

Witness the ARCTIC

Chronicles of the NSF Arctic Sciences Division

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IPY Heightens Attention to Arctic Issues

By Mead Treadwell

Over the two-year official period of the fourth International Polar Year (IPY), from March 2007 to March 2009, scientists from more than 60 nations carried out over 160 IPY projects, supported by approximately \$1.2 billion, mostly from national scientific agencies. Although its full scientific legacy will evolve over the coming years, it was clear as IPY came to its successful close in early 2009 that the program had made valuable progress toward the four major goals set by the International Council for Science (ICSU) IPY planning group in 2004:

- advances in polar knowledge and understanding (see box page 3);
- a legacy of improved observational systems, facilities, and infrastructure;
- a new generation of polar scientists and engineers; and
- interest and participation from polar residents, students, the public, and decision-makers.

Significantly, IPY has made impressive progress with the last goal—educating the public and decision-makers. As a variety of high profile events and publications shared some of the program's early

scientific results, it became increasingly obvious that national and international policy-makers and the public are beginning to recognize the Arctic's scientific and strategic importance. From international diplomatic events to presidential policy changes (see page 4) and increased science budgets (see page 8), the events of the past few months show that arctic science no longer operates in obscurity. In this new era of arctic awareness, it is incumbent on the members of the research community to be prepared—both to maximize the many opportunities the new era brings and to think through the policy implications of their work.

Ministerial Declaration on IPY

In April, the Member States of the Arctic Council and the Consultative Parties to the Antarctic Treaty met for the first time in Washington DC (see photo).

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Our New Format

Dear Subscribers,

ARCUS has changed the format of *Witness the Arctic*. To provide more frequent updates and reduce printing and mailing costs and associated environmental impacts, the newsletter will now be distributed online in three or four shorter issues per year, depending on newsworthy events. Subscribers will receive an e-mail when each issue has been released, with a link to the online content.

We hope you find the new format useful and welcome your feedback on the changes. For further information, please go to www.arcus.org/witness_the_arctic/index.html. For suggestions about the new format or ideas for future issues, contact me at ARCUS (york@arcus.org).

Sincerely,

Alison York

Witness the Arctic Editor

U.S. Secretary of State Hillary Clinton delivers opening remarks at the Joint Session of the Antarctic Treaty Consultative Meeting and the Arctic Council in April 2009.

In her speech, Clinton declared a U.S. commitment to a "high level of engagement with our partners" on arctic policy and to ratifying the U.N. Convention on the Law of the Sea (UNCLOS), which will help resolve disputed maritime borders in the Arctic Ocean. To Clinton's right are Jonas Gare Store, Norwegian Foreign Minister and Arctic Council chair, and John Holdren, Director of the U.S. Office of Science and Technology Policy.

Photo credit: Tim Sloan/AFP/Getty Images.



In her welcoming remarks, U.S. Secretary of State Hillary Clinton called for increased attention to the Arctic to “strengthen peace and security, support sustainable economic development, and protect the environment.” Following diplomatic meetings at the U.S. State Department, the joint polar event celebrated the accomplishments of IPY with a seminar hosted by NSF and the U.S. National Academy of Sciences Polar Research Board.

The more than 400 diplomats at the event issued a Ministerial Declaration on the IPY and Polar Science, urging cooperation and support to deliver a lasting legacy from the IPY. The text of the ministerial declaration is available on the State Department website: www.state.gov/g/oes/rls/other/2009/121340.htm, and video of the IPY seminar is available on the NSF website: www.nsf.gov/news/news_summ.jsp?cntn_id=114688&org=NSF&from=news.

Later in April, diplomats gathered at the Sixth Ministerial Meeting of the Arctic Council in Tromsø, Norway (see page 9), where they discussed ways to integrate results from IPY into the council’s ongoing projects. The ministers also signed the Tromsø declaration, which “recognize[d] the urgent need for an effective global response that will address the challenge of climate change, and confirm[ed] the commitment of all Arctic States to actively contribute to reaching an adequate agreed outcome at the [UN Framework Convention on Climate Change] 15th Conference of the Parties in Copenhagen in December 2009.”

Also noteworthy at the Tromsø meeting was a decision to form a task force on short-term forcers of arctic climate change,

IPY Raises Arctic Visibility

“IPY research has advanced frontiers in fields that range from climate science to understanding the mechanics of the world’s great ice sheets to the sociological ramifications of unprecedented changes occurring in the Arctic.... Researchers from the U.S. and more than 60 other nations have built a knowledge base that will elucidate our actions deep into the next century.”

—Arden Bement, National Science Foundation
Address at A Celebration of the International Polar Year

“The International Polar Year has stimulated an intense focus on the Arctic. The number and capability of modern research tools that are in, around, or above the Arctic, the skills of the observers and the modelers, and the international cooperation exceed any deployment, in any ocean, to date.”

—David Carlson, IPY International Programme Office
Testimony before the U.S. Senate Foreign Relations Committee

“In a relatively short period of time fundamental changes have occurred in relation to the circumpolar North.... [T]he perception of the Arctic as a globally important region in biophysical and geopolitical terms has taken hold. To a significant degree, this perception has been fuelled by a growing awareness of the extensive impacts on the Arctic of changes in climate and climate variability.”

