Witness the ARCTIC

Chronicles of the NSF Arctic Science Section | Spring 2016, Volume 20 Number 2

In this Issue

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ARCUS Member Highlight: UIC Science

Note: "Witness the Arctic" regularly features the research and related programs of ARCUS member institutions (https://www.arcus.org/arcus/member-institutions). This article spotlights UIC Science, located in Barrow, Alaska.

UIC Science (http://www.uicalaska.com/) is a subsidiary of the Ukpeaġvik Iñupiat Corporation, the village corporation for Barrow, Alaska formed under the authority of the Alaska Native Claims Settlement Act of 1971 (43 U.S.C. 1601). As such, UIC is a privately held company with the expressed mission to enhance shareholder value through business, educational, and employment opportunities guided by our core Iñupiat values of:

Compassion – Avoidance of Conflict – Love and Respect for our Elders and One Another – Cooperation – Humor – Sharing – Family and Kinship – Knowledge of Language – Hunting Traditions – Respect for Nature – Humility – Spirituality

UIC Science has been administered in various places within the corporate organization chart since 1996, but its current configuration was created in late 2014 by a merger with another UIC subsidiary, UMIAQ Science. Approximately 15 operational staff are based in Barrow and administrative offices are in Anchorage. In late 2015 UIC Science became the first indigenous organization member of ARCUS.

The Barrow Arctic Research Center (BARC) is the hub of daily operations for UIC Science and also provides laboratory and meeting space for researchers. Photo courtesy of Karl Newyear.

UIC Science provides logistical and technical support services to researchers and agencies, and conducts archaeological research throughout Alaska's North Slope. These activities include the following:

- UIC Science is a partner (along with Polar Field Services and SRI International under lead contractor CH2M Hill) in CH2M Hill Polar Services (CPS) to provide Arctic science support and logistics services to researchers funded through NSF's Division of Polar Programs (NSF/PLR). UIC's role includes assistance with pre-field deployment preparations such as logistics, identification of necessary permits, community outreach, and cargo receipt and staging. UIC Science provides researchers with ground transportation to the Naval Arctic Research Laboratory (NARL) campus and provides an arrival orientation along with any other specialized training such as snow machine or ATV use and proper laboratory protocols.

Science facilities available for researchers include laboratories, warehouse and staging space, lodging, vehicles, and small equipment. At the conclusion of fieldwork CPS assists researchers with demobilization of equipment and outbound shipment.

- UIC Science provides these same support services on either a long-term contract or ad-hoc basis directly with projects and Principal Investigators funded through agencies other than NSF/PLR, including numerous foreign institutions. Among others, the client list includes the U.S. Department of Energy's Next Generation Ecosystem Experiment, the National Ecological Observatory Network funded through NSF's Division of Biological Infrastructure, the Bureau of Ocean Energy Management (BOEM), NASA, the Max Planck Institute of Ornithology, the Ocean University of China, and the Swedish Polar Research Secretariat.
- UIC Science continues to perform technical support at the U.S. Department of Energy's Atmospheric Radiation Measurement (ARM) site in Barrow involving daily operations, maintenance, and repair of instrumentation at this world-class atmospheric observatory. This contract has been in place since 1997.

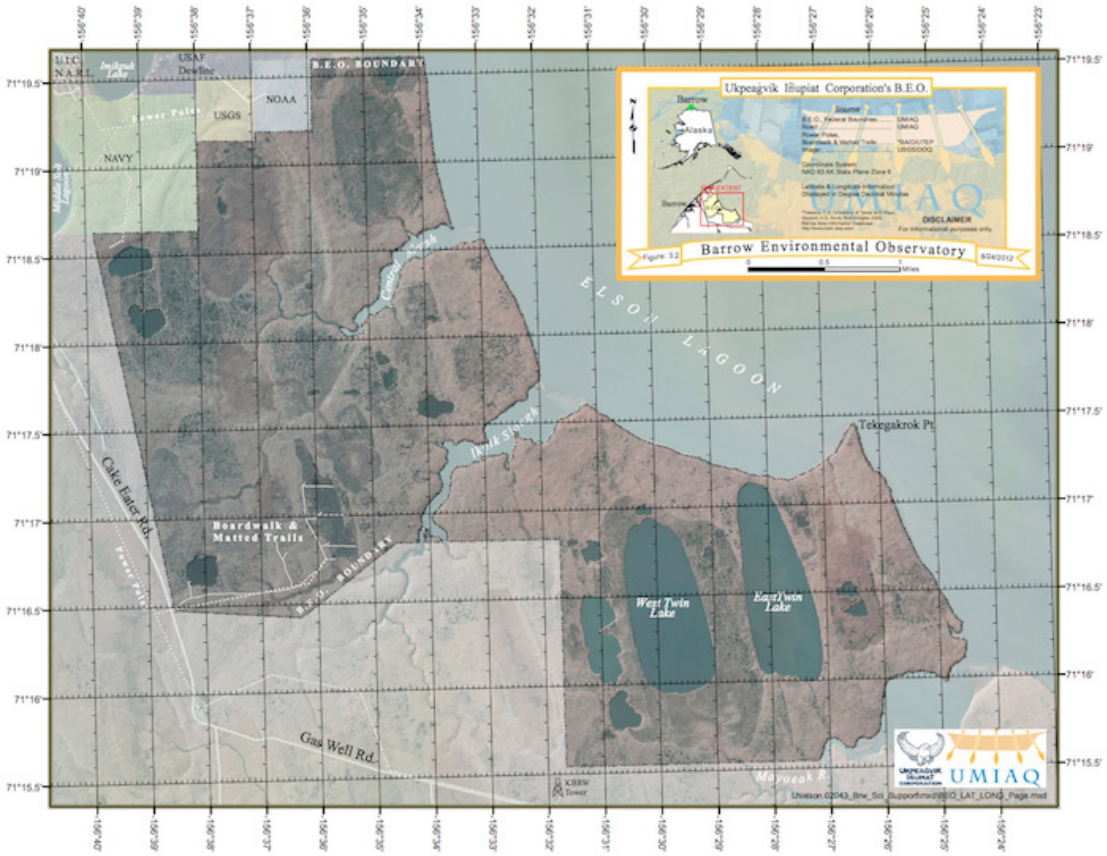
UIC Science staff assist researchers preparing for snow machine travel onto the wintertime sea ice. Photo courtesy of Karl Newyear.

UIC Science provides day-to-day operational and technical support to the U.S. Department of Energy Atmospheric Radiation Monitoring (ARM) program's world-class atmospheric observatory in Barrow. Photo courtesy of Karl Newyear.

- Dr. Anne Jensen is an Archaeologist with UIC Science who is an expert on pre- and post-contact North Slope cultures and sites. She is actively involved in several excavation locations near Barrow and regularly presents her research results at national and international conferences. She also conducts Cultural Resource Surveys of proposed research locations to help ensure that no archaeological sites are damaged.

As part of these service-oriented science support functions, UIC Science is the designated Management Authority for the Barrow Environmental Observatory (BEO). This is a 7,644 acre section of UIC-owned land specifically zoned by the North Slope Borough as a Scientific Research District, the only one in the nation. The BEO includes a wide variety of natural environments for

researchers to access including coastal bluffs, estuaries, creeks, wetlands, polygonal tundra, and continuous permafrost. Caribou and migratory waterfowl are frequently seen nearby, while marine mammals are common in near- and offshore areas.



A map showing the 7,644-acre Barrow Environmental Observatory, the only zoned Scientific Research District in the U.S. Image courtesy of Lars Nelson, UIC GIS Department.

The hub of UIC Science's operations in Barrow is the Barrow Arctic Research Center (BARC, formerly referred to as the Barrow Global Climate Change Research Facility). Although only 1 of 5 originally planned phases has been constructed so far, this facility includes modern laboratories, a large server room supporting a wireless network for scientific users, offices for UIC Science staff, and publicly available meeting and conference rooms. Shared science equipment available at the BARC includes walk-in refrigerator/freezers, a -80°C freezer, a Millipore water purification system, analytical balances, and chemical storage cabinets. UIC Science can also produce dry ice on site.

A unique strength of UIC Science is the integration of traditional knowledge in all our daily activities. Many of the staff grew up in Barrow and are well-versed in the natural, political, and economic environments in which scientific research occurs today, while at the same time participating in an active whaling culture. Barrow is an unusual location for field science because it is located in a residential community with many non-scientific stakeholders. UIC Science staff have the capabilities to help visiting researchers navigate this complex environment. UIC Science can provide bear guards for projects venturing into polar bear territory, advise on appropriate audiences and venues for community outreach, coordinate with subsistence hunters, tell researchers about the local sea ice and snow cover conditions, or recommend local restaurants and tell visitors when the next home high school basketball game will be played.

A UIC Science bear guard stands watch over a research site on the Chukchi sea ice. Photo courtesy of UIC Science.

Key Staff of UIC Science

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For further information, see the Barrow Bulletin website (http://www.barrowbulletin.com/). UIC Science capabilities are also described in the European Union's INTERACT Station Catalog available here (http://www.eu-interact.org/station-managers-forum/publications/station-catalogue/).

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Study of Environmental Arctic Change (SEARCH) Update

This update on the Study of Environmental Arctic Change (SEARCH) program includes recent news from each of SEARCH's three Action Teams as well as highlights from other activities that contribute to SEARCH goals, including the Sea Ice Prediction Network, the Sea Ice for Walrus Outlook, and the Arctic Observing Open Science meeting.

SEARCH Science Steering Committee Meeting

An in-person meeting of the SEARCH Science Steering Committee (SSC), Action Team Leads, and Science Office (https://www.arcus.org/search-program/structure) took place at the National Center for Atmospheric Research (NCAR) in Boulder, Colorado on 25-26 May 2016. The SSC discussed the accomplishments of SEARCH's three Action Teams as well as the newly convened Communications Working Group's (https://www.arcus.org/search-program/communications-working-group) efforts to prioritize audiences, messages, and tools to communicate SEARCH science products. The SSC also worked with SEARCH's Action Team leaders to prioritize the program's emerging interdisciplinary activities associated with Arctic observing coordination, scenarios development, methane synthesis, and coastal resilience.

SEARCH Contribution to Arctic Science Ministerial

Also in May, SEARCH recommended increased investments in Arctic observing systems to the White House's Arctic Executive Steering Committee (https://www.arctic.gov/aesc/). The recommendation urged the Committee to advance international support for sustained observing at the Arctic Science Ministerial planned for September 2016 (https://www.arcus.org/witness-the-arctic/2016/2/article/25678). A background document (see: Arctic Science Ministerial Meeting Input (https://www.arcus.org/search-program/aon/products)), expands on opportunities for a coordinated international Arctic Observing effort, building on discussions among the research community and stakeholders held at the Arctic Observing Summit and Arctic Science Summit Week (https://www.arcus.org/search-program/meetings/2016/AOS) in March 2016.

SEARCH Action Teams

The Permafrost Action Team: Document and Understand How Degradation of Near-Surface Permafrost Will Affect Arctic and Global Systems

Permafrost Carbon Network Co-Leads Meeting

The Permafrost Action Team will be hosting a meeting of the Permafrost Carbon Network's (PCN's) synthesis product leads/co-leads on 18-19 June 2016 in Potsdam, Germany. Taking place two days prior to the International Conference on Permafrost, this invitation-only meeting will engage approximately 20 participants (http://www.permafrostcarbon.org/documents/Participant_list_lead_meeting_Potsdam_2016.pdf) from the United States, Europe, and China in the PCN's ongoing effort to

generate new science synthesis projects and to link these efforts to the broader goals of the SEARCH Permafrost Action Team (https://www.arcus.org/search-program/permafrost/goals).

Sessions at the International Conference on Permafrost (ICOP) XI

The Permafrost Carbon Network has co-organized a session titled Climate Change, the Permafrost Carbon Feedback: Past, Present, and Future (http://icop2016.org/index.php/program/overview) for this summer's International Conference on Permafrost (http://icop2016.org/) in Potsdam, Germany. Chaired by Christian Knoblauch, Christina Schädel, and Yuri Dvornikov, it will feature oral and poster presentations on 20–21 June 2016.

New Science Highlight

An article from the Permafrost Action Team titled *Potential Carbon Emissions Dominated by Carbon Dioxide from Thawed Permafrost Soils* (http://www.nature.com/nclimate/journal/vaop/ncurrent/full/nclimate3054.html) was published online in the journal *Nature Climate Change*.

The study was led by Northern Arizona University assistant research professor, Christina Schädel. Schädel's meta-analysis of 25 Arctic soil incubation studies found that both temperature and soil conditions affected the quantity of carbon released from thawing permafrost. "Our results show that increasing temperatures have a large effect on carbon release from permafrost but that changes in soil moisture conditions have an even greater effect," says Schädel. "We conclude that the permafrost carbon feedback will be stronger when a larger percentage of the permafrost zone undergoes thaw in a dry and oxygen-rich environment."

Scientists in the international Permafrost Carbon Network that Schädel co-leads with Northern Arizona University professor of ecosystem ecology, Ted Schuur, provided much of the data. To access this article—as well as many more studies published by members of the Permafrost Carbon Network in 2016—please visit: http://www.permafrostcarbon.org/publications.html.

