across North America and the entire northern hemisphere. Weather forecasting accuracy has improved over the decades, and with the consistency and increasing volume of data from Arctic Ocean buoys, the weather models and forecasts continue to improve. The Arctic buoy data is critical to our understanding of the planet as well as helping us make informed plans for our weekend outings and adventures.

Who Have I Reached

As a nonformal educator and interpreter, Wild Rose Education's primary audiences have evolved over the past couple years as we have lived through a pandemic. I have used interpretation and education strategies to share this Arctic science and expedition with people through live virtual programming, blog posts, email campaigns, social media, radio and podcast interviews, newspaper stories, community library programs, and numerous informal interactions.

Early on as a PolarTREC educator with the IABP team, I incorporated Dr. Ignatius Rigor into the 2020 Youth Water Leadership Program virtual events with over 50 youth and young adults across western Colorado. Also in 2020 I supported the team to transfer an in-person Arctic STEM program for 20 Navy Sea Cadets (high school youth) to a virtual learning experience. Then in 2021, I worked with the team teaching an additional 40 Navy Sea Cadets across the USA.

Utilizing my Wild Rose Education network, email communications have reached over 5000 contacts (most of whom are educators) across Colorado and the entire United States inviting people to follow the PolarTREC Journals, listen to radio pieces, follow social media, watch the PolarConnect live stream event, and attend local community programs. I also invited thousands of others through the many state and national professional networks I am actively part of.

Ignatius Rigor and Sarah R. Johnson at KBRW Top of the World Radio in Utqiaġvik, Alaska. Photo by Sarah R. Johnson

While in Utqiaġvik Alaska, we engaged with KBRW, Top of the World Radio and were interviewed during the morning news hour about our science and the purpose of the IABP. We also were interviewed for the new UIC NSF Science Sessions podcast that will also be aired on KBRW across the North Slope of Alaska (size of Utah) in the coming months. These radio pieces reach numerous people across very rural geographically dispersed cabins and villages.

IABP team being interviewed by Eben Hopson for the National Science Foundation Arctic Science Sessions podcast at the UIC Barrow Arctic Research Center in Utqiaġvik, Alaska. Photo by Sarah R. Johnson

Upon returning from Utqiagvik Alaska, I did an interview with KDNK Community Radio and the Andy Zanca Youth Empowerment Program for a half hour public affairs show and podcast that was aired across the entire Roaring Fork Watershed (size of Rhode Island) and beyond. I facilitated 8 in-person public library community programs at the end of May 2022 reaching over 120 people. This kicked off their 2022 Summer Reading: Oceans of Possibilities programming. These library programs also incorporated the IABP Float Your Boat outreach project. My graduate school alma mater, Hamline University has created a broad reaching news story highlighting this PolarTREC experience. The Sopris Sun (local weekly newspaper) is also spotlighting my Arctic expedition in June 2022.

Sarah R. Johnson sharing her Real-Time Science: Observing Arctic Weather and Sea Ice presentation at the Carbondale, Colorado Library in May 2022. Photo by Alex Garcia-Bernal.

Sarah R. Johnson with a IABP teaching buoy at the Glenwood Springs Library in Colorado in May 2022. Photo by Alex Garcia-Bernal.

Associated Polar Science Learnings

In addition to the International Arctic Buoy Programme, PolarTREC has offered me opportunities to learn about other Arctic interests and initiatives. Also being a PolarTREC Educator has given me confidence and a new title to show up and represent in ways I would not have otherwise. These have included:

- PolarConnect events from fellow PolarTREC educators
- Virtual learning sessions and webinars with polar experts
- ARCUS Community and Citizen Science in the Far North virtual workshop
- IARPC Teams: Arctic Observing Systems, Sea Ice, Arctic STEM Education Working Group
- International Cooperative Engagement Program for Polar Research
- UNFCCC COP26 Cryosphere Pavilion in Glasgow, Scotland

Inuit traditional dancing during Cryosphere Cèlidh: Inuit Night on November 5, 2021 at UNFCCC COP26 Cryosphere Pavilion in Glasgow Scotland. Photo by Sarah R. Johnson

Future Polar Science Activities Education

This PolarTREC experience has introduced me to numerous professional networks, people, and possibilities. I have been inspired to want to learn about the Arctic and dig into specific interests and pathways I was not aware of before. It feels like the door has

been opened and the invitations offered. Specifically, these are a few of the ways I plan to stay engaged:

International Arctic Buoy Programme

- Float Your Boat program coordination and expansion to polar educators
- Youth STEM Arctic Buoy programs in collaboration with partner organizations
- Navy STEM Outreach program design and facilitation proposal
- National Geographic Explorer proposal

Cryosphere Professional Associations and Networks

I have joined in and participated with these organizations and plan to continue to participate and potentially contribute in years to come:

- Arctic Research Consortium for the United States (ARCUS)
- Polar Educators International (PEI)
- Interagency Arctic Research Policy Committee (IARPC)
- The Polar Science Early Career Community Office
- International Cryosphere Climate Initiative
- Association of Polar Early Career Scientists (APECS)

Conference and Science Meetings

- Colorado Alliance for Environmental Education annual conference, 2022
- North American Association for Environmental Education annual conference 2022
- Colorado Association of Science Teachers annual conference, 2022
- American Geophysical Union (AGU) annual meeting, 2022

Expectations, Outcomes, and Reflection

My goals and expectations for my PolarTREC experience have been met and exceeded in numerous ways. I set out wanting to become a more recognized leader in science and environmental education, be part of big science through field observations, expand my professional network into the cryosphere science community, learn as much about the Arctic landscape as possible (from the rocks to the politics), and be able to understand and then communicate the ‘so what’ of it all to the world. I think this has begun and will continue for years to come.

I see this as a beginning to a future that is bigger than I yet understand. My world has begun spinning into a direction of new things I can not yet fully see. I am part of an Arctic science team. I am a leader in education. I am a climate educator. I am enamored with dramatic landscapes and I get to be an ambassador for them.

IABP team walking across Arctic Ocean sea ice just offshore of Barrow Point, Alaska. Photo by Ignatius Rigor.

I have been imprinted by the Arctic Ocean and sea ice. Even though it was only a short expedition in Utqiaġvik Alaska, this place has become part of me and I have become part of it. I experienced a part of the world that very few people ever will see first hand. I think it may have stirred something huge in me that may be leading me to do something huge in return. This place and experience penetrated my being. Places become part of our stories and our stories become part of places; this place, its land, the sea, the people, the history, today, and everything in between.

Sarah R. Johnson viewing the Arctic Ocean from a helicopter nearly 100 miles offshore of Point Barrow, Alaska. Photo by Cy Keener.

I have been welcomed into and become an integral part of a science team that is essential to the world's collective understanding of the Arctic Ocean and sea ice. I have contributed to the scientific community to better understand how the Arctic Ocean works and how it is changing through first hand observations and data collection. Working at this scale is a bit overwhelming when I sit back and actually try to digest it. The planet is on fire! And I am actively part of one of the many teams who are telling this story in relevant accessible ways that hopefully leads to people world-wide changing their consumptive behaviors. I want to work in this field of Arctic science for a long time into the future. What a tremendous gift this has been.

Sarah R Johnson soaking up the last day in Utqiaġvik, Alaska laying on the Elson Lagoon snow and ice. Photo by Ignatius Rigor.

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