—Senior Arctic Official Report to Ministers
Arctic Council, Tromsø

including methane and black carbon. The U.S. Environmental Protection Agency is helping to lead the task force, and ideas from the science community to help reduce these pollutants, which promote amplification of temperatures in the Arctic, would be helpful. The task force’s goals could benefit from research on methods to convert agricultural waste to energy, better coordinate boreal forest wildfire management, and collect and burn methane that would otherwise be released into the atmosphere.

Senate Hearing on Arctic Warming

Following on the Arctic Council meeting, the U.S. Senate Committee on Foreign Relations, chaired by Senator John Kerry (D-MA), held a roundtable hearing on the Global Implications of Arctic Warming in May 2009. The session included:

- Scott Borgerson of the Council on Foreign Relations on strategic governance of the Arctic Ocean;
- Lawson Brigham on the Arctic Council’s newly released Arctic Marine Shipping Assessment (AMSA; available at [\[arcticportal.org/en/arctic-council2\]\(http://arcticportal.org/en/arctic-council2\); see *Witness* Spring 2006\);](http://</div><div data-bbox=)

- David Carlson of the IPY International Programme Office on implications of early findings from IPY research projects;
- Lisa Speer of the Natural Resources Defense Council on high seas fisheries; and
- myself on the value of international scientific cooperation in the Arctic.

All five of us stressed the importance of making progress on:

- ratifying the UN Convention on the Law of the Sea (UNCLOS), still pending in the Senate,
- building new U.S. icebreakers, and
- ensuring greater stability in U.S.-Russian

cooperation on arctic research.

Following on the findings and recommendations of AMSA, we noted that although arctic governments are already moving forward to improve Arctic Ocean ship standards and search and rescue in the Arctic, the Arctic Ocean is still not fully accessible to science, and UNCLOS could make it even less so. We need to continue to strive for improvements to this situation—too much of what’s happening in the world climate scene depends on knowledge of arctic processes, and knowledge of arctic processes depends on ocean access.

New USARC Goals Report

As this newsletter goes to press, the U.S. Arctic Research Commission (USARC) is completing its 2009 Goals Report for the U.S. Arctic Research Program. In the past two years we have seen considerable progress within the Interagency Arctic Research Policy Committee (IARPC), chaired by NSF Director Arden Bement, on development of research plans, including new cross-cutting efforts on:

- arctic infrastructure, led by the U.S. Army Corps of Engineers,
- arctic resource assessment, led by the U.S. Geological Survey,
- arctic health, led by the National Institutes of Health, and
- preservation of indigenous languages, identities and cultures.

The USARC report also identifies ways to continue strengthening research efforts on arctic climate and in the Bering Sea and Arctic Ocean, including:

- making progress in defining the national/international Sustained Arctic Observing Network (SAON);
- incorporating arctic research needs in any revision of the nation's climate change science or climate change technology programs;
- close accounting and modeling of feedbacks from arctic gas hydrates and permafrost organic materials in any global greenhouse gas mitigation regime; and
- advancing arctic adaptation research.

Finally, we are pleased to announce that the USARC is detailing an experienced arctic scientist—Kate Moran of the University of Rhode Island—to the Office of Science and Technology Policy to advance the provisions of the 1984 Arctic Research and Policy Act.

In summary, the arctic science community should be very pleased with the improved awareness of the Arctic that IPY has helped bring to policy-makers and the public—but we cannot pause to savor this advance for long. We must work together to take full advantage of the progress we have made and use it to address the many critical problems our research has identified.

Mead Treadwell was appointed to the USARC in 2001 and designated chair by President Bush in 2006. Treadwell also serves as Senior Fellow of the Institute of the North, where his research focuses on strategic and defense issues, management of commonly owned resources, and integration of transport and telecommunications infrastructure. For more information, see the USARC website: www.arctic.gov or contact Treadwell at meadwell@alaska.net. ■

IPY Publications Highlight Early Results, Remaining Challenges

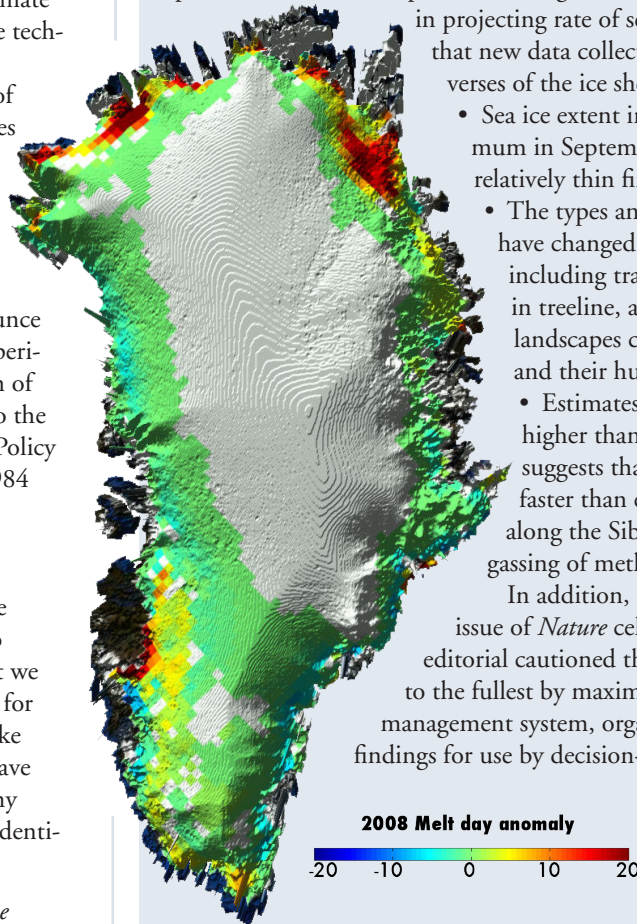
In February 2009, the international committee overseeing IPY released a report highlighting early results and calling on participating nations to ensure that the momentum generated by the program carries into sustained support for polar research in the future. Developed by the ICSU/World Meteorological Organization (WMO) Joint Committee for IPY, *The State of Polar Research* received international media attention, citing new findings that rapid polar changes will affect global systems. “The International Polar Year 2007-2008 came at a crossroads for the planet’s future,” said WMO Secretary-General Michel Jarraud at the report’s launch, “The new evidence resulting from polar research will strengthen the scientific basis on which we build future actions.” The report outlines some of the new findings in arctic research that have emerged from IPY, including:

