Witness the ARCTIC

Chronicles of the NSF Arctic Sciences Section — Winter 2013, Volume 17 Number 1

In this Issue

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SEARCH Updates

SEARCH at AGU 2012 Fall Meeting

A SEARCH (http://www.arcus.org/search/index.php) AGU Town Hall was held at the AGU fall meeting to provide a forum for open exchange on SEARCH activities and future priorities. Specific topics included the new SEARCH five-year goals and the Arctic Observing Network (AON). Approximately 80 members of the arctic science community attended the Town Hall, and input received during the discussion was used by the SEARCH Science Steering Committee (http://www.arcus.org/search/sciencecoordination/ssc-committee) to adjust SEARCH goals and planning. More information about the Town Hall and other SEARCH events at AGU is available here (http://www.arcus.org/search/meetings/2012/agu).

SEARCH Implementation Planning

Over the last few months, the SEARCH SSC and ARCUS (SEARCH project office) have focused on developing a proposal to NSF and other SEARCH Interagency Program Management Committee agencies (http://www.arcus.org/search/sciencecoordination/ipmc) in support of a new organizational structure and suite of activities to implement the SEARCH 5-year goals, which are:

1. Improve Understanding, Advance Prediction, and Explore Consequences of Changing Arctic Sea Ice (http://www.arcus.org/search/sea-ice)
2. Document and Understand How Degradation of Near-Surface Permafrost Will Affect Arctic and Global Systems (http://www.arcus.org/search/permafrost)
3. Improve Predictions of Future Land-ice Loss and Impacts on Sea Level (http://www.arcus.org/search/land-ice)
4. Analyze Societal and Policy Implications of Arctic Environmental Change (http://www.arcus.org/search/society)

In addition to the four science goals, proposed SEARCH activities will advance AON and cross-cutting synthesis activities. One focal area of SEARCH activities will be "Arctic Futures 2050"—scenarios that describe plausible future states of the arctic system or its components based on recent trajectories and projected changes.

SEARCH is currently contributing to the planning of the Arctic Observing Summit (AOS) (http://www.arcticobservingsummit.org/) (also see the AOS article in this issue (http://www.arcus.org/witness-the-arctic/2013/1/article/19630)); Craig Lee, Chair of the SEARCH Observing Change Panel (http://www.arcus.org/search/sciencecoordination/observing) is serving as co-chair of the AOS organizing committee.

NASA Research Solicitations Provide Opportunities for SEARCH Science

SEARCH recently distributed a "Dear Colleague" letter encouraging members of the arctic research community to respond to three relevant NASA Research Announcements that align with SEARCH goals: (1) Interdisciplinary Research in Earth Science (NASA Solicitation
NNH12ZDA001N-IDS), (2) Sea Level Rise (NNH13ZDA001N-SLR), and (3) Cryospheric Science (NNH13ZDA001N-CRYO).

The full letter can be found here (http://www.arcus.org/arctic-info/archive/19603).

For more information on SEARCH activities, please contact Helen Wiggins, ARCUS (SEARCH Project Office) at helen@arcus.org, or Hajo Eicken (SEARCH SSC Chair) at: hajo.eicken@gi.alaska.edu.

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Demographics of True and False Arctic Facts

In a recent survey of the U.S. general public, a team of researchers led by Lawrence Hamilton (http://pubpages.unh.edu/~lch/) at the University of New Hampshire's Carsey Institute investigated the correlation between climate beliefs and the assimilation of science information. This research, funded in part by NSF, found complex patterns in which perceptions about arctic trends could sometimes be a consequence of general beliefs rather than a simple function of science literacy. These findings have implications for science education and outreach efforts, which often aim to communicate the basic information that underlies scientific conclusions.

Hamilton and colleagues designed the survey, whereby telephone interviews were conducted with a nationwide random sample of 2,000 people in the summer of 2011. Questions covered respondent background and opinions on various topics, along with some climate belief or knowledge items like the arctic sea ice question below. To avoid possible bias, interviewers rotated the order in which they read response choices. Comparisons between the survey and 2010 U.S. Census data allowed weighting for representative results. A series of statewide New Hampshire surveys, asking the same questions, also support the national conclusions.

The survey investigated public knowledge of arctic sea ice facts with the following question:

Which of the following three statements do you think is more accurate?
Over the past few years, the ice on the Arctic Ocean in late summer:
1. Covers less area than it did 30 years ago.
2. Declined but then recovered to about the same area it had 30 years ago.
3. Covers more area than it did 30 years ago.

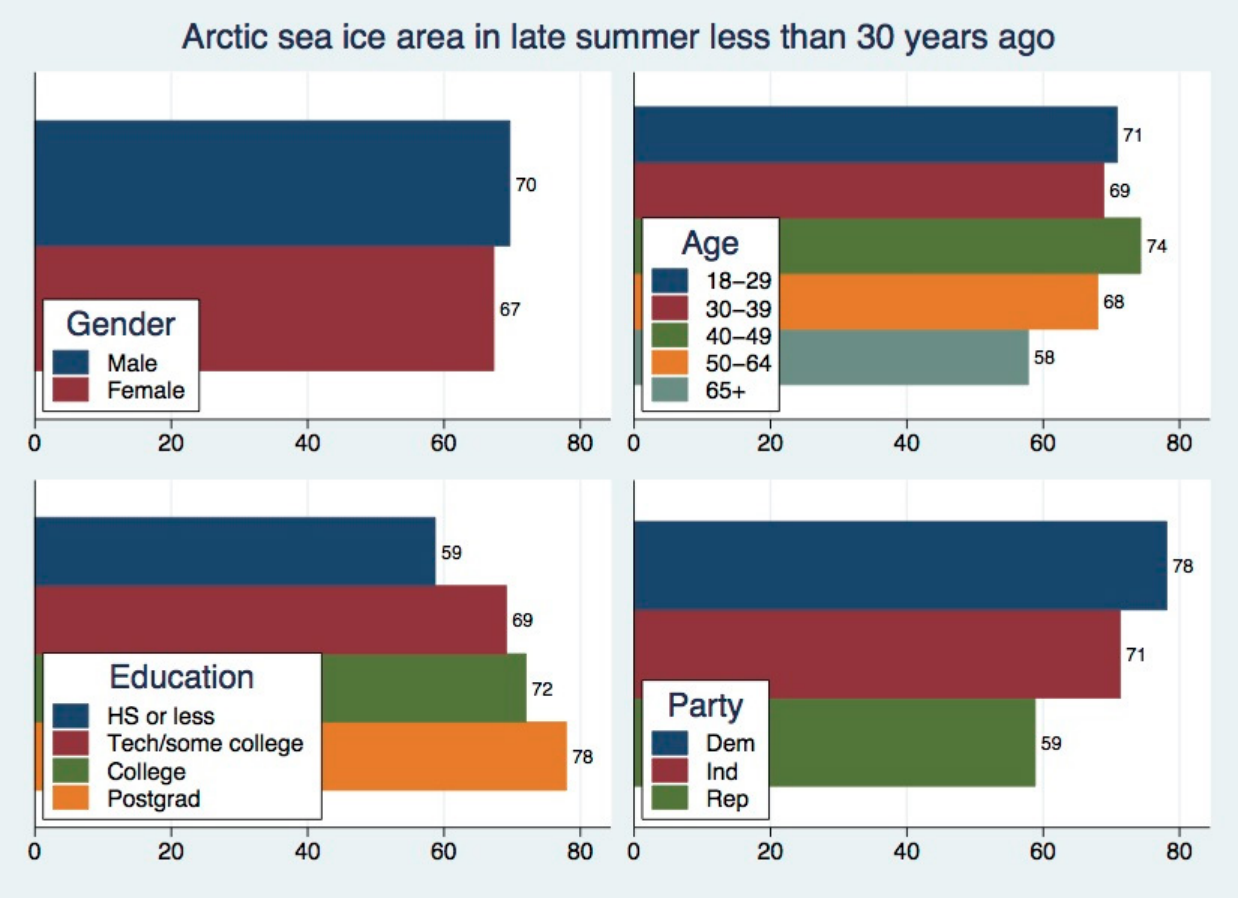

Figure 1: Demographic patterns in knowledge that arctic sea ice area declined. Image courtesy of Larry Hamilton.

Sixty-eight percent of the survey respondents knew that sea ice area has declined. The remaining 32%, however, thought that ice has recovered, or covers more area, or said they did not know. Although 68% nationally think that late-summer arctic sea ice area has declined compared with 30 years ago, this fraction is not constant across sub-groups. There are weak but statistically significant correlations with gender and age (See Figure 1), however, education and political party exhibit stronger effects on what people think about arctic sea ice. This is also true in regards to other science and environment topics.