Postdoctoral Fellowship Opportunity

The International Arctic Research Center (IARC) is currently accepting applications for a Postdoctoral Fellow to work with the SEARCH Permafrost Action Team. The foci of the position are: 1) to conduct new synthesis research on one of several topics important for understanding the impacts of degrading permafrost, and 2) to assist with the coordination of a permafrost synthesis network addressing this topic. In addition to expertise in permafrost, ecosystems, or global change biology, candidates with experience connecting permafrost issues to community sustainability, climate impacts on native/indigenous peoples, and/or Arctic infrastructure and resource development are especially encouraged to apply. The position is located at University of Alaska Fairbanks (UAF) with research visits to Northern Arizona University.

For more information about this position, please contact Dr. Ted Schuur (ted.schuur@nau.edu). To apply, please submit required documents to the UAF Postdoctoral Fellow position described here (http://careers.alaska.edu/cw/enus/job/497662/post-doctoral-fellow). Application review starts June 30th and the position will remain open until filled.

The Sea Ice Action Team: Improve Understanding, Advance Prediction, and Explore Consequences of Changing Arctic Sea Ice

In the past few months, members of the Sea Ice Action Team have been active contributors to a number of SEARCH-affiliated sea ice activities, including the Sea Ice for Walrus Outlook (SIWO) (https://www.arcus.org/search-program/siwo) and the Sea Ice Prediction Network (https://www.arcus.org/sipn). They have also developed papers, posters, and surveys for key community events such as the Arctic Observing Summit 2016 (https://www.arcus.org/search-program/meetings/2016/AOS) and the 2016 Polar Prediction Workshop (https://www.arcus.org/sipn/meetings/workshops/may-2016).

Sea Ice Action Team (SIAT) Workshops

In the months to come, the SIAT will be facilitating two workshops designed to engage diverse groups of researchers, stakeholders, and decision-makers in the Action Team's ongoing mission to advance understanding and awareness of the impacts of Arctic sea-ice loss by enabling collaboration, community engagement, and communication.

The first workshop, *"Connecting Sea Ice, Science, and Societal Resilience in the Bering Sea"* (http://www.aleutianlifeforum.com/workshops-1/2016/8/20/connecting-sea-ice-science-and-societal-resilience-in-the-bering-sea), will take place as part of the Aleutian Life Forum (http://www.aleutianlifeforum.com/) on 20 August 2016 in Dutch Harbor, Alaska. By exploring the role that sea ice conditions (past, present, and future) play in Bering Sea communities, economies, and decision-making, this event will illuminate the critical connections that exist between sea ice and society and the implications for the production of societally relevant science.

The second event, a Sea Ice Action Team Knowledge Exchange Workshop (https://www.arcus.org/search-program/sea-ice/first-ke-workshop), will take place 14-16 September 2016 in Washington, D.C. in collaboration with the Consortium for Ocean Leadership (http://oceanleadership.org/). At this event, invited experts will discuss the impacts of sea-ice loss on Arctic ecosystems and lower latitude weather as well as on human activities in the Bering, Chukchi, and Beaufort Seas. The workshop will be used to identify emerging research topics and critical knowledge gaps that would benefit from scientific synthesis, and to build the connections and communications needed to sustain ongoing interdisciplinary collaboration around these topics. The Northern Pacific Research Board (NPRB) will be sponsoring two early career researchers to attend the workshop. Interested graduate students or early career researchers (within five years of receiving a terminal degree) can apply here (https://www.arcus.org/search-program/sea-ice/alf-travel-award) or contact Matthew Druckenmiller (druckenmiller@nsidc.org) for more information.

The Land Ice Action Team (LIAT): Improve Predictions of Future Land Ice Loss and Impacts on Sea Level

Over the past few months, the Land Ice Action Team's focus has been on laying the groundwork to establish a Greenland Ice Sheet Ocean Observing System (GrIOOS) to collect long-term measurements at the glacier margins of the Greenland Ice Sheet. In December 2015, the Land Ice Action team hosted a workshop with researchers, agency officials, and stakeholders to identify key features of the system such as observation variables, monitoring sites, and methods of data capture.

Outcomes from the workshop informed the LIAT's white paper contribution (https://www.arcus.org/search-program/meetings/2016/AOS) to the March 2016 Arctic Observing Summit and the team's presentation (https://youtu.be/9QWmvPrRS98) in April to the Interagency Arctic Research Policy Committee (IARPC) Glaciers and Fjords Collaboration Team. Workshop outcomes have also been synthesized into a formal workshop report that is now under review by the SEARCH community. This document will be shared with the wider public over the months to come to further develop the plan for GrIOOS implementation and to build the international partnerships and support that will be necessary for system deployment.

New Postdoc to Join the Land Ice Action Team (LIAT)

Allen Pope (https://nsidc.org/research/bios/pope.html) (twitter: @PopePolar) will be joining SEARCH's Land Ice Action Team as a postdoctoral researcher in July 2016. Allen, a research associate with the National Snow and Ice Data Center (NSIDC) in Boulder, Colorado, is already contributing to SEARCH communication and outreach efforts. As part of the LIAT, Allen will assist with efforts to improve predictions associated with future land-ice loss, develop tools that are useful to stakeholders and decision-makers in preparing for land-ice loss impacts, and assist in the facilitation of new cross-disciplinary networks and research activities designed to meet the SEARCH LIAT's science goals (https://www.arcus.org/search-program/land-ice/goals).

Other SEARCH-Related Activities

The activities below have emerged from the wider SEARCH research community and are considered contributions to SEARCH.

Sea Ice Prediction Network (SIPN)

The Sea Ice Prediction Network (SIPN) (https://www.arcus.org/sipn), led by an interdisciplinary leadership team, manages a series of activities to improve seasonal sea ice forecasting.

2016 Polar Prediction Workshop

SIPN co-organized the 2016 Polar Prediction Workshop with several sponsors and co-organizers, including: Lamont-Doherty Earth Observatory (http://www.ldeo.columbia.edu/), Polar Climate Predictability Initiative (http://www.climate-cryosphere.org/wcrp/pcpi), the Polar Prediction Project (http://polarprediction.net/), World Climate Research Programme (WCRP) (http://www.wcrp-climate.org/), World Weather Research Programme (WWRP) (https://www.wmo.int/pages/prog/arep/wwrp/new/wwrp_new_en.html), and World Climate Research Programme-Climate and Cryosphere (WCRP-CliC) (http://www.climate-cryosphere.org/).

The workshop focused on sources of polar predictability on the sub-seasonal to inter-annual timescales, sea ice prediction, and operational and research efforts. The meeting included a series of invited talks as well as contributed presentations and poster sessions. Seventy-four participants attended, with 61 additional participants joining via a live, and live-tweeted (follow @ArcticResearch), webcast. Outcomes of the meeting included recommendations for the Sea Ice Outlook (https://www.arcus.org/sipn/sea-ice-outlook) and other activities related to polar prediction; the meeting organizers will develop a brief meeting summary this summer.

Webinar Series

SIPN continued its webinar series with a webinar in March by Cathleen Geiger, University of Delaware, on "*Challenges and Best Practices: Sea Ice Thickness Distribution as a Rosetta Stone for Cross-Scale Communication.*" This webinar focused on estimating sea ice thickness across scales and included discussion on measurement accuracy and challenges related to estimating sea ice thickness, and new best practices. Fifty participants attended the webinar, which is archived at: https://www.arcus.org/sipn/meetings/webinars.

The next webinar will be held in July and announced via the SIPN mailing list (https://www.arcus.org/sipn/mailing-list).

Sea Ice Outlook

The Sea Ice Outlook (SIO) (https://www.arcus.org/sipn/sea-ice-outlook) is the core activity of SIPN and provides an open process for those interested in Arctic sea ice to share predictions and information on seasonal Arctic sea ice. The monthly reports contain a variety of perspectives—from advanced numerical models to qualitative perspectives from citizen scientists.

The 2016 SIO season commenced with a call for early and informal contributions (https://www.arcus.org/sipn/sea-ice-outlook/2016/informal-contributions) and a call for formal contributions for the June report (https://www.arcus.org/sipn/sea-ice-outlook/2016/june/call); the June report will be released the last week of June.

Sea Ice for Walrus Outlook (SIWO)

The 2016 Sea Ice for Walrus Outlook (SIWO) was launched with the first report on 30 April. SIWO. Funded by a Cooperative Agreement from NSF to ARCUS, SIWO combines sea ice, weather, and wind forecasting efforts from the National Weather Service with in situ observations from researchers at the University of Alaska Fairbanks and local feedback from native village elders and experts. Looking specifically at four rural Alaskan villages—Gambell, Savoonga, Wales, and Shishmaref—in the Bering Strait region, SIWO releases weekly reports on conditions relevant to the spring walrus hunts that are critical to these communities' subsistence lifestyles.

25 May 2016, a walrus lounges on an ice floe off the coast of Wales, Alaska. Photo courtesy of Amos Oxereok.

The season will likely end with the report released last Friday, 10 June, as the areas in question are now almost completely free of sea ice. This end-date is similar to the 2015 season but earlier than the project's average. The weekly reports from the project's inception through the current season are archived on the SIWO website, at https://www.arcus.org/search-program/siwo.

The Arctic Research Consortium of the U.S. (ARCUS), which serves as the project management office for SIWO, plans to seek funding to expand the project in the coming year. If you have thoughts or ideas for the Sea Ice for Walrus Outlook, please contact project manager Kristina Creek (creek@arcus.org).

2015 Arctic Observing Open Science Meeting (AOOSM)

The Arctic Observing Open Science Meeting (AOOSM) (https://www.arcus.org/search-program/meetings/2015/aoosm) was held 17-19 November 2015 in Seattle, WA. The meeting provided an opportunity for community discussion of scientific findings, advances, and achievements in Arctic observing. Presentations and abstracts from plenary, panel, and parallel session speakers are available on the meeting website. AOOSM outcomes were presented at the 2016 Arctic Observing Summit held in Fairbanks, Alaska in both a Short Statement and Poster (see: https://www.arcus.org/search-program/meetings/2016/AOS). Meeting organizers are currently developing a meeting report and additional products.

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The Forum for Arctic Modeling and Observational Synthesis (FAMOS) School

By: Michael Steele, Polar Science Center, Applied Physics Laboratory, University of Washington and Andrey Proshutinsky, Woods Hole Oceanographic Institution

Forum for Arctic Modeling and Observational Synthesis (FAMOS)

The Forum for Arctic Modeling and Observational Synthesis (FAMOS) (http://web.whoi.edu/famos/) is an NSF-funded project designed to enhance the collaboration between Arctic marine modelers and observationalists, as well as others who are interested in working with such scientists. A key part of this effort is the annual workshop, usually held at the Woods Hole Oceanographic Institution (WHOI) each fall. Since 2009, the first day of the workshop is devoted to the FAMOS School for those new to Arctic marine studies. Participants are generally graduate students, postdocs, and more senior scientists who are new to the field. These are modelers and observationalists studying mathematical, physical, and biogeochemical aspects of the field. The number of participants has grown from about 20 in the first few years, to about 40 in more recent years. The school is advertised via ArcticInfo (https://www.arcus.org/arctic-info), the FAMOS listserver, Cryolist (http://cryolist.org/about.html), the Association of Early Career Scientists (APECS) (http://www.apecs.is/), word of mouth, and emails from Principal Investigators Steele and Proshutinsky. Attendance is generally first-come first-served, with a limit of about 40 and a preference for new participants. NSF provides full or partial travel support for 50-60% of the participants.

Activities for the day focus on a series of five or six long-format lectures by experts in various fields. The idea is to introduce the participants to "hot" topics in the field that will likely be discussed more intensely over the rest of the workshop and through the coming years. All lectures are composed of a basic introduction to the field, a discussion of current research, and then a look to the future. Some lecturers describe new numerical techniques, while others focus on recent observations or emerging fields of study. A variety of topics are generally covered, from atmospheric surface fluxes, to melt pond studies and modeling, to sub-mesoscale mixed layer variations and their role in Arctic productivity. In 2015, a "contest" was held to determine the "best" Arctic marginal sea among five contestants lecturing on the Bering, Chukchi, Barents, Laptev, and Canadian Arctic Shelf Seas. This was very popular.

Each year, the hours just after lunch are devoted to a non-academic activity. In the first few years, a tour of various WHOI facilities was provided, e.g., of the rotating tank lab or the engineering facility. In more recent years, this time has instead focused on public outreach activities. There have been demonstrations using water tanks (warm/cold, fresh/salty water to demonstrate convection or water mass formation), ice (formation of snow ice, illustration of heat conduction), and remote sensing (a simple laser apparatus as a model for ICESAT). There have also been lectures on the topic of "What is Climate Modeling?" which is of course central to FAMOS. Describing numerical modeling to "the public" without sacrificing accuracy is not so easy!

After each scientific and outreach presentation, ample time is budgeted for a discussion. These discussions have proven to be quite lively. The FAMOS school is often very popular with more established Arctic scientists, who attend but are asked to keep silent. This day is really focused on those new to the field. The day ends with a working dinner where students and lecturers continue their discussions.

In 2016, we will have a "peer-to-peer" lecture series by experts who are within 10 years of their PhD. The schedule is not yet determined at this time, but we expect a full slate of interesting speakers. A new focus for FAMOS over the next three years will be on high resolution modeling, so this will likely guide the lectures for the FAMOS school in the near-term. There is also recent interest in Climate Response Functions, i.e., simplified numerical and theoretical experiments that seek to determine the basic climate response to a perturbation like enhanced river discharge or changing lateral boundary fluxes. These will likely be covered in upcoming FAMOS schools.