- Novel techniques used to assess mass balance of the Greenland and Antarctic ice sheets indicate that both are losing mass and contributing to rising sea levels (see figure). The potential for further rapid ice discharge from these regions remains a major unknown in projecting rate of sea level rise. Modelers expect, however, that new data collected by collaborative IPY surveys and traverses of the ice sheets will help strengthen their predictions.
- Sea ice extent in the Arctic Ocean reached a record minimum in September 2007, and the percentage that was relatively thin first year ice continued to increase.
- The types and extents of vegetation in the Arctic have changed substantially in response to warming, including transitions from grasses to shrubs, shifts in treeline, and modification of soil structure. These landscapes changes are affecting the larger ecosystems and their human users.
- Estimates of carbon trapped in permafrost are higher than previously calculated, and new evidence suggests that terrestrial permafrost degrades much faster than expected as sea ice disappears. Cruises along the Siberian coast observed substantial out-gassing of methane from thawing ocean sediments.

In addition, a special section in the 26 February 2009 issue of *Nature* celebrated the achievements of IPY, but an editorial cautioned that those achievements must be exploited to the fullest by maximizing the effectiveness of the IPY data management system, organizing an effective assessment of the findings for use by decision-makers and the public, and creating ongoing observation networks at both poles. Efforts are underway on all three of these fronts, but all will need substantial international support and cooperation.

The State of Polar Research is available on the IPY International Programme Office website: www.ipy.org/index.php?/ipy/detail/state_of_polar_research_doc_pr/. The *Nature* editorial on IPY is available at www.nature.com/nature/journal/v457/n7233/full/4571057a.html. The IPY Data and Information Service is at <http://ipydis.org/index.html>. ■

Figure: Extreme snowmelt during summer 2008 over the northern part of the Greenland ice sheet, based on the analysis of microwave data recorded by the Special Sensor Microwave Imager (SSM/I) on the F13 satellite of the U.S. Defense Meteorological Satellite Program. Colors indicate the 2008 melt day anomaly for Greenland (number of days in 2008 with surface melt minus the average for 1979–2007). Reprinted from The State of Polar Research, courtesy M. Tedesco, CUNY/NASA/UMBC.



U.S. Policy Revisions Reflect Arctic Warming

In 2007, the USARC proposed a review of U.S. arctic policy, last updated in 1994. The National Security Council and Department of State led an interagency process that culminated in President Bush issuing a new presidential directive in January 2009. The revised arctic policy takes into account several developments, including:

- Altered national policies on homeland security and defense;
- The effects of climate change and increasing human activity in the region;
- The establishment and ongoing work of the Arctic Council; and
- A growing awareness that the region is both fragile and rich in resources.

The new policy seeks to:

1. Meet national and homeland security needs relevant to the arctic region;
2. Protect the arctic environment and conserve its biological resources;
3. Ensure that resource management and economic development in the region are environmentally sustainable;
4. Strengthen institutions for cooperation among the eight arctic nations;
5. Involve indigenous communities in decisions that affect them; and
6. Enhance scientific monitoring and research into local, regional, and global environmental issues.

Below, the policy on scientific cooperation is reproduced in its entirety, and two sections relevant to the scientific community are summarized. The complete directive is available at www.arctic.gov/files/FinalArcticPolicy.pdf.

International Scientific Cooperation

1. Scientific research is vital for the promotion of U.S. interests in the arctic region. Successful conduct of U.S. research in the arctic region requires access throughout the Arctic Ocean and to terrestrial sites, as well as viable international mechanisms for sharing access to research platforms and timely exchange of samples, data, and analyses. Better coordination with the Russian Federation, facilitating access to its domain, is particularly important.
2. The U.S. promotes the sharing of arctic research platforms with other countries in support of collaborative research that advances fundamental understanding of

the arctic region in general and potential arctic change in particular. This could include collaboration with bodies such as the Nordic Council and the European Polar Consortium, as well as with individual nations.

3. Accurate prediction of future environmental and climate change on a regional basis, and the delivery of near real-time information to end-users, requires obtaining, analyzing, and disseminating accurate data from the entire arctic region, including both paleoclimatic data and observational data. The U.S. has made significant investments in the infrastructure needed to collect environmental data in the arctic region, including the establishment of portions of an arctic circumpolar observing network through a partnership among U.S. agencies, academic collaborators, and arctic residents. The U.S. promotes active involvement of all arctic nations in these efforts in order to advance scientific understanding that could provide the basis for assessing future impacts and proposed response strategies.