From a social-science perspective, wrong answers proved to be as interesting as right answers. Correct answers can be predicted by education and some wrong answers have predictors that suggest a lack of knowledge, but other wrong answers are predicted by political and belief factors instead. Researchers found that response to the sea ice question also correlated with general beliefs about climate change, which was assessed by another question on the survey:

Which of the following three statements do you personally believe?

1. Climate change is happening now, caused mainly by human activities.
2. Climate change is happening now, but caused mainly by natural forces.
3. Climate change is NOT happening now.

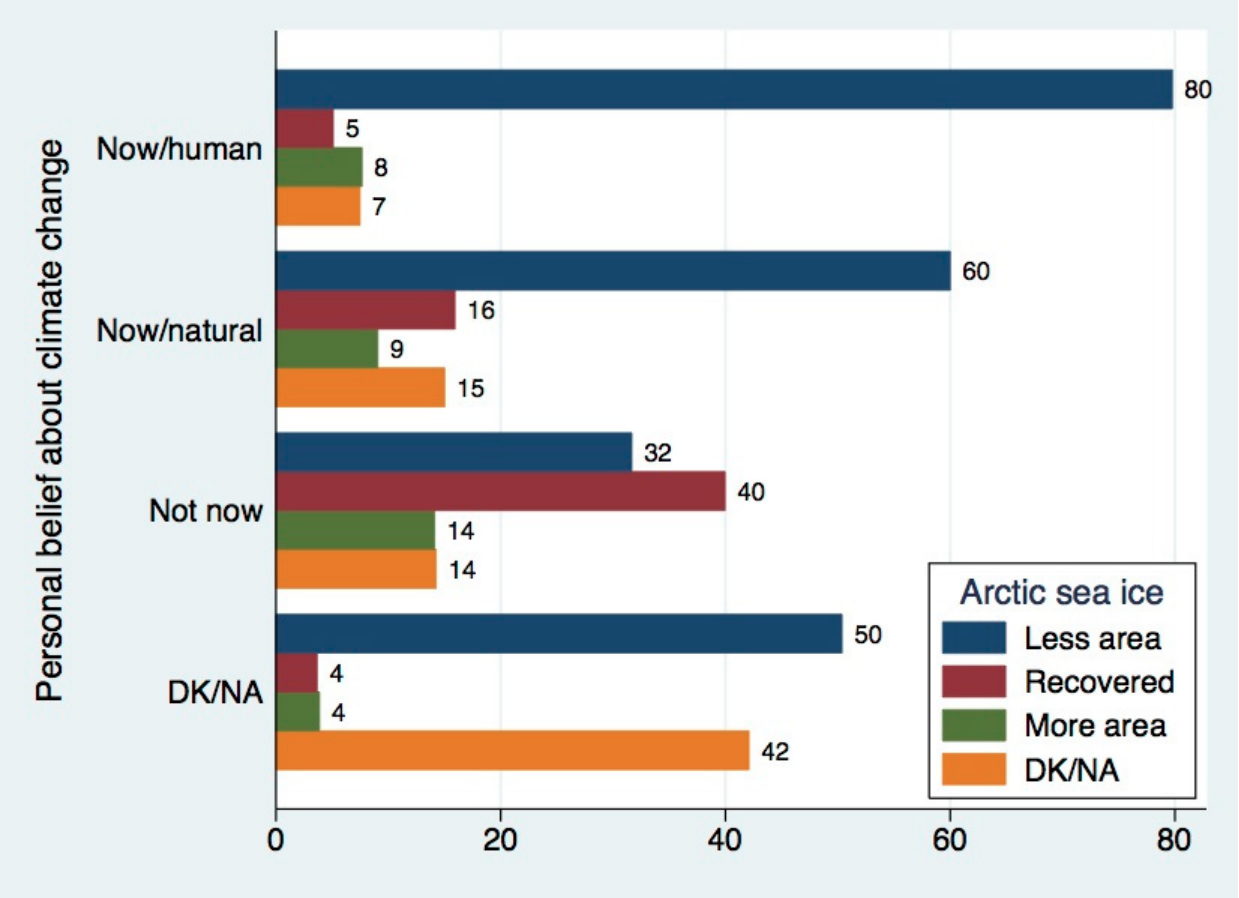

Figure 2: Sea ice response by personal belief about climate change. DK/NA indicates 'Don't Know/No Answer'. Image courtesy of Larry Hamilton.

Figure 2 shows that arctic sea ice decline was known or guessed by 80% of those who believe climate is changing now due to humans, 60% of those who believe it is changing but for natural reasons, and just 32% of those who believe climate change is not happening now. The "not now" respondents were eight times more likely than "now/human" respondents to think that arctic ice has recovered. The "not now" group was even less accurate than those who simply said they do not know about climate change, which is a pattern replicated on other questions and surveys.

The knowledge/belief relationship graphed in Figure 2 might be interpreted as a "science literacy" effect, which assumes that knowing about arctic ice decline (and similar facts such as CO_2 rise) makes people more prone to accept the scientific consensus on human-caused climate change. However, causality also runs in the opposite direction, from general beliefs to whether or not people credit scientific results. A process called biased assimilation, or selectively retaining information that supports pre-existing beliefs, could shape acceptance of the false but widely publicized claim that arctic sea ice has recovered. Detailed analyses in the study suggest that biased assimilation partly explains the patterns in Figure 2.

Regarding science outreach efforts, Hamilton notes that an information-to-conclusion ordering, which follows the natural logic of science, may not be successful in affecting public opinion on politicized topics where biased assimilation works in the opposite direction. Alternative approaches that identify and address prevalent misinformation may be more appropriate.

The 2011 national survey was supported by a grant from the Ford Foundation. Building on these results, newer statewide surveys continue tracking perceptions about polar regions in connection with the PoLAR Climate Change Education Partnership (http://barnard.edu/headlines/led-prof-stephanie-pfirman-polar-climate-change-education-partnership-receives-56-million) (supported by NSF).

For further information about the analysis of the patterns behind public perceptions of sea ice, please see: Did the Arctic ice recover? Demographics of true and false climate facts (http://journals.ametsoc.org/doi/abs/10.1175/WCAS-D-12-00008.1). Or contact Lawrence Hamilton (Lawrence.Hamilton@unh.edu).

References

Hamilton, Lawrence C. 2012. Did the Arctic ice recover? Demographics of true and false climate facts. 2012. *Weather, Climate, and Society.* DOI: 10.1175/WCAS-D-12-00008.1.

Recovered Artifacts Indicate Prehistoric Trade Across Bering Strait

Researchers working at Cape Espenberg, Alaska recently recovered cast metal objects apparently derived from eastern Asia. These objects, the first such items to be recovered in a prehistoric Alaskan context, were recovered during summer of 2011, which was the third and final field season of the NSF-funded project led by John F. Hoffecker, principal investigator, and Owen K. Mason, co-principal investigator, of the University of Colorado at Boulder's Institute of Arctic and Alpine Research (INSTAAR). Metallurgical analysis, completed in late 2012 by Harold Kory Cooper at Purdue University, indicates that the artifacts were cast of a lead, tin, and copper alloy suggesting that such metals were arriving in Alaska via trade across the Bering Strait in the late prehistoric period.

Cape Espenberg is located in northwest Alaska on the Arctic Circle at the northernmost point of the Seward Peninsula and the southern entrance to Kotzebue Sound. The cape is comprised of a series of sandy beach ridges, many of them capped with dune complexes that formed over the past 4,500 years. Native Alaskan peoples occupied these ridges throughout this time-span, subsisting on seal, caribou, fish, and other local resources, and often constructing dwellings in the dunes or beach ridges. The focus of the 2009-2011 NSF project was the last thousand years of settlement, beginning with the earliest Inupiat occupation on the sixth youngest ridge, in the context of changing climate conditions.

This prehistoric cast metal artifact, about 5 centimeters (cm) long, 2.5 cm wide, and less than 2.5 cm thick, is the first to be found in Alaska. Photo courtesy of Jeremy Foin, University of California Davis.

During the 28 June - 8 August 2011 field season, three house features were excavated at Cape Espenberg: one on the sixth ridge, and two on the large fifth ridge complex. Other house features were excavated on the sixth, fifth, and fourth ridges during the 2009-2010 field seasons. Data pertaining to the geomorphology of the ridges and past climate conditions were collected during each field season.