We have had tremendously positive feedback from school attendees and lecturers, which is of course gratifying since it does take some effort to make this happen in an optimal way. We continue to seek ways to improve the school and the program. It is quite clear that the FAMOS annual workshop and collaboratory would be much less lively without the presence of so many new people and their ideas. They are the ones who make this activity a success.

The 2015 agenda is available here (http://web.whoi.edu/famos/4th-famos-school-and-meeting-agenda/#Tuesday_November_3_2015).

More information about FAMOS is available on the website (http://web.whoi.edu/famos).

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The NSF Arctic Data Center: A New Home for Arctic Research Data

By: Amber E. Budden, DataONE, Co-Principal Investigator Arctic Data Center; Matthew B. Jones, National Center for Ecological Analysis and Synthesis (NCEAS), Principal Investigator Arctic Data Center; and Mark P. Schildhauer, NCEAS, Co-Principal Investigator Arctic Data Center

In March 2016, the Arctic Data Center (https://arcticdata.io/) was launched and assumed preservation responsibility for Arctic research data from National Science Foundation (NSF) awards. The center serves as the NSF research community's primary repository for Arctic data preservation and data discovery, and is funded by the NSF via a five-year award. The Arctic Data Center currently lists 3,899 data sets covering data from myriad research fields, such as plant ecology (Eissenstat 2016) (https://arcticdata.io/catalog/#view/doi:10.18739/A23H1N), glacial chemistry (McConnell 2015) (https://arcticdata.io/catalog/#view/doi:10.18739/A2PS56), oceanography (Aagaard et al. 2016) (https://arcticdata.io/catalog/#view/doi:10.5065/D6N014NC), and limnology (Arp) (https://arcticdata.io/catalog/#view/doi:10.18739/A2K31V), among many others.

The Arctic Data Center is a product of a national partnership, led by the National Center for Ecological Analysis and Synthesis (NCEAS) (https://www.nceas.ucsb.edu/) at the University of California Santa Barbara, along with the National Oceanic and Atmospheric Administration's National Centers for Environmental Information (NCEI) (https://www.ncei.noaa.gov/), and the NSF-funded Data Observation Network for Earth (DataONE) (https://www.dataone.org/). To preserve data over the long-term requires multiple partners that are institutionally stable and funded through diverse streams. Hence the partnership behind the Arctic Data Center ensures there are multiple agencies involved in data archival; NCEAS is leading the effort in software development, whilst enabling replication across the NOAA archives as well as participating in the large scale DataONE federation.

Arctic Data Center Services

The NSF Arctic Data Center provides data storage, curation, and discovery features needed to support NSF's Arctic research community. Though the Center is focused on data preservation, this is but one step of a multi-stage data lifecycle. Data archival is embedded within a greater scientific mission and many Arctic researchers and data producers have needs that go beyond simply preservation—including data management planning, data acquisition, analysis, and other stages within the data lifecycle. As such, the Arctic Data Center also provides tools that support researchers in those areas. Further, the Center is able to archive not just data, but other research products such as graphics, software, workflows, and provenance information that encompass the entire research process.

The key deliverables for the Arctic Data Center, as laid out in the funding proposal to NSF, include: 1) a repository for NSF funded Arctic research data; 2) a user-friendly portal for data discovery and access; 3) tools to support data and metadata submission; 4) data recovery and support services; and 5) training, education, and outreach. Currently, the repository, search and discovery portal, and initial data submission tools are live, in addition to a team actively supporting investigators with their data upload and recovery needs. Over the next year, significant new capabilities and features supporting Arctic researchers will be added.

Data Discovery Portal and Upload Tool

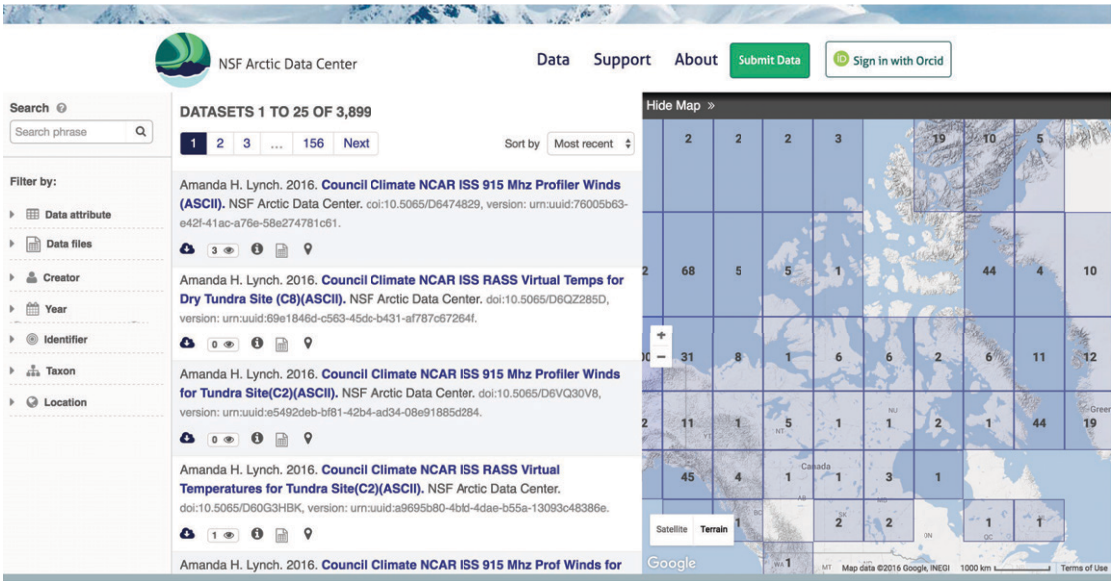

Figure 1: Arctic Data Center discovery portal, showing the geographic distribution of data sets, the list of recently added data sets, and filtering tools for precisely searching for data of interest. Image courtesy of the Arctic Data Center.

The NSF Arctic Data Center interface allows users to search for data from the extensive Arctic data collection using filters such as the name of the data creator, year, identifier, taxa, location, keywords, and others (see Figure 1). This discovery interface also provides a map-based overview of the spatial distribution of data sets and allows users to zoom and pan to specific locations of interest, which will be helpful in locating historical data in specific regions. Users can quickly identify whether a record includes downloadable data, the number of views received by the record, and a brief overview of the content. Opening a record provides rich metadata in a standardized, easy to read format, and the option to download individual data files (see Figure 2). Users may also quickly copy citation information for each record.

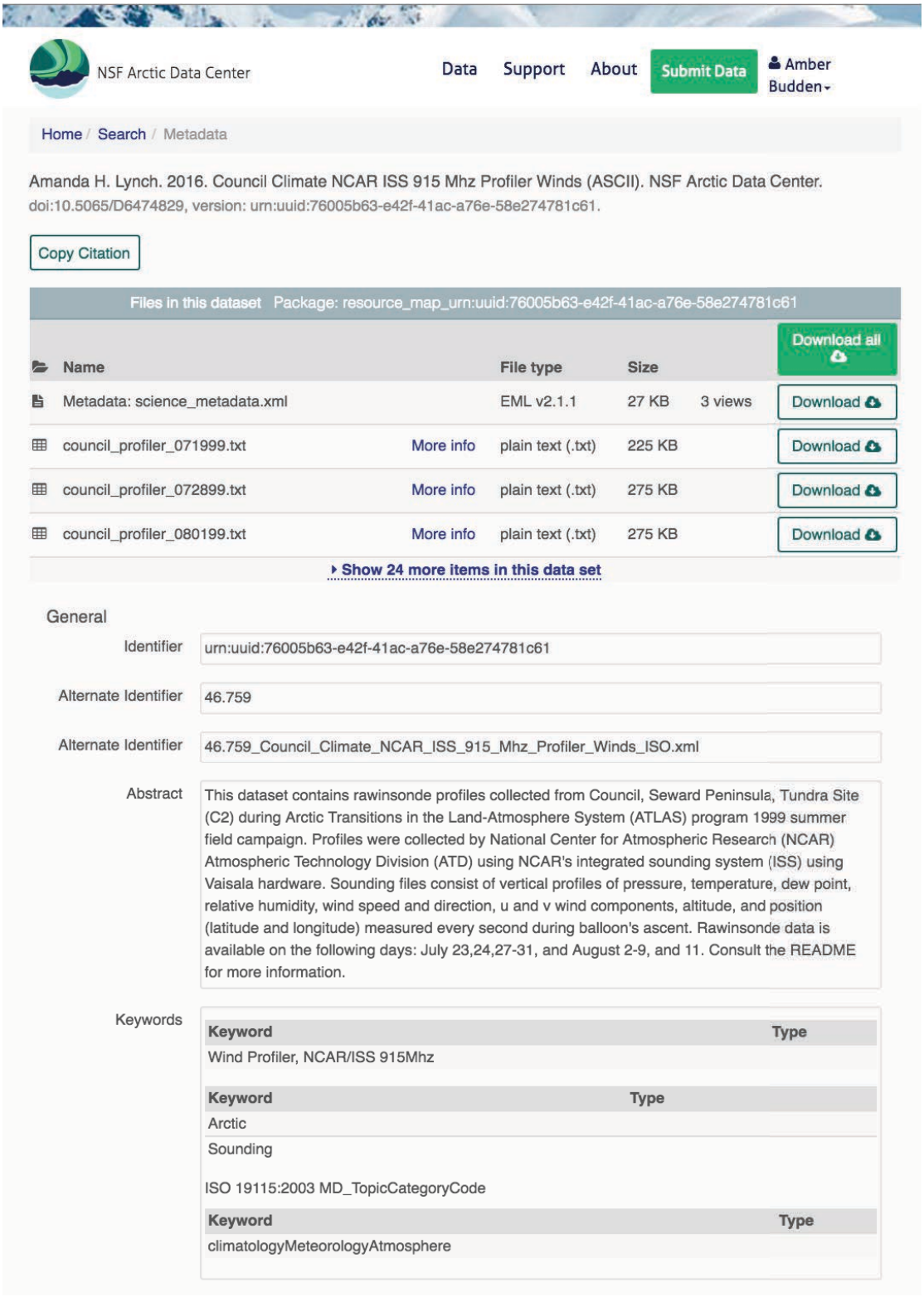

Figure 2: Example view of a metadata record describing meteorological data from Lynch 2016. Image courtesy of the Arctic Data Center.

Using the "Submit Data" button, authors are able to seamlessly upload and share their data from their desktop, contributing associated metadata and attaching data files. Once the data and metadata are reviewed and edited, Center staff assign a Digital Object Identifier so that the data are easily citable. For larger data sets, the Center supports automating uploads through scripting with common languages including R and MATLAB.

Community Participation and Training

To ensure the tools and services developed by the Center are meeting the needs of the Arctic research community, a Steering Committee (https://arcticdata.io/team) comprising leaders across domains has been established. This committee will guide the Center leadership in their activities and help set prioritization for future developments. The Center will also be actively engaging researchers at society and other meetings, through webinars, and at workshop training events to determine how to improve support for open, reproducible science for the Arctic.

Early career researchers will be eligible to further participate in the Arctic Data Center through a fellowship program focused on data-management and open-science. Fellows will work in cohorts, will be provided with training in data management and science communication, will benefit from hands-on experience working within the Arctic Data Center environment, and will participate in team meetings. We are currently recruiting two new positions (https://arcticdata.io/news/2016/06/data-science-opportunities) who will oversee these fellowship students, one focused on training and outreach, and the other on data science activities.

The Arctic Data Center will also support an annual "Arctic Synthesis Science" Working Group in order to advance innovative, integrative Arctic science research, as well as test and inform the utility of the Arctic Data Center repository for assisting with such research. Working Groups are built on the model of NCEAS synthesis working groups (https://www.nceas.ucsb.edu/search/gss/working%20groups) and will conduct interdisciplinary work, using existing data, carried out by scientists from multiple institutions.

Finally, the Center will support annual data science training events both at the Center in Santa Barbara and associated with meetings of the Arctic research community. These training events will center around techniques and approaches towards open science and data-driven synthesis, including topical foci on research computing, communication, collaboration, and other aspects of data science that support scientific synthesis. While our primary goal is to improve the research community's ability to use Arctic Data Center systems, we also anticipate significant improvements based on feedback and usability testing conducted during these training events.

New and Upcoming Features

While the initial release of data systems for the Arctic Data Center are fully functional, we plan numerous new features to improve the usefulness, capabilities, and efficiency of the system for researchers. Current work focuses on evaluating, streamlining, and improving the submission system to accommodate complete metadata and a streamlined editing process. Over the course of the project we will be adding new features for automated metadata and data quality checks, for advanced editing of provenance information, and for new analytical tools like IDL and Matlab that can access and submit data to the system. These improvements will be driven by an extensive dialog with the Arctic research community, and we welcome suggestions for new features, services, and programs serving Arctic research.

Further information is available on the Arctic Data website (https://arcticdata.io/).

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Cool as Ice: Ten Years and 10,000 Miles by Snowmachine to Study Arctic Lakes

By: Christopher Arp, Water and Environmental Research Center, University of Alaska Fairbanks (UAF); and Benjamin Jones, Alaska Science Center, United States Geological Survey (USGS)

The team stopped for a short break on a calm, cold evening in the Arctic on their final stretch run of a 1,000 mile, three-week round trip traverse between Toolik Field Station and the Teshekpuk Lake Observatory in March 2012 while conducting fieldwork for the NSF-CALON project. Photo courtesy of Guido Grosse.