4. U.S. platforms capable of supporting forefront research in the Arctic Ocean, including portions expected to be ice-covered for the foreseeable future, as well as seasonally ice-free regions, should work with those of other nations through the establishment of an arctic circumpolar observing network. All arctic nations are members of the Group on Earth Observations partnership, which provides a framework for organizing an international approach to environmental observations in the region. In addition, the U.S. recognizes that academic and research institutions are vital partners in promoting and conducting arctic research.

5. Implementation: In carrying out this policy as it relates to promoting scientific international cooperation, the Secretaries of State, the Interior, and Commerce and the Director of the National Science Foundation, in coordination with heads of other relevant executive departments and agencies, shall:

- a. Continue to play a leadership role in research throughout the arctic region;
- b. Actively promote full and appropriate access by scientists to arctic research sites through bilateral and multilateral measures and by other means;

- c. Lead the effort to establish an effective arctic circumpolar observing network with broad partnership from other relevant nations;
- d. Promote regular meetings of arctic science ministers or research council heads to share information concerning scientific research opportunities and to improve coordination of international arctic research programs;
- e. Work with the Interagency Arctic Research Policy Committee (IARPC) to promote research that is strategically linked to U.S. policies articulated in this directive, with input from the Arctic Research Commission; and
- f. Strengthen partnerships with academic and research institutions and build upon the relationships these institutions have with their counterparts in other nations.

Security Interests

Recognizing that the Arctic is primarily a maritime domain and that human activity in the region is increasing, the U.S. should:

- Assert a more active and influential presence to protect its arctic interests and to project sea power throughout the region;
- Increase arctic maritime domain awareness in order to protect commerce, critical infrastructure, and key resources;
- Preserve the global mobility of U.S. vessels and aircraft throughout the region; and
- Project a sovereign U.S. maritime presence in the Arctic in support of essential U.S. interests.

Governance and Boundary Issues

Although the policy supports U.S. participation in international organizations such as the Arctic Council, it does not endorse an “Arctic Treaty” along the lines of the Antarctic Treaty.

Given the region’s unresolved maritime boundaries, the policy urges:

- The U.S. Senate to accede to the UN Convention on the Law of the Sea (UNCLOS);
- Federal agencies to establish the outer limit of the U.S. continental shelf; and
- Russia to ratify the 1990 U.S.-Russia maritime boundary agreement. ■

CH2M HILL Polar Resources Readies for Busy Season of Research Support and Alternative Energy Development

CH2M HILL Polar Services (CPS), logistics provider to NSF's arctic research program, is busy supporting 2009 summer fieldwork. Projects on the CPS roster continue to be largely multi-institutional, international in scope, and focused on understanding the Arctic as a system. In addition to research support, CPS has several renewable energy projects planned for the 2009 summer; these projects continue work with NSF to reduce the impact of research on the fragile polar environment.

Approximately 135 research projects are currently slated to receive CPS services in the Arctic: 61 in Alaska, 56 in Greenland, 13 each in Canada and Russia, 3 in Iceland, 2 in Norway, and 9 in the Arctic Ocean and surrounding seas. These numbers are similar to those from 2008, with a small dip likely in the number of projects based in Greenland and on the Arctic Ocean and a significant bump—almost 40%—in the number of projects based in Russia. This year, NSF also increased CPS' responsibility for support to projects in Barrow, Alaska, where researchers on up to 40 NSF projects are expected to conduct fieldwork.

In early 2009, CPS supported a number of research teams working in remote Alaskan camps—a lake methane study led by University of Alaska's Katy Walter was a major early season effort. In March, CPS staff traveled to Shishmaref and Nome on Alaska's Seward Peninsula where they gathered assorted camp and project gear before traveling on snowmachines to Walter's research site at Cape Espenberg on the northern peninsula. The research team followed several days later. They worked for three weeks in the area, surveying and collecting methane samples from bubbles

trapped in frozen thermokarst lakes and drilling lake sediment cores for study.

This NSF-funded project is international both in terms of its participants and its field locations. In addition to the Alaskan field work, a research team that includes Italian and German scientists will travel this summer to Chukotka, in far eastern Russia, to conduct similar studies based out of the Northeast Science Station at Cherskiy. Walters' research will compare results from Alaska and Russia to better understand the quantity of methane stored, the process by which it is released from these thermokarst lakes, and to predict the impact of the release as permafrost continues to thaw under a warming climate.



One of two solar and wind power systems currently at Imnavait Creek. As a pilot project this summer, CPS will install a methanol fuel cell at the adjacent site. The intent of the project is to improve data communications for both research sites by providing a more constant source of power while beta testing new technology in a field setting. Image by Tracy Dahl.

In addition to providing logistics support to a variety of research efforts, CPS has several experimental renewable/alternative energy projects planned this season. Around mid-June, CPS technicians will implement a cutting-edge alternative energy project at Imnavait Creek in northern Alaska. This site hosts a suite of monitoring instruments and experiments for the Arctic Long-Term Ecological Research (LTER) site at Toolik Field Station and a related Arctic Observing Network (AON) study of landscape-level carbon, water, and energy balance (see *Witness Winter 2008/2009*). The Imnavait Creek site needs a reliable year-round energy supply

to power autonomous instruments, as well as a reliable communications link for massive data storage and transfer capabilities.