The cast metal artifacts, a tube-shaped bead and buckle, were recovered from the oldest house feature investigated in 2011. This site is located on the sixth ridge and appears to be roughly one thousand years in age (see Figure 1). The research team opened a total of 50 square meters across this feature and excavated to depths between 50 centimeter and over 1 meter. The stratigraphy indicates that the structure was cut into underlying eolian (wind blown) or beach deposits, preserved at the south and west margins, and subsequently in-filled with wind-deposited sand. Several hearth (or midden) features lie within upper silt-rich beds and may relate to, or even post date, later phases of the house occupation. A total of 3,704 artifacts, including two cast metal objects, and 15,726 faunal remains were recovered from this site.

Hoffecker and Mason subsequently sent several artifacts, including the cast objects, to Cooper for metallurgical analysis. In November 2012 Cooper reported that the compositions of the cast artifacts, are alloys containing large amounts of lead (58-69 percent by weight), tin (17-21 percent by weight), and copper (4-16 percent by weight). These artifacts have so little copper relative to tin and lead they are more accurately referred to as "white metal" than copper alloys. "White metal" is a colloquial term for any metal consisting largely of lead or tin but usually containing other metals such as copper, zinc, and silver. Such alloys are good to work with in casting (i.e., pouring melted metal into a mold) and would have been used to produce decorative objects that would appear similar to silver. Though native copper and meteoritic

Figure 1. Excavation of a house on the sixth ridge at Cape Espenberg in July 2011 by graduate and undergraduate students, assisted by high school students from local communities. Shishmaref elders also are present. Image courtesy of J.F. Hoffecker.

iron, (i.e. naturally occurring pure metals), were hammered into a variety objects by late prehistoric inhabitants of arctic and subarctic North America, there is no evidence for the smelting, casting, or alloying of metals in the Western Hemisphere north of Mexico prior to the arrival of Europeans. As a result, these two artifacts give the best and least ambiguous evidence to date that non-ferrous industrial smelted metals were arriving in Alaska via prehistoric trade across the Bering Strait.

New excavations at Cape Espenberg in 2011 were on the fifth ridge complex, previously investigated in 1988 by the National Park Service and during the first season of the NSF project (in 2009). Once fully exposed in 2011, the house (Feature 87) provided an unusually well preserved example of early Alaskan architecture (see Figure 2). The main room measured 3.0-3.3 by 2.5-3.0 meters. The rear and side walls were still standing, with some wall members extending almost 1 meter in height. Wall members were split logs that were cut with an adze on the interior surfaces. At the rear, a raised platform was composed of six broad wood boards, formed of logs split in half with the flat face up. Narrower benches composed of only one or two planks ran along the east and west side walls. The floor was also composed of halved, split logs running from front to back of the house, with an open, burnt floor area on the west side. A 7.5-meter tunnel extended from the center of the front wall to the south. In 2011, this site yielded 3,497 artifacts and 154,687 faunal remains.

The research team observed that an almost complete sequence of northwest Alaskan Inupiat settlement is represented at Cape Espenberg, beginning with occupation of the sixth youngest ridge approximately 1,000 years ago and extending through the early 19th century. The cape was largely abandoned prior to 1850. The youngest ridge that contains house features is the second ridge. All of the semi-subterranean houses excavated at Cape Espenberg reveal use of driftwood for building walls that were dug into dunes. There are no local sources of stone and all lithic materials were imported from other parts of the region.

Figure 2. A house feature on the fifth ridge at Cape Espenberg was fully exposed in 2011 and revealed a well-preserved example of early Inupiat architecture constructed into a sandy dune with several rooms, standing walls, and wooden platforms. Image courtesy of J.F. Hoffecker.

Other senior project personnel in the field during 2011 included Nancy H. Bigelow, University of Alaska Fairbanks; Chris Darwent, University of California Davis; Max

Friesen, University of Toronto; and Claire Alix, Universite de Paris. In addition to graduate and undergraduate students from the University of California-Davis, University of Alaska, University of Toronto, and Universite de Paris, high school students from several local communities including Deering, Shishmaref, and Buckland participated in the Cape Espenberg project through the Mentorship Program administered by Becky Saleeby and Gina Hernandez of the National Park Service. Shishmaref elders Clifford Weyiouanna and Florence Iyutunguk also visited Cape Espenberg and participated in the project in July 2011.

For further information about the Cape Espenberg project, see the project summary website (http://instaar.colorado.edu/news-events/instaar-news/john-hoffeckers-team-unearths-first-prehistoric-cast-bronze-artifact-found/#sthash.cUF0yeHY.dpuf).

Or contact John Frank Hoffecker (John.Hoffecker@Colorado.edu), Owen Mason (geoarch85@gmail.com), or Harold Kory Cooper (hkcooper@purdue.edu).

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Impact of FY 2013 Sequestration Order on NSF Awards

On 27 February 2013, NSF Director Subra Suresh issued Notice Number 133 entitled "Important Notice to Presidents of Universities and Colleges and Heads of other National Science Foundation Awardee Organizations" (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=in133) regarding the impact of a FY 2013 Sequestration Order on NSF Awards. The text of this notice follows:

"As you may know, since passage of the American Taxpayer Relief Act of 2012, the President has been working with Congress to reach agreement on a balanced deficit reduction plan. If an agreement is not reached by the end of this month, the President will be required to issue an order on March 1, 2013 that will implement across-the-board spending cuts known as sequestration. As a result of this expected sequestration order, the Fiscal Year (FY) 2013 appropriations of the National Science Foundation (NSF) will be reduced by 5 percent.

We intend to make the necessary FY 2013 reductions with as little disruption as possible to established commitments, and are using the following set of core principles to guide our sequestration planning activities:

- Protect commitments to NSF's core mission and maintain existing awards;
- Protect the NSF workforce; and
- Protect STEM human capital development programs.

By adhering to these core principles and the government-wide guidance issued by the Office of Management and Budget (OMB), Memorandum 13-03 (http://www.whitehouse.gov/sites/default/files/omb/memoranda/2013/m-13-03.pdf), *Planning for Uncertainty with Respect to Fiscal Year 2013 Budgetary Resources,* we expect to be able to accommodate the sequestration reductions in ways that minimize, to the extent possible, the impact on our mission, both short- and long-term.

Because the sequestration order takes effect at mid-year, its impact is somewhat greater than might otherwise be the case. At NSF, the major impact of sequestration will be seen in reductions to the number of new research grants and cooperative agreements awarded in FY 2013. We anticipate that the total number of new research grants will be reduced by approximately 1,000.

In keeping with the first core principle listed above, and to assure continuity and minimize disruption of scientific research, all continuing grant increments in FY 2013 will be awarded, as scheduled, and there will be no impact on existing NSF standard grants. The same intent applies to annual increments for cooperative agreements, though overall funding constraints may require reductions to certain major investments. These will be handled on a case-by-case basis.

It is also important to advise you that the Foundation is currently operating under a Continuing Resolution (CR) that will expire on March 27, 2013. Once NSF has appropriations in place beyond March 27th, we will revise this notice as necessary.

Subra Suresh
Director"

The full text of Notice Number 133 is available here (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=in133).

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NSF's Polar Cyberinfrastructure Program Initiative

Marco Tedesco, recently appointed Polar Cyberinfrastructure Program Director at NSF's Division of Polar Programs, aims to lay the foundation of an infrastructure that will be as revolutionary for polar science as the coming of water and electric power was for our cities.The Polar Cyberinfrastructure Program, in partnership with the Division of Cyberinfrastructure, is part of the cross-foundation initiative: Cyberinfrastructure Framework for 21st Century Science and Engineering (http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504730) (CIF21). This initiative seeks to provide a comprehensive, integrated, secure, and sustainable cyberinfrastructure (CI) that will accelerate research and education and support new functional capabilities in computational and data-intensive science and engineering.

CI is the set of physical and virtual environments that support information and computing services including data acquisition, storage and management, integration, and visualization. CI can also be interpreted as a set of technological and sociological systems providing efficient connections between laboratories, data, computers, and people with the goal of enabling novel scientific discoveries and promoting education through knowledge sharing.

Cyber technologies have made critical impacts on polar research. Increased deployment of sophisticated sensors in both the arctic and Antarctic regions combined with enhanced computational power enable scientists to observe and describe the present state of the polar regions, unveil past trends, and project future climate and environmental changes. These efforts often require extremely sophisticated integration of theoretical, experimental, observational, and modeling results as well as virtual networks for sharing information, data, and publications. The recent increase in volume and complexity of data and technologies, which support scientific discovery, demand a transformed infrastructure.