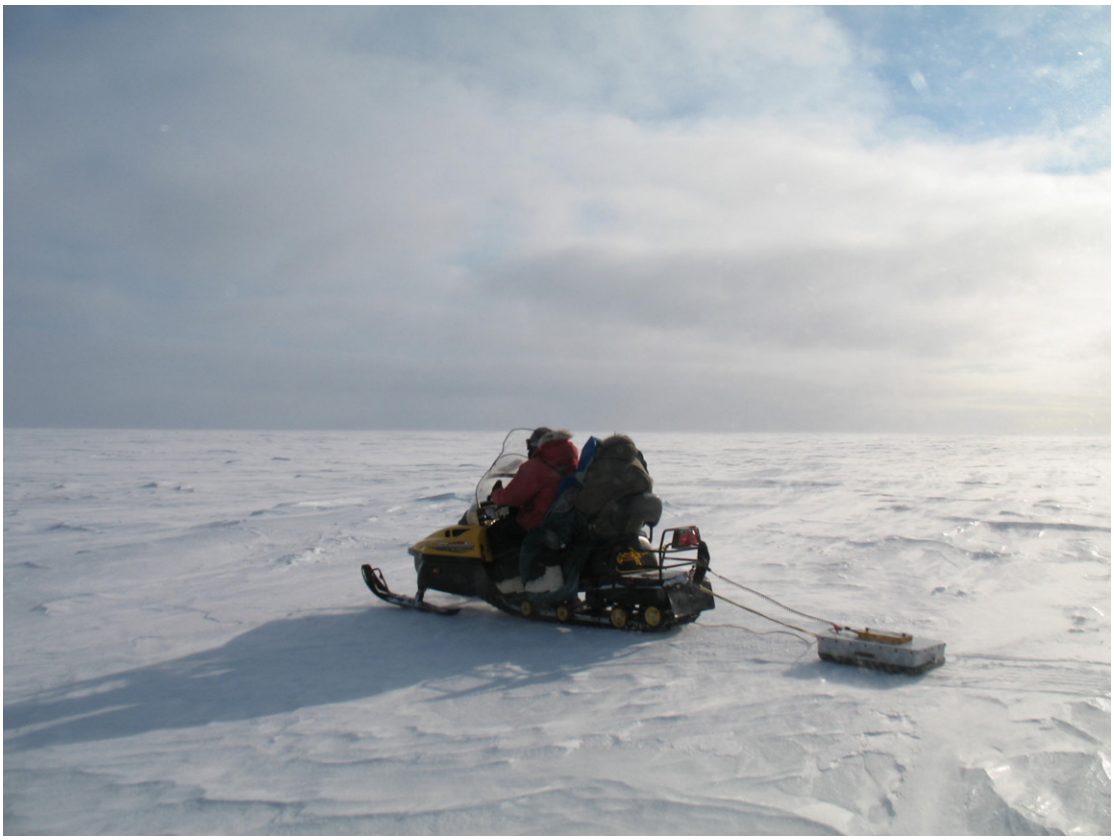
Ten years ago Christopher Arp (UAF) and Benjamin Jones (USGS) left from Barrow, Alaska, by snowmachine and headed 100 miles southeast along the Beaufort Sea coast to Teshekpuk Lake (http://www.teshekpuklake.org/)—Alaska's largest Arctic lake. Working on a project funded by the USGS, their goal was to collect data on thermokarst lakes to help address questions regarding changes in permafrost and habitat for waterbirds, such as black brant geese, which flock to the lakes and wetlands north of Teshekpuk each summer. As novices to such remote winter fieldwork they experienced numerous challenges. With much appreciated support from the experience of local guide, Ronal Aveoganna, and another USGS scientist, David Selkowitz, Arp and Jones gained insight into making such expeditions safe, successful, and a source of valuable scientific data. Being able to travel long distances to key remote sites in the winter at relatively low costs enabled the team to undertake fieldwork in northern Alaska where Arctic lakes remain ice-covered for three-quarters of the year. Whether they knew it at the time or not, this duo committed to making such expeditions a foundation of their collaborative research on lakes and Arctic landscapes. They found that to travel and experience the Arctic in the winter is to begin to truly understand the impacts climate change is having on these important ecosystems.

Camped in northern Alaska amidst a ground blizzard in March 2013.The team spent nearly a week hunkered down in their tent as the relentless blizzard made working conditions very difficult. Photo courtesy of Christopher Arp.

Since 2007, Arp and Jones have traveled 10,000 miles together on snowmachines in Alaska, studying lakes in regions where water often covers more of the land surface than tundra or trees. Usually in the company of other companions, these Arctic scientists have spent entire trips in deep cold, such as in early March 2009 when temperatures remained below -20°F for nine straight days. During an even more frigid trip on the Yukon-Kuskokwim Delta in March 2012, the team had to resort to body heat to thaw out 20-pound propane tanks to cook meals and warm camp tents. Wind velocity and duration are also important forces in determining trip success. The team spent nearly a week pinned down in a tent by a ground blizzard west of Nuiqsut, Alaska, in March 2013.

That experience provided an opportunity to appreciate the importance of wind and blowing snow in shaping the Arctic landscape. Experiencing such adventures with scientific colleagues forms essential bonds, which often translate into new hypotheses, study designs, data collection, and scientific and personal discoveries. Since 2008, these snowmachine traverses have resulted in 18 publications in peer-reviewed journals, as well as numerous datasets on lakes, snow, ice, and permafrost that will serve as a baseline to evaluate future change in the Arctic.

The repeated winter snowmachine traverses also formed the basis for two National Science Foundation (NSF) projects: the Circum-Arctic Lakes Observation Network (CALON) (http://www.arcticlakes.org/), funded by the NSF Arctic Observing Network (AON) program in 2011; and the Arctic Lake Ice Systems Science (ALISS) (http://arcticlakeice.org/), funded by the Arctic System Science program in 2014 with additional support provided by the USGS (http://alaska.usgs.gov/science/geography/studies/index.php), the Arctic Landscape Conservation Cooperative (Arctic LCC) (http://arcticlcc.org/), and the Bureau of Land Management (BLM) (http://www.blm.gov/ak/st/en.html).



Benjamin Jones and Christopher Arp measuring lake ice thickness with a ground penetrating radar (GPR) system. The data from the GPR are used to distinguish where lakes are frozen to their bed and where they retain water below the ice which is important for the development of thaw bulbs in the permafrost below lakes. Photo courtesy of Christopher Arp.

The NSF-CALON project focused on the development of a lake observation network in northern Alaska between Toolik Field Station (http://toolik.alaska.edu/) and Barrow, Alaska. Scientists instrumented 60 lakes with various sensors that recorded information on temperature, water level, and chemistry year-round. They also visited these sites biannually, once in the spring on snowmachine and again in the summer via floatplane, to download the instruments and conduct more detailed point measurements. The baseline datasets provided by the CALON project provided insight into the annual regime of Arctic lakes along transects that spanned from the Brooks Range to the Arctic Ocean. These datasets also led to the development of testable hypotheses related to changing Arctic lakes that underscore the idea that to better understand lake-rich Arctic landscapes, winter research is required. The recently funded NSF-ALISS project specifically focuses on the eight to nine months of the year in which lakes in northern Alaska are ice-covered. Evidence indicates that thinner ice growth in response to warmer, snowier winters is pushing many bedfast ice lakes to floating ice regimes. If such a regime shift becomes pervasive across lake-rich landscapes, resulting permafrost thaw and enhanced moisture and heat flux could generate positive feedbacks, further amplifying this regime change. To study this, the scientists are using a combination of remote sensing, field surveys, geophysical measurements, experiments, and physical models to isolate processes, quantify interactions, and project changes.

Christopher Arp and Benjamin Jones auguring a hole in the lake ice to install instruments and collect water samples for lab analysis. The instruments measure properties associated with lake ice growth and decay, water temperature, and water chemistry. Photo courtesy of Guido Grosse.

During April and May of 2016, Arp and Jones were accompanied by Allen Bondurant (UAF), Andrew Parsekian (University of Wyoming), Andrea Creighton (University of Wyoming), and Esther Babcock (USGS) on the spring ALISS field campaign. The scope of the fieldwork was intense during this 900 mile, three week snowmachine traverse from Toolik Field Station to Barrow. The team measured the depth to permafrost below forty lakes using a variety of geophysical techniques, collected lake sediment cores for lab analysis that will reconstruct ice thickness fluctuations in the distant past, ground-truthed satellite radar imagery acquired during the expedition that shows where fish are potentially overwintering, installed near real-time lake ice growth and decay buoys, and continued to build on the decade-long dataset of ice thickness and snow cover conditions on lakes in northern Alaska. Lake buoys transmit near real-time data via satellites so ice conditions can be checked daily online. Data are available on the ALISS website (http://arcticlakeice.org/) under the "Real-Time Data" tab.

The 2016 snowmachine expedition was particularly thought-provoking given that the team was chasing the melting snow cover northward the entire trip. The ALISS team arrived in Barrow on 6 May 2016 over a dwindling snowpack, almost ten years to the day since Arp and Jones's first research-based snowmachine expedition in the Arctic. Their arrival was just in time, as Barrow posted its earliest recorded spring snowmelt on 13 May 2016. The team is excited to study the impact that such an early break-up in northern Alaska will have on the numerous lakes that dominate the landscape.

The ALISS 2016 field crew (left to right to front): Allen Bondurant, Andrew Parsekian, Esther Babcock, Christopher Arp, Benjamin Jones, and Andrea Creighton. Photo courtesy of Benjamin Jones.

For more information on the projects and efforts associated with their research on Arctic lakes please visit these related websites:

Arctic Lake Ice Systems Science (ALISS) (http://arcticlakeice.org/)

Circum-Arctic Lakes Observation Network (CALON) (http://www.arcticlakes.org/)

Teshekpuk Lake Observatory (TLO) (http://www.teshekpuklake.org/)

United States Geological Survey (USGS) (http://alaska.usgs.gov/science/geography/studies/index.php)

For additional details, contact Christopher D. Arp (cdarp@alaska.edu) and Benjamin M. Jones (bjones@usgs.gov).

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Meltdown: Archaeologists Find Ancient History in Ice and Snow

By: Mary Stapleton, Cultural Liaison, Arctic Institute of North America, University of Calgary

The Arctic—the perpetually snow-capped mountain tops, the eternally flowing glaciers—might seem to attract poets and artists rather than scientific archaeological specialists. The indigenous people of northern countries, who have lived in these environments for millennia, have always believed that ice in many forms carried spirits and secrets. A creative sub-specialty of archaeology, glacial archaeology, has become the key to opening this ancient fragile treasury to begin to tell the story of ancient peoples and their innate relationships to the earth. Imagine the spine-chilling realization that as atmospheric temperatures rise, the most eternal yet ephemeral of matter—ice—inevitably thins and disappears. Thus treasures are revealed that shed light on flora, fauna, cultural practices, and the interaction of human beings and their environments back to the dawn of history. No written word could be so compelling as the experience of seeing, touching, examining, and reflecting on the significance of the tangible objects found in disappearing snow, ice, and permafrost.

At high latitudes and altitudes, formerly permanent ice is melting: climate change is immutably taking place. Ice patches are located in areas where ice is perennially frozen and relatively static, thus preserving even the most fragile components of artifacts. Ice Patch or Glacial Archaeology is dedicated to research on the human and environmental landscapes where melting occurs. Artifacts and biological specimens, preserved by freezing temperatures, are appearing at sites as diverse as Paleo-Eskimo middens in Greenland, burials in the Altai Mountains of Russia, mummies of the Andes, in the Himalayas, and in reindeer and caribou hunting sites in Norway, Canada, and Alaska. Stratified layers of ice-preserved evidence of hunters, animals, and weapons are emerging, evidence of activities dating back thousands of years. These sites can be studied through radio carbon dating, DNA analysis, and other advanced technologies. There is the potential to link similar cultural heritage around the world, despite distance and time.

Why are these ancient artifacts found high on mountains preserved in ice? Arctic and alpine glaciers and ice have always been used for travel, communication, trade, and hunting by many peoples. In northern environments, game—caribou, reindeer, and ground squirrels—seek shelter in summer from heat and insects at high altitudes where snow remains. Local hunters followed their prey. To date, many items of wood, antler, stone, and bone; fauna from mammals and birds; caribou remains and dung; textiles, shoes, and even a sledge have been recovered and analyzed in Canada, Alaska, and Norway.

Frozen remains bring immediacy to the past. In 1999, the body of a young indigenous man was found frozen inside a glacier in the traditional territory of the Champagne and Aishihik First Nations in Yukon Territory, Canada. He was named Kwaday Dan Ts'inchi, translated as "long-ago person found." He wore a robe made from gopher or squirrel skins stitched together with sinew, and carried a walking stick, an iron-blade knife, and a spear thrower. Radiocarbon analysis placed the age of the body at between 300 and 550 years. DNA testing connected Kwaday to at least 17 people living in the region, an exciting reaffirmation of their deep connection with their land and community. The find, while not as old, was comparable in condition and value to Ötzi the Iceman, found in the Ötztal Alps in 1991 and dated at 3,000 years old.