The new experimental system that CPS is deploying in mid-June adds a methanol fuel cell to an existing solar photovoltaic (PV) system. The fuel cell will power the communications link, which sends data once daily via broadband satellite to servers in California. In addition to overcoming the seasonal limitations of solar PV, fuel cell technology has potential for broader applications in polar research environments, as the power comes without electromagnetic noise and emissions that can interfere with some sensing instruments.

In addition to the new integrated power and communication system at Imnavait

Creek, CPS engineers will also test lightweight, portable PV systems, being developed by project partners at Ascent Technologies, Inc., at the site. These systems could potentially be used by researchers who seek light yet rugged and quickly deployable power sources to run laptops and other devices in the field. A portable

PV unit will receive trial use in Greenland and Alaska so CPS can evaluate its functionality under varied polar conditions.

At Summit Station on the Greenland ice cap, engineers will test solar thermal systems deployed on the exterior of a mobile science facility. The small building can be configured for a wide variety of research uses and towed to satellite research sites on skis. By utilizing the abundant solar energy available during the polar summer when this facility is in operation, CPS expects the thermal systems to reduce the electric heater power draw by up to 75%.

For more information, see the CPS website: www.polar.ch2m.com, or contact Kip Rithner (kip@polarfield.com). ■

NSF Stimulus Funding will Support ARRV Construction

The American Recovery and Reinvestment Act of 2009, commonly known as the stimulus bill, includes \$400 million for the NSF Major Research Equipment and Facilities Construction (MREFC) account. From this amount, NSF plans to direct more than \$100 million to the University of Alaska Fairbanks (UAF) to support construction of the Alaska Region Research Vessel (ARRV), which was approved as a MREFC project in 2007. The final amount of the award is still to be determined.

The ARRV will be a 77 m (254 foot) ice-capable vessel designed to support a variety of research objectives in high latitudes. The ARRV, which will be owned by NSF and operated by UAF on behalf of the ocean sciences community through the University-National Oceanographic Laboratory System (UNOLS), will be the first vessel in the U.S. academic research fleet able to break ice up to 0.75 m (2.5 feet) thick. The ARRV will also be able to:

- accommodate up to 26 researchers, including those with disabilities, in addition to a crew of up to 20,
- allow collection of sediment samples from the sea floor,
- host remotely operated vehicles (ROV),
- use a suite of flexible winches to lower and raise sampling equipment through the water column, and
- communicate in real time with classrooms and other outside entities worldwide.

An aft view of the ARRV, designed by The Glostsen Associates in 2004. The ARRV will be capable of year-round operations in seasonal sea ice, near shore, and open ocean regions in the North Pacific, Gulf of Alaska, and Bering, Chukchi, and Beaufort Seas. The ARRV will include 2100 ft² of laboratory space, a deck working area of 3690 ft², and be able to accommodate up to four science vans. The vessel's science mission requirements were first developed by UNOLS Fleet Improvement Committee in 1998 and were considered and refined by the vessel's oversight and advisory committees in 2000 and 2001. Rendering by The Glostsen Associates, courtesy UAF.



The university released a request for proposals for the vessel's construction in mid-March 2009 with proposals due 30 April 2009. After evaluation of the proposals, final award of a shipyard contract is expected in fall 2009, with science operations beginning in 2013.

At the UAF Seward Marine Center, where the ARRV will be headquartered, the university plans to add a new all-weather dock and additional support facilities; UAF will need to obtain funding for these improvements from a non-federal source.

Planning for the new vessel began more than 30 years ago; it was developed as a replacement for the R/V *Alpha Helix*, a 133-foot research vessel that was built in 1966, retired after 40 years of service, and sold in 2007 to a private firm for use as a charter research vessel.

The design for the ARRV has been in development since 2000 and has evolved

through concept design, preliminary design, and an initial contract design that was completed in 2004 by The Glostsen Associates, a group of marine architects in Seattle. In August 2007, UAF entered into a cooperative agreement with NSF to proceed with a project refresh of the 2004 contract design and development of the project documentation needed to support construction. A Final Design Review took place at NSF in October 2008, and in March 2009 the National Science Board authorized the NSF Director, at his discretion, to make awards to UAF for the construction of the ARRV. As of the end of April 2009, UAF had received \$18 million through the cooperative agreement.

For more information, see the ARRV website: www.sfos.uaf.edu/arrv/, or contact Dan Oliver (fndko@uaf.edu) or Terry Whitedge (terry@ims.uaf.edu). ■

Update on ARCSS Program Activities

The latest Arctic System Science (ARCSS) Program solicitation, Changing Seasonality in the Arctic System (CSAS), was released in June 2008. The proposal deadline was in October 2008. In response to the solicitation, NSF received 71 proposals representing approximately \$30 million in requested funding. NSF anticipates making between 10 and 20 awards totaling \$5 to \$10 million. Awards are expected to be announced by July 2009.

The ARCSS Committee, which is appointed by ARCUS and offers a mechanism through which NSF can stay informed of community interests, is currently focusing on two main activities: discussions with the Study of Environmental Arctic Change (SEARCH) Science Steering Committee regarding much closer coordination of the two efforts, and input into the 2010 State of the Arctic Conference (see page 7).

In personnel news, Dr. Erica Key joined the Office of Polar Programs staff as Associate Program Director for the ARCSS Program. She is at NSF through the Visiting Scientists, Engineers, and Educators (VSEE) Program.