The main goal of the Polar CI Program will be to advance discovery, innovation, and education across disciplines in the Arctic and Antarctic. This will be achieved in part through integration of updated computing, data management, information, networking, and sensor and software technologies into polar research efforts. These advances will enhance data-enabled discoveries, storage and distribution of large complex data sets, continuity of access to long-lived publicly accessible data sets, and other important functions. The program will interact with other ongoing NSF CI activities such as EarthCube (http://earthcube.ning.com/). The program aims to transform the research and engineering community's ability to effectively address and solve the many complex problems facing science and society.

Further information about NSF's CIF21 is available here (http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504730).

For more information about the Polar Cyberinfrastructure Program, please contact Marco Tedesco via email (mtedesco@nsf.gov) or phone: 703-292-7120.

Community Updates from NSF Arctic Town Hall Meetings

Arctic Sciences (ARC) Division (http://www.nsf.gov/div/index.jsp?div=ARC) Director Simon Stephenson and Arctic Natural Sciences Program Director Hedy Edmonds led a Town Hall meeting on 5 December 2012 during the American Geophysical Union fall meeting in San Francisco. The Town Hall provided a forum for open exchange on NSF activities and directions. Stephenson and Edmonds updated attendees on recent ARC developments including staffing changes, the organizational realignment at NSF, budget overview, funding opportunities, and related issues.

New Staff: Recently appointed to ARC staff within the Intergovernmental Personnel Act (IPA) in rotator positions are Ming-Yi Sun, Arctic Natural Sciences Program Director; Robert Max Holmes, Arctic System Science (ARCSS) Program Manager; and Marco Tedesco, Polar Cyberinfrastructure Program Director. In other staffing news Celeste Carter joins ARC part time from the NSF Directorate for Education and Human Resources to help lead activities related to the integration of research and education. Peter West will remain in Polar programs coordinating public outreach. The community is requested to alert him regarding publication of research results.

NSF Realignment: On 1 October 2012, as part of a Foundation-wide realignment at the start of fiscal year 2013 (FY13), the Office of Polar Programs was moved from the Office of the Director to the Directorate for Geosciences. Stephenson noted that this realignment is consistent with the prior organizational structure—Polar Programs was in the Directorate for Geosciences prior to 1993—and that the community can expect ARC program operations to continue as they did before the merger. He commented that conversations with the arctic research community, rather than the realignment, is the real driver of change and progress. Ongoing opportunities for community input include the NSF website and two town hall type meetings per year. An updated NSF organizational flow chart is available here (http://www.nsf.gov/od/opp/org_chart_text.jsp).

Budget Overview: In recent years, funding for NSF's Arctic Sciences Division (ARC) has been relatively stable. $107 million was allocated in FY11, slightly less was allocated in FY12, and flat funding levels were extended for FY13 (prior to the recent sequester). In general approximately 60% of the ARC portfolio is available for research grants and 40% for research support and logistics. The NSF administration's FY14 budget request is based on the FY11 allocation. Further information about recent funding levels for NSF, the Office of Polar Programs, and the Arctic Sciences Division is available in *Witness*, Winter 2012 (http://www.arcus.org/witness-the-arctic/2012/1/article/13951).

Funding Opportunities: Several funding opportunities were mentioned during the meeting including several competitions within the Science, Engineering, and Education for Sustainability (SEES) (http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504707) initiative including Arctic SEES, Coastal SEES, Earth System Modeling, and Ocean acidification; the Integrated NSF Support Promoting Interdisciplinary Research and Education (INSPIRE) (http://www.nsf.gov/pubs/2013/nsf13518/nsf13518.htm); and the new INSPIRE II solicitation (http://www.nsf.gov/pubs/2013/nsf13518/nsf13518.htm). ARC Principal Investigators are encouraged to think of ways to contribute to these cross-foundation activities and to discuss ideas with Program Officers.

Also highlighted during the meeting were the issues of risk management in field research and program evaluations. NSF encourages the research community to put greater emphasis on field safety and will offer significant support and guidance to that end. Program evaluations will also have higher emphasis at NSF, especially in the ARCSS and Arctic Observing

Network (AON) programs. For example, NSF has implemented revised merit review criteria intended to provide more clarity to the process. To review resources and guidance on how to incorporate revised criteria in proposals submitted after January 2013, go to NSF's merit review webpages (http://www.nsf.gov/bfa/dias/policy/merit_review/resources.jsp).

Directorate of Geosciences News: Roger Wakimoto was named by NSF to serve as Assistant Director for the Directorate for Geosciences. He assumed the post in February 2013. Wakimoto is immediate past director of the National Center for Atmospheric Research (NCAR) (http://ncar.ucar.edu/).

For further information about the Arctic Sciences Section, contact Simon Stephenson (sstephen@nsf.gov) or Hedy Edmonds (hedmonds@nsf.gov).

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Administration Releases Five-Year Arctic Research Plan

The White House Office of Science and Technology Policy (http://www.whitehouse.gov/administration/eop/ostp) announced release of the five-year Arctic Research Plan, which was developed by the Interagency Arctic Research Policy Committee (IARPC) (http://www.nsf.gov/od/opp/arctic/iarpc/start.jsp). The announcement, as posted by Brendan P. Kelly and Simon N. Stephenson on 19 February 2013, follows:

Working Together to Understand and Predict Arctic Change

Today, the Administration's National Science and Technology Council released a five-year Arctic Research Plan (http://www.whitehouse.gov/sites/default/files/microsites/ostp/2013_arctic_research_plan.pdf) that outlines key areas of study the Federal government will undertake to better understand and predict environmental changes in the Arctic. The Plan was developed by a team of experts (http://www.whitehouse.gov/blog/2010/08/23/nstc-coordinate-certain-arctic-research-policy-committee-activities) representing 14 Federal agencies, based on input from collaborators including the Alaska Governor's Office, indigenous Arctic communities, local organizations, and universities. Seven research areas are highlighted in the Plan as both important to the development of national policies and well-poised to benefit from interagency collaboration, including among them: regional climate models, human health studies, and adaptation tools for communities.

Environmental changes in the Arctic such as rapidly-melting ice on land and at sea are not only having profound impacts on local Arctic populations but are also affecting more distant communities and businesses that depend on Arctic resources to thrive. Among an array of effects, melting land-ice contributes to rising sea levels, and will have costly implications for communities, businesses, and infrastructure located on coasts. Diminishing sea-ice changes the composition and distribution of species found in regional ocean waters and, as a result, forces communities that depend on those resources for food to alter their harvest practices and/or their diets. Waning sea ice accelerates global warming and alters circulation in the atmosphere and oceans in ways that change storm patterns in other parts of the world.

At the same time, Arctic indigenous peoples suffer shorter life expectancies and greater infant mortality rates than their respective national populations. Native peoples also experience a high prevalence of infectious diseases and health impacts associated with exposures to environmental pollutants and rapid environmental change. Scientific research to improve fundamental understanding of these issues and their interactions with the changing environment is critical to developing on-the-ground strategies and national policies to help communities respond.

Among a number of other activities, the new five-year plan calls for the Department of Agriculture, Department of the Interior, Department of State, Environmental Protection Agency, National Oceanic and Atmospheric Administration, National Science Foundation, and the Smithsonian Institution to work together to assess the resilience and vulnerabilities of Arctic communities to the impacts of climate change. That assessment will aim to provide Arctic residents, community leaders, and policy makers at all levels of government with the knowledge needed to plan and adapt.

The research plan released today does not encompass all Federal Arctic research activities that will occur over the next five years. It does, however, provide a roadmap for unprecedented collaboration between agencies on high impact research activities that will provide a solid scientific basis for on-the-ground progress in the Arctic. It also complements a number

of steps being taken by the Administration to enable data-driven and science-based stewardship in the Arctic region, including the recent launch (http://www.whitehouse.gov/blog/2012/03/23/supporting-science-based-decision-making-arctic-region) of regionally-focused data communities (http://www.data.gov/ocean/page/regional-planning?field_alias_value=alaska-arctic) on ocean.data.gov (http://www.data.gov/ocean/community/ocean).

Studying terrestrial ecosystems will contribute to a better understanding of the cumulative impacts of changes taking place in the Arctic. Image courtesy of Arctic Research Plan FY 2013-2017 Fact Sheet.

To read the full report, please click here (http://www.whitehouse.gov/sites/default/files/microsites/ostp/2013_arctic_research_plan.pdf).

To learn more about the Arctic environment, please click here (http://www.arctic.noaa.gov/index.shtml).

The National Science and Technology Council (NSTC) is the principal means by which the Executive Branch coordinates science and technology policy across the diverse entities that make up the Federal research and development enterprise. A primary objective of the NSTC is establishing clear national goals for Federal science and technology investments. The NSTC prepares research and development strategies that are coordinated across Federal agencies to form investment packages aimed at accomplishing multiple national goals. More information is available here (http://www.whitehouse.gov/administration/eop/ostp/nstc).