Traditional knowledge is essential to interpret the evidence found in ice and snow. Combining indigenous perspectives with archaeological methods has already benefited expansion of ecological and ethnographic environmental understanding. As the descendants of ancient hunters, local indigenous peoples feel a profound connection to such sites. The process of information gathering, monitoring, and dissemination builds on the knowledge, perspectives, and values of many cultures. Cultural strengthening and capacity building are important outcomes of the research.

How will scientists, indigenous peoples, and the wider community of interest ensure that the resources are not lost? Raising awareness is a critical first step. Cultural Heritage Management (CHM) of frozen sites presents special challenges. Sites must be found, assessed, and inventoried. Remote and high altitude locations present expensive field logistics, including the transportation of delicate finds. Outreach and dissemination activities require the support not only of archaeologists but also heritage specialists, government, philanthropists, and the public.

A herd of caribou crosses an ice patch. Photo courtesy of the Government of Yukon, Canada.

"The mountains have a lot of history protected in ice patches which are diminishing but are not lost," says Martin Callanan in *Managing Frozen Heritage: Some Challenges and Responses*. "Our generation understands that change is occurring, and it is our job to learn from it" (M. Callanan, personal communication, 2016). This heritage cannot be "saved" or preserved; it must be explored and interpreted as melting continues. Sites degrade and disappear, along with their contents. This unique opportunity must receive attention and funding while there is still time.

For more information about this article, contact Mary Stapleton via email (mary@stapleton.ca), by phone (+1-403-931-2453), or cell phone (+1-403-860-4182).

Further information about archaeological discoveries from glacial, permafrost, polar, and high-altitude frozen contexts across the world, and the latest discoveries and research from frozen sites, is available from the Journal of Glacial Archaeology (https://journals.equinoxpub.com/index.php/JGA/issue/current).

Several international symposia, entitled "Frozen Pasts," have been held in various locations in recent years. These conferences have productively brought together researchers who are studying the history and cultures revealed by melting ice and snow. The next symposium will be held in Innsbruck, Austria, on 12-16 October 2016.

Acknowledgments

The author would like to acknowledge the following experts for helpful interviews (recognizing their outstanding contributions to the field of Glacial/Ice Patch Archaeology) carried out while preparing this article: Tom Andrews, Territorial Archaeologist, Prince of Wales Northern Heritage Centre, Canada; Martin Callanan, Norwegian University of Science and Technology, working on the Snow Patch Archaeological Research Cooperation (SPARC) (http://www.ntnu.no/vitenskapsmuseet/about-sparc) project at the NTNU-University Museum in Trondheim, alpine snow patches in Southern Sami areas, Managing Editor of the Journal of Glacial Archaeology, and coordinator for the international Frozen Pasts conferences; Jim Dixon, Professor of Anthropology, University of New Mexico, United States; and Greg Hare, Site Assessment Archaeologist, Yukon Government Department of Tourism and Culture, Canada.

New Program Brings the Arctic to the Classroom

By: Janet Warburton, ARCUS Project Manager

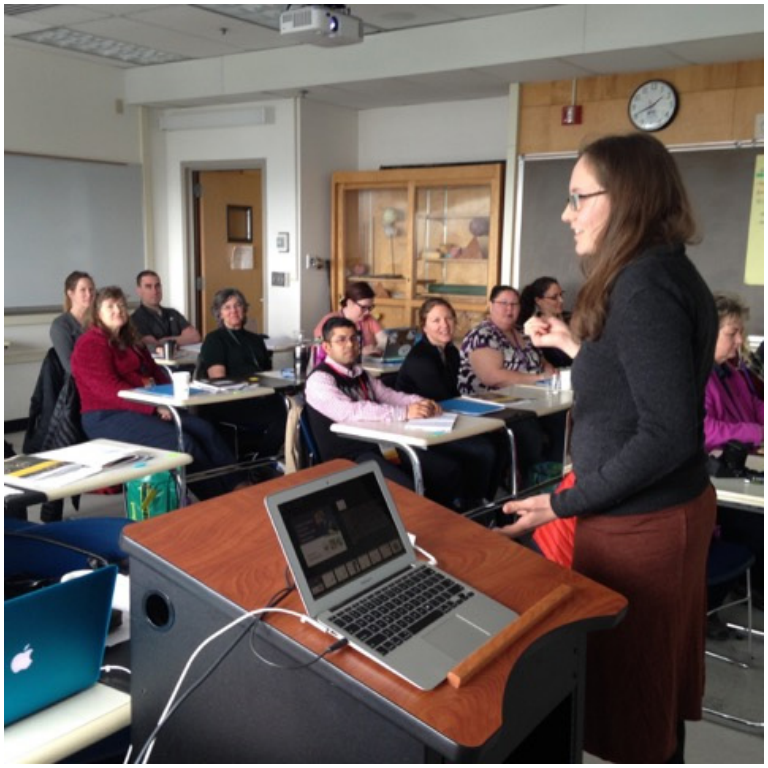
The Arctic in the Classroom (TAC) is a recently developed program created by the Arctic Research Consortium of the U.S. (ARCUS) that partners scientists, educators, and communities to improve Arctic education. This four-year program educates K-12 teachers, students, communities, and others about the Arctic. Our goal is to identify best practices for how to administer both citizen science and community-based monitoring programs that are applicable for Arctic communities. We aim to use this information to help researchers engage Arctic communities in their work and offer students and teachers a window into the relevancy of science projects in their communities. Support for this program is provided by the Arctic Research Consortium of the U.S. (ARCUS) and applicable community service payments from federal court settlements.

Workshop participants formed groups based on criteria such as science/education goals, geography, and other professional interests. Photo courtesy of Judy Fahnestock, ARCUS.

Over the next four years, we will: 1) actively engage Arctic K-12 students, teachers, and community members with local research projects through a citizen science framework; 2) manage collaborative development of K-12 Arctic-focused educational resources based on citizen science contributions to research; 3) disseminate Arctic-focused educational resources and make these available to teachers in Alaska and nationwide; and 4) develop ARCUS' role in helping researchers to meet their outreach goals, including by utilizing citizen science projects. The project also involves an external evaluation being conducted by Goldstream Group Inc., of Fairbanks, Alaska.

In March 2016, our first workshop was held in Fairbanks, Alaska to coincide with the Arctic Science Summit Week (ASSW) (https://www.arcus.org/witness-the-arctic/2016/2/article/25666). At the *Make an Impact* workshop, seven K-12 educators who currently teach in Alaskan Arctic communities and ten researchers who conduct research in the Alaskan Arctic came together with the common interest of implementing a citizen science and/or community-based monitoring project in Arctic Alaska. For three days, they worked to co-create citizen science projects that will engage communities and students in local research efforts. At the end of the workshop, the self-selected teacher-researcher teams assembled their ideas into draft plans to bring citizen science into Arctic communities. These plans will be refined and implemented in the months and years ahead.

More information about *The Arctic in the Classroom*, including the report from the *Make an Impact* workshop, can be found here (https://www.arcus.org/tac).



Speakers were invited to present their findings on relevant topics such as citizen science in the classroom, community engagement in Arctic Research, and making data available to students. Photo courtesy of Sarah Bartholow.

Inquiries about this program can be directed to info@arcus.org

Thank you to Sarah Bartholow, formerly with ARCUS, for her contributions and leadership throughout this project's development.

Recent Personnel Changes in NSF's Division of Polar Programs

The National Science Foundation's Division of Polar Programs has seen several key personnel changes in recent months.

On 1 May 2016, Brian W. Stone, who had headed the Division's Antarctic Infrastructure and Logistics (AIL) section, began an assignment as Chief of Staff to NSF Director France A. Córdova. Stone is the first to hold the position of Chief of Staff to the Director. Kelly K. Falkner, Division Director, noted at the time, "This is an excellent opportunity for Brian and a fantastic chance for him to use his managerial skills to benefit the entire foundation." She added, "Although we will miss him during his upcoming assignment, we in Polar are fortunate enough to have a depth of talent and ability in our ranks to ensure that NSF remains a global leader in polar science with continuity in all of our operations." Stone received his Bachelor's degree from Duke University and his Masters in Business Administration from George Washington University.

In the wake of this appointment, other changes took place in the Division's senior management. Scott G. Borg, who had headed Antarctic Sciences, replaced Stone as head of AIL. Eric Saltzman, who headed the Division's Arctic Sciences Section, became the head of the Antarctic Sciences Section. Simon Stephenson, who formerly headed the Arctic Sciences Section before taking a temporary assignment in the White House Office of Science and Technology Policy, once again assumed the role of Arctic Sciences Section Head.

Earlier this year there was another personnel change in the Arctic Sciences Section. In late January, Henrietta N. Edmonds, who previously served as a program officer for Arctic Natural Sciences, became the lead program director of the Chemical Oceanography program in the Geoscience Directorate's Ocean Sciences Division. A search is underway for her replacement.

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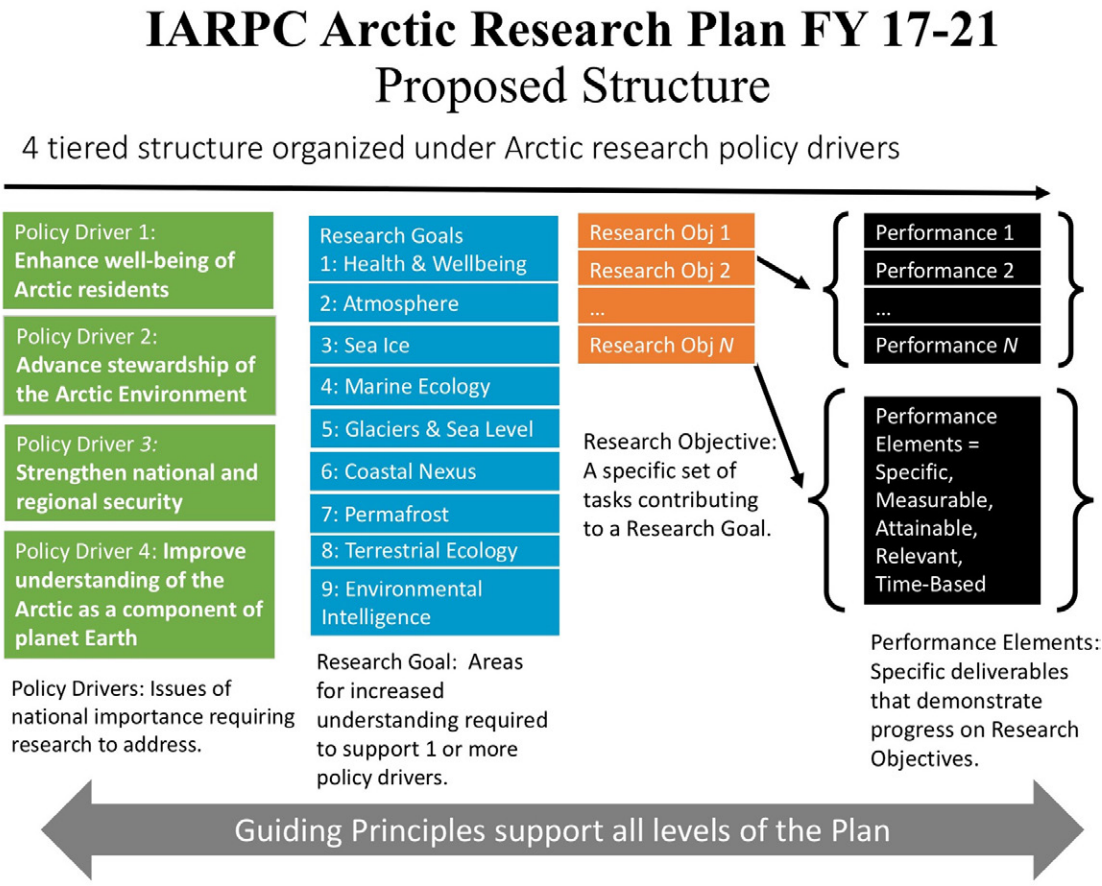
Development of the IARPC 5-Year Research Plan 2017-2021

By: Sara Bowden, Executive Secretary, Interagency Arctic Research Policy Committee (IARPC); Meredith LaValley, Intern, IARPC; and Sandy Starkweather, Senior Scientist, IARPC

The Interagency Arctic Research Policy Committee, a subcommittee of the National Science and Technology Council (NSTC), is made up of representatives from 15 federal agencies and chaired by the National Science Foundation. It is in the process of drafting its next 5-year research plan—Arctic Research Plan 2017-2021—to guide the overall federal effort in Arctic research. Like its predecessor, Arctic Research Plan 2013-2017, which was issued in February 2013, the new plan intentionally builds on the strong intellectual accomplishments and ideas of the research community at the federal, state, local, and tribal levels. It also includes ideas from the academic community, non-governmental organizations, and the private sector. Learn more about the current Arctic Research Plan here (http://www.iarpccollaborations.org/plan/index.html).

The outline for Arctic Research Plan 2017-2021 includes four tiers of organization: Policy Drivers, Research Goals, Research Objectives, and Performance Elements.



Proposed Structure for IARPC Arctic Research Plan FY 17-21

Research objectives and performance elements are currently under development.

What Might Change in the New Plan?