Key is an atmospheric physicist and oceanographer; she earned an M.S. and Ph.D. in Meteorology and Physical Oceanography from the Rosenstiel School of Marine and Atmospheric Science (RSMAS) at the University of Miami in 2004. After completing a postdoctoral fellowship at RSMAS, she served as a Researcher First-Class in air-sea interaction at the Centre d'Etudes des Environnements Terrestre et Planétaires (now the Laboratoire Atmosphères, Milieux, Observations Spatiales [LATMOS]) near Paris. She returned to the U.S. to work on marine biophysics at the Columbia University's Lamont-Doherty Earth Observatory before joining the ARCSS Program in May 2009. She has extensive field experience, having worked in all five oceans collecting data for both oceanographic and atmospheric research. She uses these observations to further advancements in remote sensing retrievals, modeling, and forecast analyses.

Key can be contacted at ekey@nsf.gov. For more information on the ARCSS Program, go to: www.arcus.org/ARCSS/index.html, or contact Neil Swanberg (nswanber@nsf.gov), Josh Schimel (Schimel@lifesci.ucsb.edu), or Helen Wiggins (helen@arcus.org). ■

2009 SEARCH Sea Ice Outlook Effort Underway

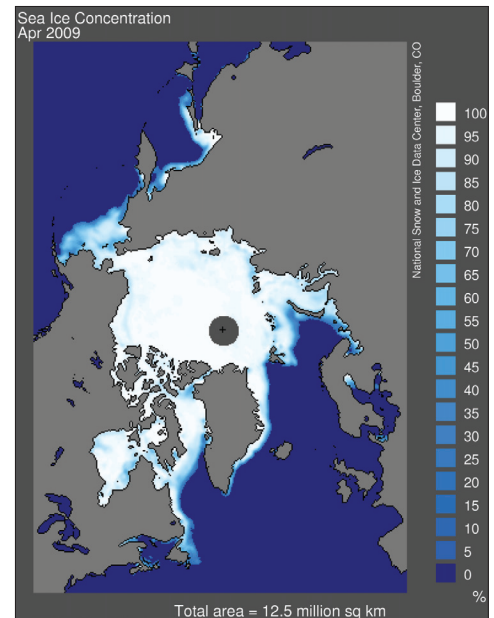
The Study of Environmental Arctic Change (SEARCH) Sea Ice Outlook (SIO), which provides an integrated, community-wide summary of projections of the annual arctic sea ice minimum, has launched activities for the 2009 season. Contributions are currently being accepted, and the first monthly report will be released in early June, with subsequent reports each month through September 2009.

The SIO effort, which began in 2008 in response to the drastic and unexpected record sea ice minimum of 2007, provides a means to synthesize and communicate community outlooks for the annual sea ice minimum. The SIO is based on an open and inclusive process—more than 20 research groups contributed in 2008—by providing information on current and expected states of the arctic sea ice. A 2008 retrospective report concluded that the SIO showed good agreement between outlook projections and observations, served as a successful forum and model for community synthesis, and was an important initial step toward better understanding arctic sea ice loss. A central lesson learned from the 2008 SIO was that the condition of sea

ice in late spring was a major driver of the 2008 sea ice minimum.

A workshop to further evaluate the SIO effort and plan for the upcoming season was recently held in Boulder, Colorado. Participants at this March 2009 meeting discussed lessons learned from 2008 and made several recommendations for improvements to the 2009 Outlook. The presentations from this workshop are available on the meeting website (www.arcus.org/search/seaiceoutlook/march_2009_wgm/agenda.php). The resulting workshop report, which will be circulated as a draft for community and public input, includes recommendations for the 2009 Outlook on scientific goals, content, and format and will be available as a PDF file on the SIO website in June 2009.

For more information or to contribute to the SIO, go to www.arcus.org/search/seaiceoutlook/index.php, or contact Helen Wiggins at ARCUS (helen@arcus.org), James Overland at the National Oceanic and Atmospheric Administration (james.e.overland@noaa.gov), or Hajo Eicken at the University of Alaska Fairbanks (hajo.eicken@gi.alaska.edu). ■



More than 20 research groups, including scientists from the National Snow and Ice Data Center (NSIDC), contributed to the 2008 Sea Ice Outlook (SIO) by providing information on current and expected states of arctic sea ice over the summer season. This NSIDC image, derived from satellite passive microwave data, depicts the April 2009 average percentage of ice cover for areas that were more than 15% covered by ice. Note that the black cross indicates the geographic North Pole and that the satellite does not image a circular sector over this area due to orbit inclination. Figure credit: NSIDC.

State of the Arctic Conference

State of the Arctic Conference Set for March 2010

Planning is underway for a large State of the Arctic Conference, which will be held 16–19 March 2010 in Miami, Florida. This open international forum will provide an opportunity to present, exchange, and discuss the latest knowledge on the state of the Arctic and future directions of arctic science and policy. Specifically, the conference will:

- review the scientific understanding of the basic functioning of the arctic system, including human subsystems;
- assess our capacity to observe and understand the system, especially in light of rapid system-scale changes in all subsystems;

- examine our capability to project future states of the arctic system under various scenarios; and
- explore options for solutions to the problems caused by human-induced environmental change.

The conference is being organized by ARCUS, with major funding provided by the NSF Division of Arctic Sciences, including the interagency Study of Environmental Arctic Change (SEARCH; see this page) and the Arctic System Science Program (ARCSS; see page 6).

Other sponsors include the International Study of Arctic Change (ISAC), the Canadian ArcticNet Network of Centres of

Excellence, and the European Developing Arctic Modeling and Observing Capabilities for Long-term Environmental Studies (DAMOCLES) program.