Brendan P. Kelly is Assistant Director for Polar Sciences at OSTP
Simon N. Stephenson is Head of the Arctic Sciences Section at the National Science Foundation

The Arctic Report Card: Past and Present

The Arctic Report Card is an annually updated, peer-reviewed source for concise environmental information on the current state of the Arctic relative to historical records. It is intended for a wide audience including scientists, teachers, students, decision-makers, and the general public. Support for the Arctic Report Card is provided by the National Oceanic and Atmospheric Administration (NOAA) Climate Program Office (http://cpo.noaa.gov/default.aspx) through the Arctic Research Program (http://www.arctic.noaa.gov/arp/).

History and Purpose

The Arctic Report Card got its start at a small workshop in 2005 that was hosted by Woods Hole Oceanographic Institute (WHOI) (http://www.whoi.edu/) and funded by NOAA. The workshop had been proposed by Jackie Richter-Menge of the Cold Regions Research and Engineering Laboratory (CRREL) (http://www.crrel.usace.army.mil/) and Jim Overland of NOAA/Pacific Marine Environmental Laboratory (PMEL) (http://www.pmel.noaa.gov/). The primary goal of the workshop was to create a comprehensive baseline report describing the state of the Arctic, plus a methodology for producing annual reports in the future. From the start, the intent was to keep the report short, straightforward, and to highlight observational data rather than model reports.

2005 State of the Arctic Report workshop participants (from left to right): Skip Walker, Volker Rachold, Vladimir Romanovsky, Lennart Bengtsson, Rajmund Przyblak, Jackie Richter-Menge, Jim Overland, Nancy Soreide, Don Perovich, Andrey Proshutinsky, Weislaw Maslowski, Jean-Claude Gascard. Photo Courtesy: Jackie Richter-Menge.

As a result of the workshop, the NOAA Climate Program Office introduced the State of the Arctic Report in 2006, which established a baseline of conditions from the previous five years (2000-2005) relative to those in the latter part of the 20th century. This benchmark assessment was based on data obtained from U.S. and international sources. The 2006 report described pan-arctic atmosphere, ice, ocean, and land variables. This report is now updated annually as the Arctic Report Card to monitor changing conditions in the Arctic.

Developing Report Card Content

Producing the annual Arctic Report Card involves the cooperation and coordination of many groups of people and organizations. The editorial team is presently Martin Jeffries, (lead editor; Office of Naval Research (http://www.onr.navy.mil/)), Jackie Richter-Menge, and Jim Overland. Each year, the editorial team identifies section coordinators for the main sections of the report. Each section consists of an overall summary written by the section coordinator and individual topical essays composed and prepared by separate writing teams. The editorial team works with the section coordinators to identify the essay topics that will be included in each section and to select lead authors for each essay. The lead authors select their writing team, with a focus on incorporating a strong international perspective.

The current Arctic Report Card is organized into five sections: Atmosphere, Sea Ice and Ocean, Marine Ecosystems, Terrestrial Ecosystems, and Terrestrial Cryosphere. Essay topics vary from year to year depending on the availability of data. For example, annual essays on sea ice are possible because satellites obtain frequent data over large areas, whereas annual updates to marine and terrestrial ecosystem topics are constrained by more limited data availability.

The review process begins with an internal review. The editorial team, section coordinators, and lead essay authors examine the first draft of the Report Card content. Next, the draft report is sent to the NOAA Arctic Project Office, which works in conjunction with the Arctic Monitoring and Assessment Programme (AMAP) (http://www.amap.no/) to conduct an external, anonymous peer-review. The content undergoes several iterations in response to the peer-review input. The entire Report Card is presented online; Nancy Soreide and Tracey Nakamura from NOAA/PMEL are responsible for creating the report website and video. Further outreach is led by Jana Goldman in NOAA's Public Affairs Office, who organizes the annual public release of the Report Card. The report is also recognized as a contribution to the Study of Environmental Arctic Change (SEARCH) (http://www.arcus.org/search/index.php).

The 2012 Arctic Report Card

The 2012 Arctic Report Card was released on 5 December 2012 at an American Geophysical Union fall meeting press conference led by Dr. Jane Lubchenco, Under Secretary of Commerce for Oceans and Atmosphere and Administrator of NOAA. The 2012 Report Card contains 20 essays by 141 scientists from 15 countries. Highlights include:

- Record low snow extent and low sea ice extent occurred in June and September, respectively.
- Growing season length is increasing along with tundra greenness and above-ground biomass. Below the tundra, record high permafrost temperatures occurred in

The 2012 Arctic Report Card Website

northernmost Alaska.

- Duration of melting was the longest observed yet on the Greenland ice sheet, and a rare, nearly ice sheet-wide melt event occurred in July.
- Massive phytoplankton blooms below summer sea ice suggest previous estimates of ocean primary productivity might be ten times too low.
- Arctic fox is close to extinction in Fennoscandia and vulnerable to further changes in the lemming cycle and the encroaching Red fox.
- Severe weather events included extreme cold and snowfall in Eurasia, and two major storms with deep central pressure and strong winds offshore of western and northern Alaska.

On its release, the 2012 Report Card website was accessed from 19,851 unique sites in 105 countries; 4,765 websites referred to the Report Card and the YouTube video has been viewed 32,404 times.

To view the 2012 Arctic Report Card, the YouTube video, and previous report cards, please visit the NOAA website (http://www.arctic.noaa.gov/reportcard/).

For more information regarding the Arctic Report Card, please contact Jana Goldman, NOAA Communications & NOAA Research, at jana.goldman@noaa.gov or 301-734-1123.

Many thanks to Jackie Richter-Menge and Martin Jeffries for their contributions to this article.

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Recent Presidential Appointments to USARC

The Arctic Research and Policy Act of 1984 established the U.S. Arctic Research Commission (USARC) (http://www.arctic.gov/), which is headed by seven Commissioners (http://www.arctic.gov/commissioners.html) appointed by the President. The Commission includes four members from academic or research institutions; two members from private industry undertaking commercial activities in the Arctic; and one member from among the Indigenous residents of the U.S. Arctic. The Director of NSF serves as an ex-officio eighth member. Commissioners are appointed to four-year terms. Chair Fran Ulmer was appointed in March 2011.

USARC Commissioner David Benton, appointed by President Obama in June 2012. Image courtesy of USARC.

In June 2012 President Barack Obama appointed David Benton to replace former Commissioner Michele Longo Eder. Benton is a marine conservationist with over 30 years experience in national and international oceans governance issues. For roughly 14 of those years, he represented the State of Alaska in international negotiations and on national fisheries issues. As the state's international fisheries negotiator at the Alaska Department of Fish and Game, Benton helped negotiate many fisheries treaties now in force in the north Pacific Ocean and Bering Sea. On behalf of the State of Alaska, he participated in numerous legislative initiatives in Congress including reauthorization of the Magnuson Stevens Act, the Marine Mammal Protection Act, and the American Fisheries Act. In addition, he served on the North Pacific Fishery Management Council for nine years, three years as Chair. Benton also served twice on the North Pacific Research Board (NPRB), as the first Chair of the NPRB at its inception in 2001-2003 and as the special fisheries representative 2004-2006. Most recently he held the position of Executive Director of the Marine Conservation Alliance. He led industry efforts to secure the Arctic Fishery Management Plan, closing U.S. Arctic waters to commercial fishing. Benton is currently working as a consultant to the seafood industry and environmental organizations on a range of oceans management and conservation matters.

On 27 November the President filled two commission vacancies by appointing the Honorable Edward Saggan Itta to occupy the seat vacated by Helvi Sandvik, and Dr. James J. McCarthy to take the place of the Honorable Mead Treadwell.

Edward Saggan Itta, of Barrow, Alaska, is an Inupiat whaler and hunter, and served as Mayor of Alaska's North Slope Borough from 2005 to 2011. He has held a variety of leadership positions in municipal government, the Arctic Slope Community Foundation, the Barrow Whaling Captains Association, and the Inuit Circumpolar Council-Alaska. Itta is a local representative for Alaska on the Outer Continental Shelf Policy Committee and is a past commissioner, vice chairman, and current member of the Alaska Eskimo Whaling Commission. Itta brings to the Commission leadership skills and experience in areas of priority to the USARC, including the integration of local/traditional knowledge into research, subsistence and food security, and the improvement of human health through coordination of water and sanitation needs in rural Alaska.