This plan aims to increase the visibility of research that addresses socio-economic factors of import to human well-being as well as the integration of research from across the spectrum of basic to use-inspired research.
Two topics, "Coastal" and "Permafrost," are new to this plan and IARPC hopes they will pull a rich array of existing activities together into greater coordination. The concept of "Environmental Intelligence" is also new to the plan, but it is drawing on familiar territory: observations, models, and data management.

All current IARPC Collaboration Team members and new members are welcome to contribute to the implementation of the new plan.

What is the Timeline for the Next Plan?

- **March-June 2016:** The federal-only IARPC Drafting Subgroup will develop Research Objectives and Performance Elements. They will incorporate extensive agency input, public input, and review.
- **July-August 2016:** IARPC will solicit public input. In mid-July there will be a **Federal Register Notice** and in early August IARPC will hold an **electronic town hall meeting** to hear input and comments. Through the open Federal Register process, anyone is welcome to submit a comment on the plan, and IARPC will respond to all comments.
- **September 2016:** The plan will be submitted to the appropriate federal bodies for approval and clearance to publish.
- **December 2016:** The target for public release of the approved plan.

Anyone with an interest in the development of Arctic Research Plan 2017-2021 is encouraged to request an account on the IARPC Collaborations member space (http://www.iarpccollaborations.org/request-account.html). Here, scientists and others from federal, state, academic, non-governmental, private sector, and other organizations share resources and collaborate on the implementation of the current 5-year plan. Information related to the IARPC Arctic Research Plan 2017-2021 process will be shared periodically on the member space and at collaboration team meetings.

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The Synthesis of Arctic Research - A Holistic Look at the "New Normal" Pacific Arctic

The Synthesis of Arctic Research (SOAR) gains momentum with a second volume devoted to an interdisciplinary look at the new normal Pacific Arctic.

By: Lisa Sheffield Guy, ARCUS Project Manager and Synthesis of Arctic Research (SOAR) Coordinator
University of Washington, Joint Institute for the Study of the Atmosphere and Ocean and NOAA, Pacific Marine Environmental Lab

The Synthesis of Arctic Research (SOAR) (http://www.arctic.noaa.gov/soar/), led by NOAA scientists Sue Moore and Phyllis Stabeno, and supported by the Bureau of Ocean Energy Management (BOEM), was initiated in 2011 to capture the conditions of the changing Pacific Arctic using completed and ongoing research. The effort takes a holistic look at the "new normal" Pacific Arctic of the last decade, which now has a longer open-water season with reduced sea ice thickness and extent, increased primary production, and observed changes in abundance and behavior of Arctic species. The goal of SOAR is to increase scientific understanding of the relationships among oceanographic conditions (i.e., physics, chemistry, sea ice), benthic organisms, lower trophic pelagic species (i.e., forage fish and zooplankton), and higher trophic species (i.e., seabirds, walrus, whales) in the Pacific Arctic.

The Synthesis of Arctic Research (SOAR) provides a physics-to-whales ecosystem synthesis in the Pacific Arctic. Photos courtesy of K. Stafford, J. Craighead George, G. Divoky, C. Gelfman, R. Gradinger, B. Bluhm.

SOAR began with a three-day synthesis workshop held in Anchorage during March 2012. More than 50 Arctic experts from a broad range of disciplines, and from both the scientific and local communities, convened to identify science themes and relevant datasets, and to form synthesis teams to address high-priority questions about the new normal Pacific Arctic. During the workshop, draft themes were identified and 20 synthesis topics were proposed. The Eos Meeting Report is available here (http://onlinelibrary.wiley.com/doi/10.1029/2012EO480007/epdf).

Following the workshop, synthesis teams met individually to share data and integrate information. The first phase of the synthesis was completed in summer 2015, and findings were published in a special issue of Progress in Oceanography comprised of 17 papers on topics ranging from ocean physics to whales. The synthesis was structured around three themes: 1) observations and models of sea ice loss and effects on primary production (five papers); 2) the response of mid-level trophic species to the new normal Arctic (five papers); and 3) responses of upper trophic level species (six papers). The issue uses a multi-disciplinary approach to explore how biophysical changes such as reductions in seasonal ice cover, warmer ocean temperatures, and increases in primary production and ocean acidification are reflected in changes in body condition, habitat use, and seasonal timing of upper trophic level species. Several articles, including the Special Issue overview by Moore and Stabeno, are available via open access here (http://www.sciencedirect.com/science/journal/00796611/136).

The second and final phase of SOAR extends this synthesis effort in a new special issue of Deep Sea Research II – Topical Studies in Oceanography. Building on the foundation of the original three SOAR themes, six papers will focus on observations and models of sea ice loss and effects on primary production, three papers focus on the response of mid-level trophic species to the 'new state' of the Arctic, and nine papers focus on the responses of upper trophic level species.

A summary of major SOAR findings, including what the new normal Pacific Arctic looks like and how Arctic marine life is responding to changes, was recently published in Eos and is available here (https://eos.org/project-updates/what-does-the-pacific-arctics-new-normal-mean-for-marine-life).

A complete list of SOAR Phase II special issue papers and contributors is available here (http://www.arctic.noaa.gov/soar/SOAR_projects_2.shtml).

For more information, please contact Sue Moore, NOAA/NMFS at sue.moore@noaa.gov or Phyllis Stabeno, NOAA/PMEL at Phyllis.stabeno@noaa.gov.

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Update on Recent U.S. Arctic Research Commission Activities

By: Ruth Cooper, U.S. Arctic Research Commission (USARC) Intern

The U.S. Arctic Research Commission (USARC) (https://www.arctic.gov/) is an independent federal agency that was established in 1984 by the Arctic Research and Policy Act. Its principal duties are to develop and recommend an integrated national Arctic research policy and to assist in establishing a national Arctic research program plan.

Appointments to the Commission

USARC Commissioner Larry Mayer. Photo courtesy of Larry Mayer.

President Obama recently reappointed one USARC Commissioner and named two new ones:

David Benton (https://www.arctic.gov/benton.html) was reappointed to USARC in February 2016. He is a marine resource consultant and has previously served as Executive Director of the Marine Conservation Alliance (http://marineconservationalliance.org/). He was originally appointed in June 2012.

Marie N. Greene (https://www.arctic.gov/greene.html), appointed by President Obama in December 2015, contributes a wealth of cultural insight and strong senior level leadership experience to the Commission. She previously worked at the NANA (http://www.nana.com/) Regional Corporation for 20 years, 13 of which she served as president and CEO.

Larry Mayer was appointed to the Commission in May 2016. Dr. Mayer is a Professor and Director of the School of Marine Science and Ocean Engineering at the University of New Hampshire (http://marine.unh.edu/). He has also served as the Director of the Center for Coastal and Ocean Mapping at the University of New Hampshire (http://marine.unh.edu/program/center-coastal-and-ocean-mappingjoint-hydrographic-center) since 2000.

Working Groups

USARC coordinates several working groups to explore research needs and develop action plans for issues of critical importance in the Arctic. There are currently three working groups facilitated by USARC.

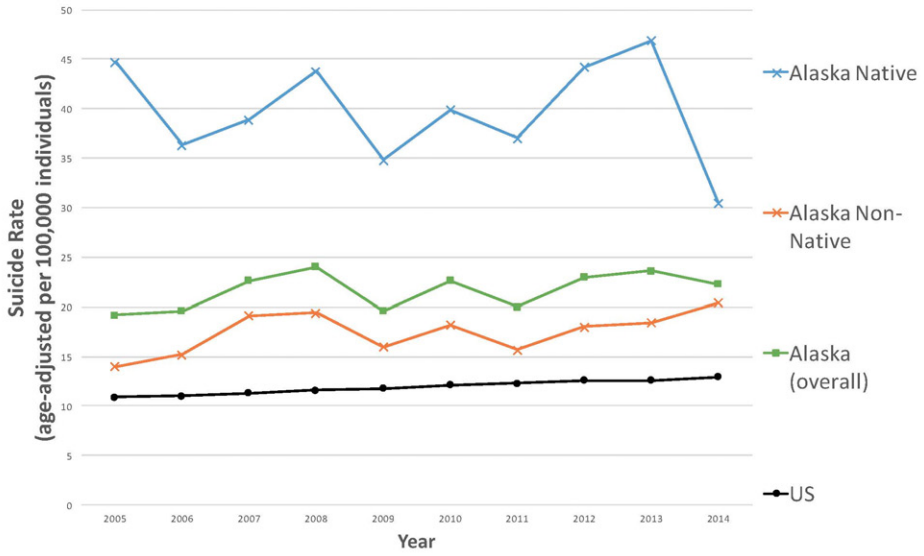
Arctic Renewable Energy Working Group (AREWG)

The AREWG was formed in late 2015 to promote research on renewable and efficient energy systems in remote Arctic communities. Group focus areas include researching new options for home heating and electricity that would increase efficiency and the use of renewable energy while decreasing heating oil consumption; the indirect community benefits of renewable energy

and efficiency that do not routinely get included in a typical energy cost/benefit analysis; and increasing the potential for industry investment in remote renewable energy projects. To date the working group has been concentrating on the home heating needs of remote Alaskan villages. A workshop was held in January 2016 to develop a heat-related research plan for rural Alaska. More information is available here (https://www.arctic.gov/arewg/index.html).

Arctic Mental and Behavioral Health Working Group (AMBHWG)

The AMBHWG aims to work with tribes and key stakeholders to promote research on, and raise awareness of, the significant behavioral health disparities that exist between Arctic and non-Arctic populations. The group's mission is to strengthen the systems of care to prevent suicide and improve mental health in the circumpolar north, with a specific focus on early intervention approaches for children. During 2016-17, the group will focus on promoting research on behavioral health evaluation of children with the hope of strengthening protective factors prior to a behavioral health crisis; supporting improved information and data sharing with the hope of enabling current systems to better identify and provide assistance to communities in need; and highlighting unmet mental health provider needs in Alaska. More information is available here (https://www.arctic.gov/ambhwg/index.html).



Alaska suicide rates for years 2005-2014 and age-adjusted per 100,000 individuals. Image courtesy of Alaska Bureau of Vital Statistics.

Alaska Rural Water and Sanitation Working Group (ARWSWG)

There are a variety of entities in Alaska working towards improving health outcomes in rural Alaska by providing and improving water services in villages. Since 2010, USARC has been coordinating these groups so that this work is maximally efficient and ideas can be shared across federal, state, Alaska Native, and academic groups. In 2016-17, the ARWSWG plans to focus on capacity, management, and economics in this subject area, with a specific emphasis on management at the local level and how success can be best achieved through working with local communities. Further information about the ARWSWG is available here (https://www.arcus.org/www.arctic.gov/water-san/index.html).

Events

On 28 September 2016, science ministers from over 20 nations will gather in Washington, D.C., for the first-ever White House Arctic Science Ministerial. The event will be co-chaired by Fran Ulmer, Chair of USARC, and France A. Córdova, Director of the National Science Foundation and Ex-Officio Member of USARC. Further information is available here (https://www.arctic.gov/aesc/ministerial.html).

USARC's 106th meeting will be held in Washington, D.C. on 29-30 September 2016.

Publications

The ARWSWG released a revised Alaskan Water and Sanitation Retrospective 1970-2005 in June 2015. Focused on techniques deployed in rural Alaskan villages between about 1970 and 2005, the report is available here (https://www.arcus.org/www.arctic.gov/water-san/publications.html).

The September 2015 issue of Oceanography, co-sponsored by the Arctic Research Program, Climate Observation Division of NOAA, and USARC focused on the Russian-American Long-term Census of the Arctic (RUSALCA) (http://www.arctic.noaa.gov/rusalca/) program. The special issue contains 14 articles that describe joint U.S.-Russian expeditions and follow-on research in the Chukchi Sea and Bering Strait regions. The issue is available online here (https://www.arcus.org/www.tos.org/oceanography/issue/volume-28-issue-03%23sthash.oRK6RlDe.dpuf).

Other News

The new Arctic Executive Steering Committee (AESC) website has been launched and can be found here (https://www.arctic.gov/aesc/). President Obama established the AESC with his January 2015 Executive Order, "Enhancing Coordination of National Efforts in the Arctic (https://www.whitehouse.gov/the-press-office/2015/01/21/executive-order-enhancing-coordination-national-efforts-arctic)." The AESC is charged with providing guidance and coordinating priorities and activities across Executive Branch agencies under the National Strategy for the Arctic Region. These responsibilities include improving the coherence of engagement with the State of Alaska and Alaska Native communities and supporting the U.S. Chairmanship of the eight-nation Arctic Council for 2015–2017.

To subscribe to the Arctic Update, a daily email newsletter that keeps readers up to date on Congressional hearings, legislative actions, noteworthy news stories, and future events related to the Arctic, go here (https://www.arctic.gov/arctic_update/index.html).

Further information on USARC activities is available on the USARC website (http://www.arctic.gov/) or by contacting John Farrell, USARC Executive Director (jfarrell@arctic.gov).