Additional sponsorships are invited, and interested parties are encouraged to contact Helen Wiggins at ARCUS (helen@arcus.org).

Additional information, including registration, abstract submission, and other materials, will be available soon through a State of the Arctic Conference website, which will be announced via the ArcticInfo mailing list and linked through the ARCUS website: www.arcus.org. ■

Workshop Report Outlines Gaps and Makes Recommendations for Monitoring Efforts in Arctic Seas

The Alaska Ocean Observing System (AOOS) and the North Pacific Research Board (NPRB) sponsored a workshop on marine research and monitoring efforts in the Arctic, particularly in the Beaufort and Chukchi Seas, as part of the January 2009 Alaska Marine Science Symposium in Anchorage, Alaska.

The goal of the workshop, attended by 145 individuals from more than 60 organizations, was to share information and promote collaboration among the many entities with increasing activities in marine research and monitoring in the region, including the oil and gas industry, local, state, and federal agencies, and non-governmental and academic organizations.

The workshop was an initial step by AOOS and NPRB toward long-term development of a more comprehensive monitoring and assessment plan, through which each participating organization can focus on projects to meet their particular goals while contributing to a larger data sharing and integration effort.

A draft workshop report, prepared by Craig Dorman, retired University of Alaska vice president for research, and entitled *Toward a Strategy for the Chukchi and Beaufort Seas*, was circulated for community review in April.

The final document, which is available on the AOOS website (www.aos.org), was released in late May and contains:

- background information on the history of research and monitoring in the Chukchi and Beaufort Sea regions;
- a description of current climate, economic, and policy challenges and potential cumulative impacts in these regions;
- a summary of what participants felt were major information and data needs; and
- short and long term recommendations to advance coordination, planning, and data sharing and address these needs.

AOOS will work with other partners to form a committee to follow up on the report's recommendations. For more information, go to the workshop website: www.alaskamarinescience.org, or contact AOOS Director Molly McCammon (mccammon@aos.org). ■

Capitol Updates

FY 2010 NSF Budget Proposal Tops \$7 Billion

The Obama administration released details of its FY 2010 budget request in early May 2009. The proposed NSF budget is \$7.045 billion, an increase of \$555 million (8.5%) over the FY 2009 budget plan of \$6.49 billion. NSF received an additional \$3 billion from the American Recovery and Reinvestment Act of 2009 (commonly called the stimulus bill; see *Witness Winter 2008/2009* and page 6); this one-time appropriation is not included in the following calculations or discussion.

The proposed FY 2010 funding puts NSF back on a path to double its budget relative to 2006 levels, as authorized in 2002 and called for in a number of independent studies.

The proposed FY 2010 budget includes:

- \$5.7 billion for Research and Related Activities, an increase of \$550 million (10.6%);
- \$858 million for Education and Human Resources, an increase of \$12.5 million (1.5%); and

- \$117 million for Major Research Equipment and Facilities Construction, a decrease of \$35 million (23%).

The budget includes two proposed new foundation-wide programs of interest to the arctic research community:

- Climate Change Education, funded at \$10 million each in both FY 2009 and 2010, and
- Climate Research, included in the budget request at \$197.26 million.

The Office of Polar Programs request is \$516 million, an increase of \$45.3 million (9.6%) over the FY 2009 budget of \$470.7

million. Of the FY 2010 OPP request, the Division of Arctic Sciences would receive \$108.7 million, an increase of \$10.44 million (10.6%) over FY 2009. Of this, almost \$62 million is requested for arctic research and education grants and almost \$47 million for arctic research support and logistics.

In the proposed budget, the Division of Arctic Sciences would provide:

- \$35.45 in support of the new foundation-wide Climate Research program; this funding builds on and goes beyond

continued on page 10

"Research in polar regions...addresses the Administration's focus on making the U.S. a leader on climate change and builds on a foundation established during the International Polar Year....The Administration is assessing the overarching issues facing the Arctic, including those associated with impacts of climate change, increased human activity, new or additional information needs, and conservation of arctic resources. This approach will necessarily include identifying any implementation issues associated with the Arctic Policy signed by the previous Administration."

—Office of Polar Programs in Context
FY 2010 NSF Budget Request

IASC Merges with AOSB; Secretariat Moves to Potsdam

The International Arctic Science Committee (IASC) is implementing several structural changes. The planned IASC merge with the Arctic Ocean Sciences Board (AOSB), combining the resources and scientific expertise of both organizations, was made official during Arctic Science Summit Week (ASSW) 2009 in Bergen, Norway (see box this page).

Another change in structure—formation of Scientific Standing Committees and Action Groups as new core elements to advance IASC's mission—was presented during ASSW. Feedback received at the meeting and input from IASC member countries is currently being incorporated into the structure.

In March, IASC Executive Secretary Volker Rachold and the IASC secretariat moved to Potsdam, Germany. For the next five years, the Alfred Wegener Institute for Polar and Marine Research will host the secretariat with financial support from the German Science Foundation. For three years prior to the move, the Swedish Research Secretariat in Stockholm hosted the IASC secretariat with funding from

the Swedish Research Council. The secretariat is responsible for the daily operations of IASC including communication with council members and other organizations, management of IASC finances, and outreach and communication activities.