James McCarthy, of Cambridge, Massachusetts, specializes in oceanography, marine systems, and climate; holds faculty appointments at Harvard University in the Department of Organismic and Evolutionary Biology and the Department of

USARC Commissioner Edward Saggan Itta, appointed by President Obama in November 2012. Image courtesy of USARC.

Earth and Planetary Sciences; and is the university's Alexander Agassiz Professor of Biological Oceanography. For the past two decades McCarthy has worked as an author, reviewer, and co-chair with the Intergovernmental Panel on Climate Change. For the Third IPCC Assessment, he headed Working Group II, which assessed the impacts and vulnerabilities of global climate change. He was also a lead author of the seminal Arctic Climate Impact Assessment published in 2004.

USARC Commissioner James McCarthy, appointed by President Obama in November 2012. Image courtesy of USARC.

McCarthy is a Fellow of the American Association for the Advancement of Science (AAAS) and served as the association's past president and chair of the board of directors. He is also a Fellow of the American Academy of Arts and Sciences, a Foreign Member of the Royal Swedish Academy of Sciences, and is currently chair of the board of directors for the Union of Concerned Scientists. McCarthy brings strong scientific experience to the USARC through service on national and international planning committees, advisory panels, and commissions focusing on oceanography, polar science, and the study of climate and global change for federal agencies, intergovernmental bodies, and international organizations.

The President also re-appointed Commissioners Dr. Charles Vorosmarty and Dr. Warren Zapol, M.D. to another four-year term on the Commission.

Additional biographical information can be found on the USARC website (http://www.arctic.gov/).

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USARC Resources and Reports

The U.S. Arctic Research Commission (USARC), an independent federal agency created by the Arctic Research and Policy Act of 1984, is charged with recommending arctic research policy to the President and Congress and reporting to Congress on the progress of the Executive Branch in reaching goals set by the Commission. The Commission holds business meetings and conducts public hearings in Alaska and elsewhere to receive input. Major recommendations of the Commission are published in the Commission's biennial Report on Goals and Objectives for Arctic Research (http://www.arctic.gov/reports_goals.html), as well as the Commission's Special Report (http://www.arctic.gov/reports_other.html) series.

U.S. Arctic Research Commission

USARC Launches Arctic Science Portal Prototype

As part of a broader interagency effort on the Arctic, the USARC has initiated development of a prototype science portal. The Arctic Science Portal (http://www.arctic.gov/portal/index.html) has been recently launched on the USARC home page. It serves as a library of links (URLs) to websites where arctic data are made publicly available. The portal is neither an interactive website nor is it a site where data are archived. Instead, it is a tool that directs users to available information on the Arctic sorted in the main categories of society, environment, economics, references, and organizations. USARC staff encourage users of the portal to provide feedback.

USARC Report on Arctic Oil Spill Research

Commission Chair Fran Ulmer released the USARC report entitled "Oil Spills in Arctic Waters: An Introduction and Inventory of Research Activities and USARC Recommendations" (http://www.arctic.gov/publications/oil_spills_2012.html) on 13 November 2012 at the U.S. - Canada Northern Oil and Gas Research Forum. The report, co-authored with the U.S. Army Cold Regions Research and Engineering Laboratory (CRREL) (http://www.crrel.usace.army.mil/), is a compilation of recent research and contains recommendations for future work in areas including oil spill response technologies for cleanup and recovery of oil, data management tools, and the effects of oil on the environment.

"As oil and gas development and shipping increase in the Arctic, it's important to prepare and plan for possible accidents. Preparation includes research into oil in icy waters: how it behaves, how to locate and map oil under ice, how different response techniques could be adapted to be more effective even in arctic conditions. The USARC report catalogues the research which has been done and by whom, and it makes recommendations for future research. We hope this will be useful to government, industry, and the public," said Ulmer, who was also a member of President Obama's National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling. The full report is available online (http://www.arctic.gov/publications/oil_spills_2012.html).

USARC and Canadian Polar Commission Participate in Northern Oil and Gas Research Forum

As part of their ongoing collaboration, the Canadian Polar Commission (CPC) (http://www.polarcom.gc.ca/) and the USARC helped organize, and participated in, the Third Biennial U.S. - Canada Northern Oil and Gas Research Forum (http://www.northslope.og.event/forum2012) held 13-15 November 2012 in Anchorage, Alaska. The forum provided an

opportunity for experts from both countries to discuss knowledge gaps, research priorities, and the links between research and informed decision-making and sustainable oil and gas development in arctic basins including the Chukchi and Beaufort Seas.

Chairs Fran Ulmer (USARC) and Bernard Funston (CPC) presented remarks to the forum addressing the uniqueness and vulnerability of the northern environment, which requires a new way of doing business with high levels of expertise and safety as a core priority; effective collaborations between the two countries; the need for more reliable and trusted systems to gather and effectively use Indigenous traditional knowledge; and the importance of the research communities' capacity to adapt to the periods of diminished research funding. An initial joint summary of the key points and conclusions of the forum is available online as a USARC press release and supplement, which is available here (http://www.arctic.gov/news.html).

The Canadian Polar Commission, created by an Act of Parliament in 1991, is Canada's national institution for furthering polar knowledge and awareness. The CPC supports sharing information about the polar regions through enhanced connections among northerners, research communities, governments, and the general public, and provides analysis of current and emerging polar issues. For more information about the Canadian Polar Commission, please see here (http://www.polarcom.gc.ca/).

The Arctic Research and Policy Act of 1984 established the USARC. 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 to implement the policy. Commissioners also facilitate cooperation between the federal government, state and local governments, and other nations with respect to basic and applied arctic research. For more information about USARC, its meetings, workshops, and resources, see here (http://www.arctic.gov/).

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Polar Research Board Releases Report on Seasonal to Decadal Predictions of Arctic Sea Ice

In November 2012, the Polar Research Board (PRB) (http://dels.nas.edu/prb) of the U.S. National Academy of Sciences issued the report, Seasonal to Decadal Predictions of Arctic Sea Ice: Challenges and Strategies (http://dels.nas.edu/Report/Seasonal-Decadal-Predictions-Arctic/13515), which explores major challenges in sea ice prediction, and identifies methods, observations, and technologies that might advance capabilities to predict the extent of sea ice.

Dramatic reductions in the extent and thickness of ice in the Arctic (see Figure 1) affect a growing community of diverse stakeholders, including indigenous populations, natural resource industries, fishing communities, commercial shippers, marine tourism operators, national security organizations, regulatory agencies, and the scientific research community. The reductions in ice extent and thickness can lead to a wide array of impacts such as marine mammal habitat changes, circulation shifts in the ocean and atmosphere, and challenges for subsistence hunters, which has created an urgent need for better predictions of future sea ice conditions.