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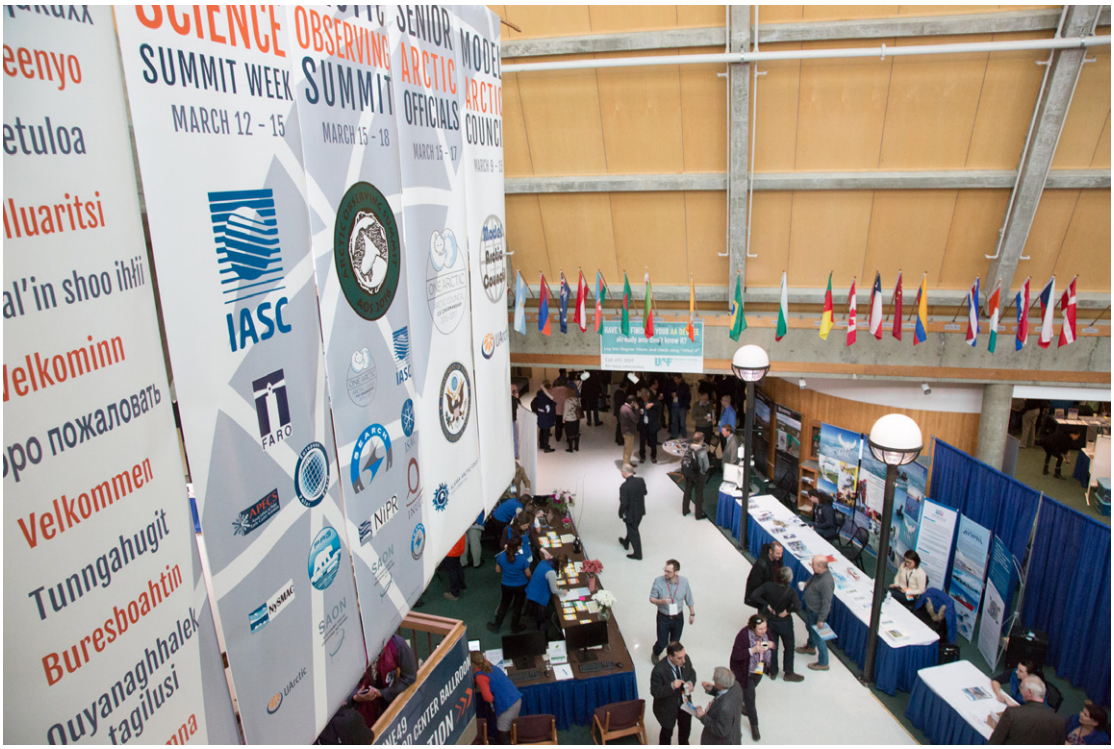
Largest Arctic Science Summit Week to Date is a Leap Forward for Arctic Research and Policy

By: Kristin Timm, Science Communications Lead, Scenarios Network for Alaska and Arctic Planning, University of Alaska Fairbanks

Over 1,000 Arctic experts and enthusiasts convened in Fairbanks, Alaska on 11-18 March for the 2016 Arctic Science Summit Week, Arctic Observing Summit, and numerous other meetings and events. With participants representing 30 nations and more than 130 different institutions, the gathering represents a significant step towards the future of Arctic research and policy.



The University of Alaska Fairbanks hosted the 2016 Arctic Science Summit Week. Photo courtesy of Todd Paris.

While this was the 18th Arctic Science Summit Week (ASSW) convened by the International Arctic Science Committee (IASC) and its partner organizations, the conference achieved many notable firsts. For the first time, the Arctic Council held their Senior Arctic Officials meeting in conjunction with ASSW. It was also the first time that representatives from the U.S. Polar Research Board (U.S. PRB), U.S. Arctic Research Commission (USARC), European Polar Board (EPB), Polar Knowledge Canada (PKC), and the Asian Forum on Polar Sciences (AFOPS) jointly convened. The University of Alaska Fairbanks (UAF) hosted the first International Arctic Assembly in the middle of the week when most of the meeting participants overlapped. Approximately 100 smaller side meetings and sessions complemented these and other major meetings. From Arctic health and community resilience, to data collaboration and science communication, the diversity of meeting subjects covered an impressively range of Arctic issues.

Participants were equally diverse, with roughly a tenth of the conference participants representing Arctic indigenous groups and private industry. An additional 20 percent of participants represented local, state/provincial, or federal governments or agencies. This convergence of scientists, policy makers, technical specialists, security and defense representatives, local residents, and

indigenous stakeholders enabled an extensive and genuine exchange of ideas and concerns. The week provided an excellent opportunity for a dialogue to better understand the complex interplay of interests in the Arctic and to translate scientific research into specific plans and actions to respond to rapid Arctic change.

The conference provided an indication of the acute ability of the Arctic community to pull together towards common visions and goals; despite their different scientific disciplines, missions, and nationalities, progress was made on several specific issues, including:

Arctic Science Summit Week

ASSW created opportunities for collaboration and strategic planning on international research projects. With representatives from federal agencies and other governing bodies, this enabled the concerns of many perspectives to be included and ensures communication to all major parties involved.

UAF Vice Chancellor for Rural, Community, and Native Education Evon Peter was one of the dancers at the ASSW Banquet. Photo courtesy of Todd Paris.

Arctic Observing Summit

The Arctic Observing Summit resolved to create an observing system that will support decision making in a rapidly changing environment. "Arctic change is a consequence of global change, with global repercussions, and addressing it is a global responsibility," the statement concludes. "It is time to move forward with full intent and full engagement and act on these recommendations of summit participants."

Multidisciplinary Drifting Observatory for the Study of Arctic Climate (MOSAiC)

The MOSAiC session provided an opportunity to unveil the MOSAiC implementation plan, which has been under development with support from the International Arctic Science Committee (http://iasc.info/)- Third International Conference on Arctic Research Planning (http://icarp.arcticportal.org/)
(IASC-ICARPIII) process. The session updated the community on specific details related to the project design, re-supply considerations, drift trajectory, timing, project leadership/management, and funding considerations. It was very well attended and had great engagement, suggesting a growing excitement in the community.

Third International Conference on Arctic Research Planning

The final conference statement from the Third International Conference on Arctic Research Planning (ICARPIII) was released during ASSW 2016. This was released as a plan for integrating Arctic research as a roadmap for the future. Numerous recommendations focused upon understanding the role of the Arctic in the global system. Additional guidance was provided to enhance observations and increase the predictive capability of future climate dynamics and ecosystem responses. Many recommendations were targeted to understanding the vulnerability and resilience of Arctic environments and societies.

Many school children, community members, and press were also engaged in the excitement and energy that surrounded the summit. Over 150 pieces of original art and videos were submitted by students from Alaska and as far away as Russia, Wisconsin, and Arizona. Over 30 public outreach events, field trips, and UAF facility tours were conducted over the course of the week giving

Alaskans and the Fairbanks community opportunities to mingle with conference participants and learn about science and policy issues in their Arctic backyard. Social media and live web streaming enabled virtual participation in several parts of the meeting, and 2,000 unique views were documented when people around the world joined the live web-stream. Eight journalism fellows helped carry stories—both specifically from the week and from Arctic science more generally¬—to audiences around the nation and world through articles in numerous news outlets including the Washington Post, the Guardian, and EFE (the largest Spanish-language news service).

Hosting the largest Arctic Science Summit Week to date was no small effort. The Fairbanks community, the Fairbanks Convention and Visitors Bureau, over 200 volunteers, and dozens of sponsors made this event possible. In addition to countless hours and in-kind support by the University of Alaska Fairbanks, the major conference sponsors included:

- NSF
- NASA
- Department of Energy
- NOAA
- North Slope Science Initiative
- Alaska EPSCoR
- U.S. Arctic Research Commission
- Alaska Ocean Observing System
- North Pacific Research Board

If you attended ASSW or AOS, you can help the organizers evaluate the meeting by completing a short post-conference evaluation available here (http://goo.gl/forms/Gn5KXBL66a).

Photos, videos, documents, news stories, and more information about the 2016 Arctic Science Summit Week are available on the ASSW 2016 website (http://assw2015.org/).

Photo courtesy of Julien Schroder

Dr. John Walsh (Chief Scientist at the International Arctic Research Center (IARC), University of Alaska Fairbanks) was awarded the International Arctic Science Committee (IASC) medal during ASSW 2016, and delivered a compelling lecture about his Arctic climate change studies. The medal committee selected Walsh due to his exceptional contributions to modeling and evaluating climate change impacts in the Arctic, particularly with regard to his sustained and distinguished contributions to quantitatively improving our understanding of the Arctic.

IASC Secretariat Moves from Germany to Iceland

By: Volker Rachold, International Arctic Science Committee (IASC) and Þorsteinn Gunnarsson, the Icelandic Centre for Research (RANNÍS)

The International Arctic Science Committee (IASC) (http://iasc.info/) is a non-governmental, international scientific organization founded in 1990 by representatives of national scientific organizations of the eight Arctic countries: Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden, and the United States of America. Over the past 25 years, IASC has evolved into the leading international science organization of the North and its membership today includes 23 countries, including 15 non-Arctic countries (Austria, China, the Czech Republic, France, Germany, India, Italy, Japan, the Netherlands, Poland, Portugal, South Korea, Spain, Switzerland, and the United Kingdom). The Founding Articles (http://iasc.info/images/about/iasc-founding-articles.pdf) committed IASC to pursue a mission of encouraging and facilitating cooperation in all aspects of Arctic research, in all countries engaged in Arctic research, and in all areas of the Arctic region. IASC promotes and supports leading-edge multi-disciplinary research in order to foster a greater scientific understanding of the Arctic region and its role in the Earth system. IASC´s instruments to support science development include its five Working Groups (http://iasc.info/working-groups) and the Arctic Data Committee (http://iasc.info/data-observations/arctic-data-committee). Contributions are made through participation in workshops, networks, long-term programs, assessments, and collaborative science planning activities such as the recently completed third International Conference on Arctic Research Planning (ICARP III) (http://icarp.arcticportal.org/).

The organizational needs of IASC are served by an international Secretariat, which is hosted and financed by an IASC member country. The first 15 years Norway provided support for the Secretariat and in 2006 Sweden took over. Since 2009 the Secretariat is hosted by the Alfred Wegener Institute in Potsdam (Germany) and co-financed by the German Science Foundation (DFG). The central IASC Secretariat is supported by small sub-secretariats hosted and financed by other IASC member countries. At present the Secretariat has sub-offices in Canada, Japan, Korea, and Poland and a fifth sub-secretariat in Russia is currently being established.

At the IASC Council (http://iasc.info/iasc/organization/council) meeting, which was held on 14 March 2016 in Fairbanks, Alaska, it was decided to move the location of the central IASC Secretariat from Potsdam to Akureyri, Iceland where it will be hosted by the Icelandic Centre for Research (Rannis) (https://en.rannis.is/) for five years beginning 1 January 2017.

Rannis supports research, innovation, education, and culture in Iceland. Rannis cooperates closely with the Icelandic Science and Technology Policy Council (https://eng.forsaetisraduneyti.is/science-and-technology-policy-council/) and administers competitive funds in the fields of research, innovation, education, and culture, as well as strategic research programs. It also coordinates and promotes Icelandic participation in European programs such as Horizon 2020 (https://ec.europa.eu/programmes/horizon2020), Erasmus+ (http://ec.europa.eu/programmes/erasmus-plus/node_en), and Creative Europe (https://ec.europa.eu/programmes/creative-europe/) and represents Iceland within IASC.

Northern Lights over Akureyri, Iceland. Photo courtesy of Ragnar Hólm.

The IASC Secretariat will be located in the town of Akureyri in Northern Iceland, which has become a center for Arctic research institutes, activities, and events. In Akureyri, the IASC Secretariat will be located on the University of Akureyri campus in close proximity with several important Arctic agencies that can benefit IASC activities; these agencies include the Stefansson Arctic Institute, the Icelandic Arctic Cooperation Network (IACN), the University of Akureyri Research Centre, and two of the secretariats for the Arctic Council Working Groups—Conservation of Arctic Flora and Fauna (CAFF) and Protection of the Arctic Marine Environment (PAME).

The cooperation of these Arctic institutes and agencies, and others in the research environment of Akureyri, will create excellent conditions for the IASC Secretariat to thrive and prosper in an efficient way for the long-term interest of the important endeavor that is Arctic research.

Further information about IASC is available here (http://iasc.info/).

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White House Arctic Science Ministerial and Call-To-Action

By: Brit Myers, Project Manager, Arctic Research Consortium of the U.S.

On 28 September 2016, the U.S. Administration will host the first-ever Arctic Science Ministerial meeting in Washington, D.C., convening science ministers, chief science advisors, indigenous representatives, and other high-level officials from foreign governments around the world in an effort to advance international scientific collaboration in the Arctic.

According to the White House event announcement (https://www.whitehouse.gov/blog/2016/05/13/white-house-arctic-science-ministerial-september-28-2016), the goals for the meeting are "to advance promising, near-term science initiatives and create a context for increased international scientific collaboration on the Arctic over the longer term." Additionally, four key themes have been identified to guide and focus Ministerial discussions:

1. **Arctic Science Challenges and their Regional and Global Implications** – addressing the need for additional international scientific collaboration in the gathering, synthesizing, and sharing of environmental Arctic change information and its local and global implications.
2. **Strengthening and Integrating Arctic Observations and Data Sharing** – addressing the shortfalls and integration barriers associated with current Arctic monitoring capabilities, community-based observing, and the use of indigenous knowledge.
3. **Applying Expanded Scientific Understanding of the Arctic to Build Regional Resilience and Shape Global Responses** – addressing the need to enhance the resilience of Arctic communities in the face of change through international collaboration.
4. **Arctic Science as a Vehicle for STEM Education and Citizen Empowerment** – addressing the educational challenges facing Arctic youth to ensure that the next generation of Arctic communities is prepared for and active participants in their futures.