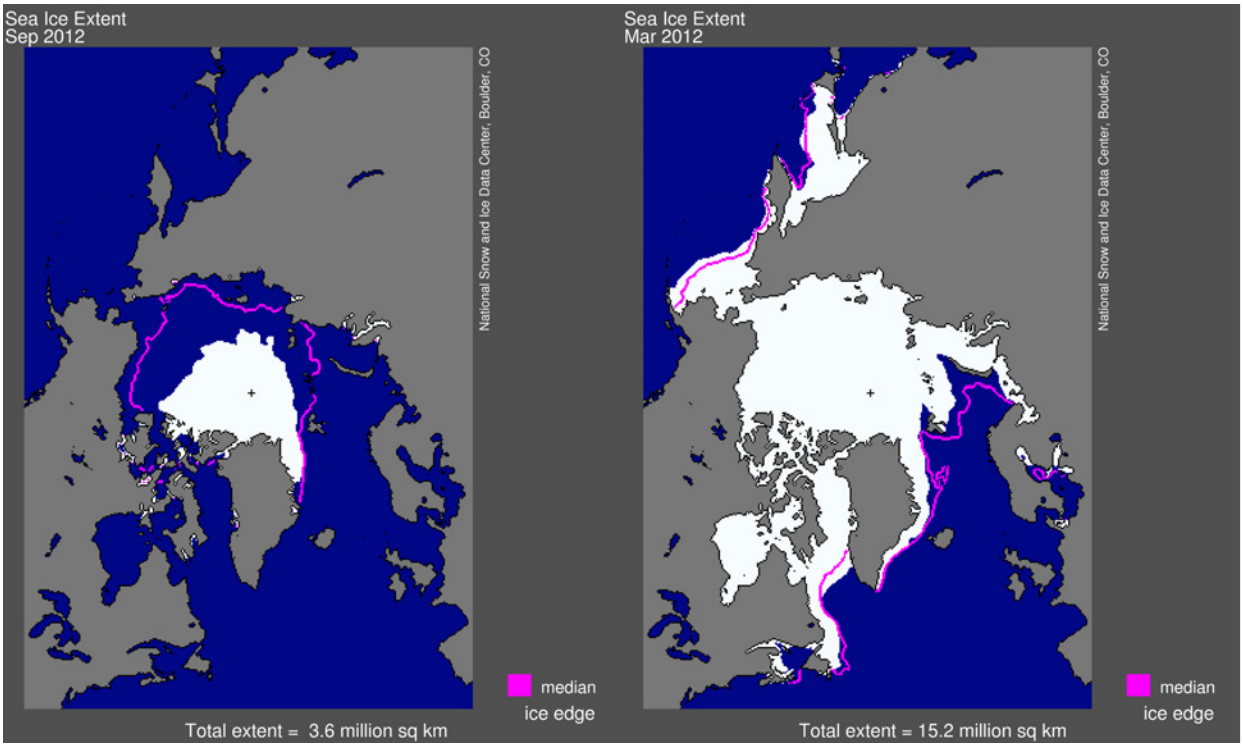

Figure 1: The extent of arctic sea ice has undergone dramatic declines in recent years. The white shaded area show the sea ice extent in March 2012 (left) and September 2012 (right). The purple lines indicated the median ice extent from 1979 to 2000. Image courtesy of NSIDC.

There are several key overarching challenges, not unique to the topic of sea ice prediction, that hinder advancements in our predictive capabilities:

Understanding the Interactions Among the Various Parts of the Arctic System

Sea ice is just one part of the larger arctic system, which includes components such as ocean currents, atmospheric conditions, land cover, and the arctic food web. Changes in any one of these components can influence other parts of the system, but interactions between the various parts of the system are not fully understood. Adding to the complexity is the fact that humans have an increasingly large role in the ecosystem, for example by causing oil spills or through greenhouse

gas emissions.

Enhancing Sea Ice Prediction Models to Reflect Changing Characteristics of Sea Ice

Recent reductions in the extent of summer sea ice have also caused shifts in the composition of the ice. Dominated by thick, multi-year ice just a decade ago, thinner first year ice now makes up an increasingly large part of the ice cover (see Figure 2). First-year sea ice is more susceptible to summer melt, and is more easily ridged, ruptured, and moved by winds, which has important implications for predicting future sea ice cover. Many current sea ice models use formulations and parameters based on data collected during the multi-year sea ice regime and may not accurately reflect recent changes in sea ice characteristics.

Meeting the Needs of a Wide Range of Stakeholders

Clearly defining the broad and evolving needs of stakeholders would help inform future directions for sea ice modeling and observations in support of sea ice prediction.

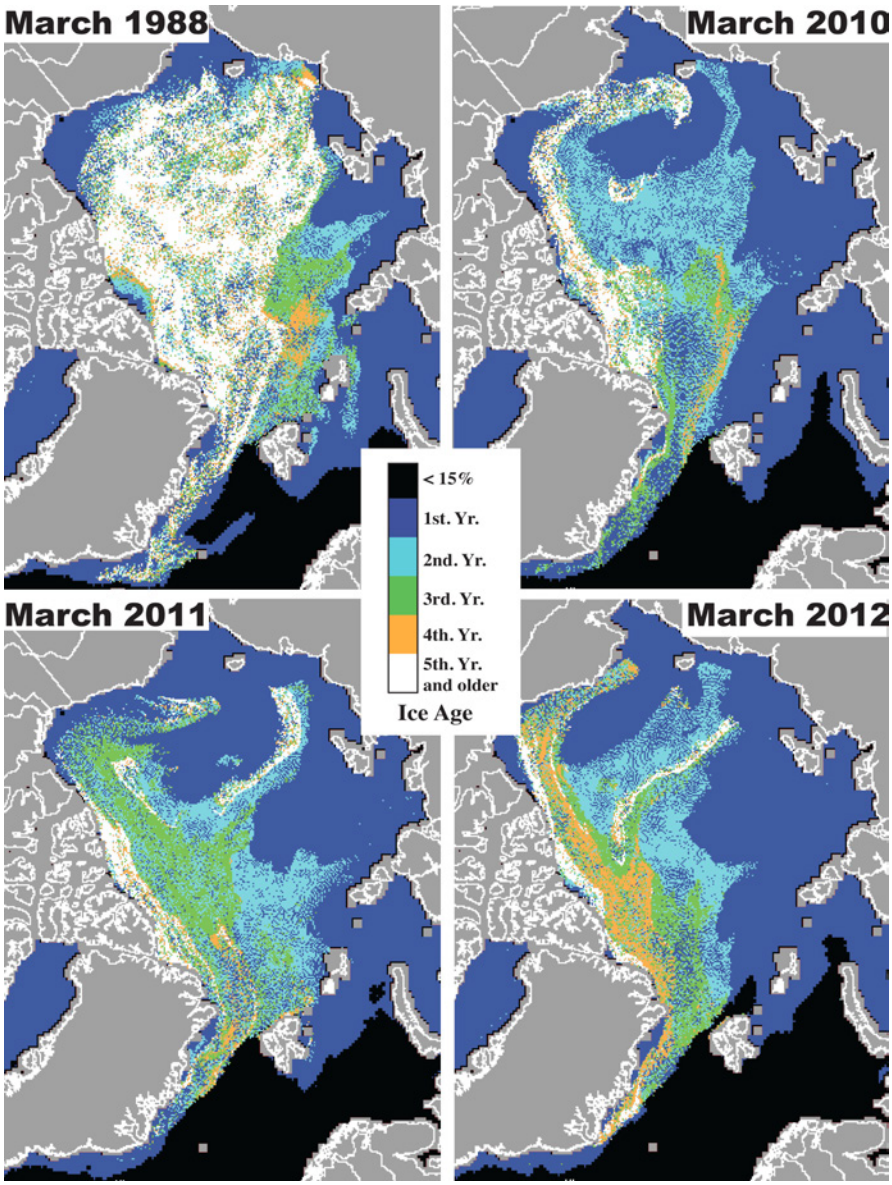

Figure 2: Sea ice is shifting in composition from predominantly multi-year ice to thinner first-year ice. Satellite data compares March sea ice age distribution for the years 1988, 2010, 2011, and 2012 and shows the loss of older, multi-year ice in recent years. Image courtesy of Polar Research Board, J. Maslanik, C. Fowler, and M. Tschudi.

There are also challenges in advancing predictive capabilities specific to seasonal and decadal timescales:

Understanding the Relative Accuracies, Strengths, and Weaknesses of the Different Approaches Used to Forecast Seasonal Ice

Currently, the three approaches for seasonal forecasts are: (1) statistical models; (2) coupled ice-ocean models; and more recently, (3) coupled atmosphere-ocean-ice models.

Knowing the Degree of Precision Required in Characterizing Initial Ice-ocean Conditions in Order to Generate Accurate Seasonal Predictions

Few experiments have been performed to investigate exactly how to optimize sea ice observations. For example, there is little information on what observational quality, spatial density, location and accuracy are required for different variables. Furthermore, obtaining the data quickly enough to make seasonal predictions can be challenging.

Improving Simulation of Realistic Climate Forcings from the Atmosphere and Ocean by Using Coupled Climate Models, and Identifying the Model Variables and/or Processes that Contribute to Unrealistic Simulations

Coupled climate models that are used to generate decadal sea ice predictions generate their own atmospheric and oceanic variables from the basic laws of physics. Any errors in the variables used to drive sea ice, however, can lead to unrealistic sea ice distributions. Simulating realistic atmospheric and oceanic conditions depends on assumptions about future trends in carbon dioxide emissions, aerosol loading, changing surface characteristics, and other factors.

The report also identifies steps that could be taken to advance sea ice prediction over seasonal to decadal time scales. Chief among them is to establish sustained and coordinated collaboration among the sea ice data user, modeling, and observation communities. This collaboration could help reveal gaps in understanding, help balance the needs and expectations of different stakeholders, and ensure that resources are allocated to address the most pressing sea ice data needs. In addition, given the vast amounts of data on arctic sea ice and the numerous stakeholders who use these data, there is a need for a coordinated and centralized information hub that facilitates timely access to observational and modeling results, unifying the various databases and providing a consistent system for finding and accessing data.

Other important strategies to significantly enhance our understanding and predictions of arctic sea ice cover include:

- Evaluation of the different methods for forecasting seasonal sea ice. Understanding each method's weaknesses and strengths could help scientists determine which method for forecasting sea ice is best suited for informing different stakeholders.
- Coordinated process-based study of seasonal sea ice. It is necessary to understand the impact of the increasing predominance of younger, first-year ice on sea ice predictions. Process-based studies also offer an opportunity to identify, develop, and test observational instruments.
- Model sensitivity studies to determine key first-order observational needs. These studies will help scientists understand how much specific variables impact model simulations, aid in prioritizing observational needs (e.g., observation types, locations, and coverage), and be useful for advancing the design of the Arctic Observing Network.
- Coordinated experiment with multiple numerical models. The identification of the model components that are critical to simulating a realistic ice cover will also guide decisions regarding high priority model development needs and the expansion of models to include additional capabilities and variables of interest to stakeholders.

The report is available as a free PDF here (http://www.nap.edu/catalog.php?record_id=13515). To purchase paper copies, please contact the National Academies Press at: 800-624-6242.

The PRB is a unit within the National Academies and is responsible for studies related to the Arctic, Antarctic, and cold regions in general. More information about the PRB and other related activities can be found here (http://dels.nas.edu/prb/).

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International Arctic Observing Summit to Convene Spring 2013

The Arctic Observing Summit (AOS) is a high-level summit that aims to provide community-driven and science-based guidance for the design, implementation, coordination, and operation of an international network of arctic observing systems to be sustained over several decades. AOS is led by the International Study of Arctic Change (ISAC) (http://www.arcticchange.org/) as part of the implementation of the observing change component of the ISAC Science Plan. AOS 2013 (http://www.arcticchange.org/arctic-observing-summit-2013), scheduled to convene 30 April - 2 May 2013 in Vancouver, Canada, is the first in a planned series of biennial summits. AOS 2013 registration (http://www.arcticobservingsummit.org/users/registration.php) is now open.

The Arctic Observing Summit 2013 will convene 30 April - 2 May 2013 in Vancouver, Canada.

AOS is organized as an international forum to address urgent needs of arctic observing activities across all components of the arctic system, including the human component. It will foster international communication and coordination of long-term observations aimed at improving understanding and responding to system-scale arctic change. The summit will provide a platform for optimizing resource allocation through coordination and exchange among researchers, funding agencies, arctic residents, and others involved or interested in long-term observing activities, while minimizing duplication and gaps. The AOS 2013 schedule allows for side-meetings to advance planning, coordination, and integration of activities. Products from the summit will be prepared for an audience that includes arctic communities, governmental decision-makers, the research community, the private sector, and the general public.

AOS 2013 Themes

1. Status of the current observing system including its objectives, capabilities, challenges, and sustainability.
2. Observing system design and coordination including integration of components and implementation.
3. Stakeholder perspectives on observing system design and integration.
4. Mechanisms for coordination of support, implementation and operation of a sustained arctic observing system.

To capture consensus on arctic observing needs and articulate critical issues AOS 2013 organizers solicited white papers and short contributions from the community and encouraged contributors to address broad underlying questions such as:

1. What can be done to improve the design, implementation, coordination and sustained long-term operation of arctic observing systems in the focus area of a given white paper?
2. Are arctic observations relevant to the theme of a given white paper shared optimally today among communities such as scientists, governments, and stakeholders?
3. Are there specific restrictions to collecting or sharing arctic observations imposed by military strategic reasons or natural resource protection, for example?

The white papers also provide a mechanism through which stakeholders, beyond the AOS 2013 participants, can shape the 2013 summit and its outcomes and guide the focus of future summits. AOS 2013 white papers and short contributions are available for comment on the AOS 2013 website (http://www.arcticobservingsummit.org/users/white_papers.php).

AOS 2013 organizers invite poster contributions to highlight recent research and activity results relevant to arctic observing. The poster session at the AOS 2013 will provide an opportunity for summit participants to present new and innovative work-in-progress and enable discussion in an informal setting. Poster abstracts will be published and, with author permission, posters will be made available as part of the AOS proceedings following the summit. The submission deadline for posters is 8 April 2013 and the poster submission webpage is available here. (http://www.arcticobservingsummit.org/users/posters.php)

The website also features a community input survey (http://www.arcticobservingsummit.org/users/survey.php), the results of which will help to shape this and future summits. A preliminary schedule, including side events, is available here (http://www.arcticobservingsummit.org/programme.php).

AOS is a task of the Arctic Council's Sustaining Arctic Observing Networks (SAON) (http://www.arcticobserving.org/) initiative. It is part of the broader SAON implementation process, which is jointly led by the Arctic Council (http://www.arctic-council.org/index.php/en/), International Arctic Science Committee (IASC) (http://www.iasc.info/), and the World Meteorological Association (WMO) (http://www.wmo.int/pages/index_en.html). AOS 2013 partners include: the U.S. interagency program Study of Environmental Arctic Change (SEARCH) (http://www.arcus.org/search/index.php), the ArcticNet Network of Centres of Excellence Canada (ArcticNet) (http://www.arcticnet.ulaval.ca/), the European Union's Arctic Climate Change Economy and Society project (ACCESS) (http://www.access-eu.org/), the International Network for Terrestrial Research and Monitoring in the Arctic (INTERACT) (http://www.eu-interact.org/), the Swedish Polar Research Secretariat (SPRS) (http://www.polar.se/en), and the International Arctic Research Center (IARC) (http://www.iarc.uaf.edu/).

For more information, see the AOS 2013 website, or contact the Arctic Observing Summit organizers (AOS@arcticchange.org) or Maribeth S. Murray (murray@arcticchange.org).

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A Brief Personal Look at the Evolution of the R/V Sikuliaq

Arctic marine research has suffered over the past decades because the U.S. academic fleet, operated by the University-National Oceanographic Laboratory System (UNOLS) (http://www.unols.org/), has never operated an ice capable vessel. This has not been the case for the Southern Ocean, which always has had both supply and research capabilities. Nor was it the fault of enthusiastic scientists. For example, Dr. Robert Elsner, now emeritus professor with the University of Alaska Fairbanks (UAF), has pursued this dream since the 1970s. He kept a log of all ice-capable vessels in the world, was familiar on a first hand basis with Finnish icebreaker technology, and wrote early proposals for the design of a U.S. arctic research vessel. He had become familiar with The Glosten Associates of Seattle, the naval architect firm that subsequently worked with UAF and the UNOLS design committee over the years.

The R/V Sikuliaq is launched 13 October 2012 in Marinette, Wisconsin. Photo courtesy of UAF School of Fisheries and Ocean Sciences and Val Ihde.

Over the next decades we carried out three design efforts with support from the National Science Foundation. The first was completed in the 1970s but funding was never secured. The second met a similar fate more than a decade later. The final and successful effort resulted in a far more capable vessel than earlier designs. During my tenure as Director of the Institute of Marine Sciences (http://www.ims.uaf.edu/) and Dean of the UAF School of Fisheries and Ocean Sciences (http://www.sfos.uaf.edu/), it was high priority for me to work on the proposals and design and to keep the project visible in Washington, D.C. Dr. Thomas Royer, Chairman of the UAF ship committee, played an important leadership and design role for the project as well. In the end it was the American Recovery and Reinvestment Act of 2009, also known as the "Stimulus Act," that provided the funds for construction. Making use of this opportunity was possible because the ship design was ready at the right time and because the National Science Foundation made it a priority.

Now, as the vessel is approaching the "sail away" day, it is impossible for me to mention all the talent, devotion, and support being provided by the University of Alaska team, the Wisconsin shipyard team at Marinette Marine Corporation, and the National Science Foundation. Construction and launch of the R/V Sikuliaq is a dream come true. Bob Elsner and I were honored as ship sponsors with our initials engraved on the keel and participation in the christening and launch. The latter was amazing! About 2,000 people stood outdoors in the wind and rain and cold—horrible weather—to watch the event. The launch itself was dramatic. The vessel slid sideways into the water (more like dumped) and almost keeled over before righting itself. A great roar of applause went up from the crowd.

The R/V Sikuliaq will be ready for operations in Alaskan waters in 2014. This is an extremely capable vessel. She is ice-worthy and well equipped for the scientific work ahead. The crew is being hired and sea trials will take place over the next few months. The Sikuliaq will be home-ported in Seward but will spend most of the time at sea.

— Vera Alexander
President, ARCUS Board of Directors

Further information about the vessel and program are available on the UAF School of Fisheries and Ocean Sciences website (http://www.sfos.uaf.edu/).

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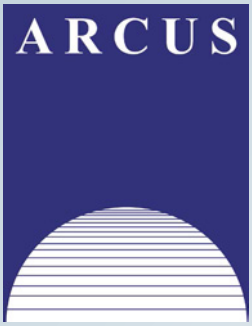

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