In advance of the event, the White House has issued a call-to-action (https://www.whitehouse.gov/webform/white-house-arctic-science-ministerial-september-28-2016) asking "individuals, organizations, and institutions from all sectors to take new, specific, and measurable steps to help all people better understand, adapt to, and address the changing conditions in the Arctic." Call-to-action responses that align well with the key themes of the Ministerial may be featured in White House communications surrounding the event.

To submit your response to the White House call-to-action please click here (https://www.whitehouse.gov/webform/white-house-arctic-science-ministerial-september-28-2016).

Connecting Arctic Research – A Note from the ARCUS Executive Director

The Arctic Research Consortium of the United States (ARCUS) has been dedicated to connecting Arctic research across boundaries for more than 25 years. We work to support communication, coordination, and collaboration between researchers, among institutions, spanning disciplines, bridging sectors, and connecting nations. Witness the Arctic is one of many offerings we provide.

In order so that we can better serve you, I'd encourage each Witness reader to complete the Arctic research readership needs survey here (https://www.surveymonkey.com/r/ArcticReadership). In today's environment of rapidly changing communications tools and media, we will be using the results of this survey to continue to provide you with the information and insights that you most need, and to get them to you in a timely and easily accessible manner.

Since I last wrote, ARCUS was very busy in support of connections at the Arctic Science Summit Week / Arctic Observing Summit / Arctic Council meetings and related events in Fairbanks during March. We welcomed more than 50 members of the Arctic research community to an Open House Drop-In Event with rich conversations and new connections. We kicked off the Arctic in the Classroom project with a "Make an Impact" workshop that brought together Alaska Arctic educators and researchers ready to collaborate in the development of STEM educational resources. I facilitated a well-attended and well-received listening session to gather input on priority objectives and implementation targets for the Interagency Arctic Research Policy Committee (IARPC) 5-year research plan. We were visible and actively connecting people throughout the events, hosted a joint exhibit booth with the Polar Research Board, and much more. A summary of highlights is at https://www.arcus.org/meetings/2016/assw.

Our Arctic Research Seminar/Webinar Series in Washington, D.C. has been very successful, drawing an audience of policymakers, resource managers, non-governmental organizations, researchers, and the interested public to hear from the leading researchers on the latest results. So far, we have hosted Julie Brigham-Grette (University of Massachusetts), Jennifer Francis (Rutgers University), Jeremy Mathis (NOAA and the University of Alaska, Fairbanks), and Ted Schuur (Northern Arizona University) for highly informative discussions at our ARCUS D.C. office and shared online via live, free webinar. Information and registration for upcoming presentations, and recordings of past presentations, are available at https://www.arcus.org/research-seminar-series.

In May, ARCUS held a Polar Prediction Workshop in support of the Sea Ice Prediction Network and in collaboration with Columbia University's Lamont-Doherty Earth Observatory. There was a wide range of prediction science discussed there and some great connections begun. Also, working in support of the Study of Environmental Arctic Change (SEARCH), we brought together a meeting of its Science Steering Committee and Action Team Leads focused on sea ice, land ice, and permafrost, as well as a number of cross-cutting issues.

Speaking of sea ice, our annual Sea Ice for Walrus Outlook (SIWO) season took place from March – June 2016. SIWO brings together information from the National Weather Service, the Sea Ice Prediction Network, and coastal Alaska Arctic communities to provide timely, valuable information on local sea ice to support subsistence activities. Also, the 2016 Sea Ice Outlook has begun, drawing upon an international collection of researchers to synthesize and improve our understanding of sea ice prediction. More information, including an invitation to participate, is available at https://www.arcus.org/sipn.

ARCUS is a member-focused organization and we invite you to join us. Last year, we expanded ARCUS membership access to all types of organizations and to individuals interested in championing the study of this important region. If you support Arctic research (or are engaged in conducting it), you should be an ARCUS member. Dues are not high, as we seek to represent and engage all those working toward better understanding of the Arctic and the application of that knowledge to decision-making. For more information on ARCUS and how to get involved, please view our ARCUS video at https://www.arcus.org/video.

Feel free to contact me with any ideas that you have for future content, or any other suggestions that ARCUS could pursue to better help you to connect across boundaries. I'd love to hear from you at bob@arcus.org.

Thank you for everything that you do in support of Arctic research.

Robert H. Rich, Ph.D., CAE

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Arctic Research Policy Update: An Inside-the-Beltway View

Greetings from the ARCUS D.C. Office, which is increasingly serving as a hub of Arctic research activity here in the nation's capital. The Arctic Research Seminar Series (https://www.arcus.org/research-seminar-series) has been bringing policymakers and local stakeholders together with leading Arctic researchers each month since January. Our building also hosted the Interagency Arctic Research Policy Committee (IARPC) Re-visioning Workshop in December and an International Arctic Fisheries Meeting in April.

D.C. Arctic Research Policy Activities

A major advantage of my being based here in D.C. (with our headquarters remaining in Fairbanks, Alaska) is the ability to participate in the frequent policy discussions related to Arctic research. In April, I attended a presentation (http://www.brookings.edu/events/2016/04/25-us-arctic-council-chairmanship) at the Brookings Institution by Admiral Robert J. Papp, Jr., who is U.S. Special Representative for the Arctic. He spoke of substantial progress made through the Arctic Council in establishing international agreement and cooperation on issues including black carbon (http://www.thearcticinstitute.org/2016/04/keeping-arctic-white-black-carbon-and.html), oil spill prevention and response (http://arctic-council.org/eppr/agreement-on-cooperation-on-marine-oil-pollution-preparedness-and-response-in-the-arctic/), and search and rescue (including establishment of the Arctic Coast Guard Forum (http://www.thearcticinstitute.org/2015/11/the-arctic-coast-guard-forum-big-tasks.html)). He also highlighted Obama administration efforts to raise Arctic visibility within the U.S., primarily through the GLACIER Conference (http://www.state.gov/e/oes/glacier/index.htm) and the President's visit to Alaska last summer. Following up from that visit, progress has been made on obtaining a new Arctic icebreaker, enhancing emergency response and preparedness, promoting clean energy innovations in the Arctic, bolstering nautical charting, and signing an agreement on unmanned aerial systems in Alaska. There was a tabletop exercise in October called Arctic Zephyr (http://www.uscgnews.com/go/doc/4007/2618330/U-S-Coast-Guard-and-federal-partners-lead-Arctic-search-and-rescue-exercise) to support search and rescue. Admiral Papp spoke about ongoing negotiations to achieve an international agreement (through the Arctic Council) on scientific cooperation in the Arctic, something which ARCUS and the community will be watching closely. It is hoped that this agreement will be signed as part of the Spring 2017 Arctic Council Ministerial Meeting (http://www.newsminer.com/news/local_news/fairbanks-to-host-arctic-council-ministerial-meeting-in/article_60243ed4-c3ae-11e5-9816-c71b2b6f32fa.html) in Fairbanks, Alaska .

Another major research-related Arctic event in D.C. was the Arctic Matters Day (http://nas-sites.org/arctic/), held by the Polar Research Board (part of the National Academies of Science, Engineering, and Medicine) in January. ARCUS was a major participant in the exhibit hall, sharing inspiring hands-on Arctic research and education activities with the attendees, many of whom were government officials and NGO leaders.

Appropriations Update

ARCUS is pleased to have initiated a reciprocal membership agreement with the Consortium for Ocean Leadership, which has an active advocacy effort on behalf of the Earth Sciences. Here is a brief update from them on the Senate Appropriations Bill which just passed committee:

In a show of bipartisanship, the Senate Appropriations Committee voted (http://www.appropriations.senate.gov/hearings/markup-

of-the-fy17-commerce-justice-science-appropriations-bill-and-the-fy17-transportation-housing-and-urban-development-bill) unanimously to approve the Commerce, Justice, Science and Related Agencies (CJS) bill. The CJS bill appropriates a total of $56.3 billion for national security, law enforcement, and science. This year's Senate bill is $563 million above last year's enacted funding level and $1.6 billion above the Administration's Fiscal Year (FY) 2017 request, demonstrating the committee's support for science and innovation. While CJS Subcommittee Chairman Richard Shelby (AL) chastised the National Oceanic and Atmospheric Administration (NOAA) for its "inability to modernize the way it manages fisheries," the bill still proposes $5.7 billion for NOAA, a $33.5 million increase over last year's enacted funding. The Majority summary notes the inclusion of "$5.7 billion for NOAA, a $33.5 million increase above the FY2016 enacted level for core NOAA operations including: ocean monitoring; fisheries management; coastal grants to states; aquaculture research; and severe weather forecasting. The bill provides full funding for NOAA's flagship weather satellites, which are critical for accurate weather warnings to save lives and protect property." For more general information, click here (http://policy.oceanleadership.org/science-funding-moves-forward).

Appropriations for research remain a concern in this tight funding environment. ARCUS urges everyone in the Arctic research community to pay attention and get involved in the process.

Shifting Roles in U.S. Arctic Research Leadership

NSF Polar Programs has announced some significant staffing changes:

The National Science Foundation announces that Brian W. Stone will serve as the NSF Director's Chief of Staff, and related personnel changes within the Antarctic Sciences Section (ANT) and the Arctic Sciences Section in the Division of Polar Programs (POLAR).

Brian W. Stone, who heads the Antarctic Infrastructure and Logistics (AIL) section in the National Science Foundation's Division of Polar Programs, will begin an assignment as chief of staff to NSF Director France A. Córdova on 1 May 2016.

Scott G. Borg, who is currently the head of the Division's Antarctic Sciences Section, will replace Brian as the head of AIL. Eric Saltzman, who is currently head of the Division's Arctic Sciences Section, will become the head of Antarctic Sciences.

Simon Stephenson, who formerly headed the Arctic Sciences section before taking a temporary assignment in the White House Office of Science and Technology Policy, will once again assume the role of Arctic Sciences Section head.

"This is an excellent opportunity for Brian and a fantastic chance for him to use his managerial skills to benefit the entire foundation," said Kelly K. Falkner, Division Director. "Although we will miss him during his upcoming assignment, we in Polar are fortunate enough to have a depth of talent and ability in our ranks to ensure that NSF remains a global leader in polar science with continuity in all of our operations."

Also, IARPC has announced a new Executive Director:

IARPC is pleased to welcome Martin O. Jeffries as their new Executive Director. Martin is currently on detail/secondment from the Office of Naval Research to the White House Office of Science and Technology Policy, where he also serves as the Assistant Director of Polar Science. Martin has been involved with IARPC as a co-lead of the Sea Ice Collaboration Team as well as section author of the IARPC Arctic Research Plan 2013-2017. More information about Martin is available on the IARPC Collaborations profile. IARPC wishes to thank Mike Kuperberg, U.S. Global Change Research Program, for his service as their Interim Executive Director. More information about Jeffries is available here (http://www.iarpccollaborations.org/members/people/164).

Reports Released from IARPC and the Arctic Executive Steering Committee (AESC)

In March, the White House released two new key reports related to the Arctic: The 2015 Year in Review (https://www.whitehouse.gov/sites/whitehouse.gov/files/documents/Progress%20Report%20on%20the%20Implementation%20of%20the%20National%20Strategy%20for%20the%20Arctic%20Region.pdf)- Progress Report on the Implementation of the National Strategy for the Arctic Region; and, as an appendix to that report, the 2016 Implementation Framework for the National Strategy for the Arctic Region (https://www.whitehouse.gov/sites/whitehouse.gov/files/documents/National%20Strategy%20for%20the%20Arctic%20Region%20Implementation%20Framework%20%28Appendix%20A%29%20Final.pdf), discuss government-wide coordination activities in the Arctic. Also included as an appendix is the IARPC 5-Year Plan Collaboration Teams-Summary of Accomplishments and 2016 Priorities (https://www.whitehouse.gov/sites/whitehouse.gov/files/documents/Appendix%20B%20IARPC%202015%20Annual%20Report.pdf). These documents highlight the Nation's commitment to action on the challenges and opportunities presented by the rapidly changing Arctic environment. All are recommended background reading on where Arctic policy is headed.

Upcoming Arctic Science Ministerial

This fall, we expect to see a ministerial-level meeting (https://www.whitehouse.gov/the-press-office/2016/03/10/us-canada-joint-statement-climate-energy-and-arctic-leadership) of Arctic science ministers convened by the AESC and State Department. This presents a great opportunity to draw high level attention to the needs of our community and for connecting across boundaries in support of Arctic research. ARCUS is working to bring research voices to the table in these deliberations.

Conclusion and Summary

As I reported to ARCUS members last month, the environment for Arctic research remains uncertain. I would ask everyone to speak out and make sure that the important work being carried out to understand this vital and rapidly changing region remains a priority. At ARCUS, we seek to maximize the effectiveness of the research effort by enhancing communication, coordination, and collaboration across boundaries. Hopefully, this information on the D.C. policy scene is useful to you. If you have any comments or suggestions for future such columns, please email me at bob@arcus.org. Thank you for reading!

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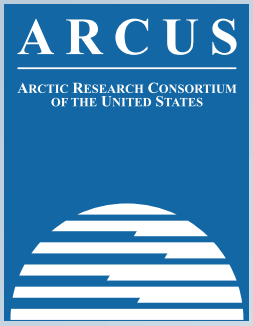

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