For more information, see the IASC website: www.arcticportal.org/iasc/, or contact Volker Rachold at the secretariat (volker.rachold@iasc.se). ■

ASSW 2009 Includes Open Science Symposium For the First Time

This year's Arctic Science Summit Week (ASSW) was held in March 2009 in Bergen, Norway, attended by more than 300 scientists, students, policy makers, and other professionals.

The purpose of the summit, which is organized by IASC and other scientific organizations, is to provide opportunities for international coordination, collaboration, and cooperation in all areas of arctic science and to combine science and management meetings. This event typically features annual meetings of arctic organizations and presentations on arctic research being undertaken by the host country. This year and for the first time, an open science symposium was added to the schedule. The topic of the three-day meeting was Arctic Connections: Results of 150 Years of Arctic Research and presentations illustrated the increasingly integrative nature of arctic research.

An open science meeting will also be part of ASSW 2011, which will be organized by the Republic of Korea. ASSW 2010 will be held in Nuuk, Greenland, on 13–16 April.

For more information on ASSW, see the IASC website: http://arcticportal.org/iasc/arctic_science_summit_week. ■

Denmark Assumes Chairmanship of Arctic Council

Denmark assumed chairmanship of the Arctic Council (AC) at the sixth Ministerial Meeting in Tromsø, Norway, in April 2009. More than 300 participants attended, including delegates from the eight arctic nations, observer states, and indigenous peoples' organizations.

Following on two years of Norwegian leadership, Denmark's program for 2009–2011 prioritizes peoples of the Arctic, the International Polar Year (IPY) legacy, climate change, biodiversity, megatrends in the Arctic, integrated resource management, operational cooperation, and the AC in a new geopolitical framework. Per Stig Møller, Danish Minister for Foreign Affairs, will serve as chair—he replaces Jonas Gahr Støre.

The Tromsø Declaration was also endorsed and signed at the meeting and provides guidance on the work of the Arctic

Council under Danish leadership. Recommendations adopted by the AC encompass search and rescue, arctic shipping guidelines, infrastructure safety, oil and gas exploration, non-CO₂ drivers of climate change, ocean management, and melting ice. The declaration also says that the AC is “deeply concerned by the escalating rate of warming of the arctic climate, which will likely also affect the rest of the world.”

The 6th Ministerial Meeting was scheduled in conjunction with a meeting entitled Melting Ice: Regional Dramas, Global Wake-Up Call between former U.S. Vice President Al Gore, foreign ministers, and climate change scientists.

The chair of the AC rotates among member states every two years. Sweden is set to assume leadership in 2011. Norway, Denmark, and Sweden identified a common set of priorities for their successive

chairmanships: climate change, integrated management of resources, IPY, indigenous peoples and local living conditions, and AC management issues. To continue the focus on common priorities and foster development of institutional memory, the AC Secretariat will remain in Tromsø for the duration of the three Nordic chairmanships.

Due to the increased activity and interest in the Arctic, the established schedule of biannual Senior Arctic Officials meetings and biennial ministerial meetings will be supplemented with meetings in alternate years on the political (deputy foreign minister or equivalent) level. The next ministerial meeting is scheduled for April 2011 in Greenland.

For more information, see the AC website: <http://arctic-council.org>, or contact the Secretariat (ac-chair@arctic-council.org). ■



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Witness the Arctic is published periodically by ARCUS. Any opinions, findings, conclusions, or recommendations expressed in this publication do not necessarily reflect the views of NSF. Submit suggestions for the next issue of the newsletter by August 2009.

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witness (wit nis) *n.* 1.a. One who has heard or seen something. b. One who furnishes evidence. 2. Anything that serves as evidence; a sign. 3. An attestation to a fact, statement, or event. —*u. tr.* 1. To be present at or have personal knowledge of. 2. To provide or serve as evidence of. 3. To testify to; bear witness. —*intr.* To furnish or serve as evidence; testify. [Middle English *wimes*(se), Old English *wimes*, witness, knowledge, from *wit*, knowledge, wit.]

A Note From the ARCUS President

New Executive Director Joins ARCUS

On behalf of the ARCUS Board of Directors, I am pleased to announce that Susan E. Fox became executive director of ARCUS in April 2009. Fox replaces Wendy K. Warnick who stepped down from the position after 17 years of service.

As a seasoned non-profit executive, Fox brings a wealth of experience and enthusiasm to ARCUS. Her experience includes a combined 15 years of service as executive director of the Society of American Archivists and the American Association of Law Libraries. In these positions, she worked with staff and the community to bring the organizations to a new level of effectiveness and service. Before that, she worked at Harvard's Kennedy School of Government in the Science, Technology, and Public Policy program and with the Center for Science and International Affairs.

Fox has a B.S. in Communications from Boston University's College of Communication and an M.S. in Public Affairs from the John W. McCormack Graduate School of Policy Studies at the University of Massachusetts Boston.

I recently asked Fox what she sees as the future of ARCUS.

"This is very early in my tenure with ARCUS—I'm just starting my fifth week—

so I won't have a fleshed out vision until I've had a chance to listen to the ambitions and concerns of the arctic community. Having said that, I think ARCUS is ideally situated to take advantage of this historic moment with world attention focused intently on arctic issues. This spotlight opens up a corresponding world of opportunities. The challenge will be for us to dream big dreams and then to think and act strategically to enact them.

Fortunately, we have a bright, dedicated board partnered with a bright, dedicated staff. ARCUS is extraordinarily blessed in this way. We have a justifiably high reputation in the scientific community and all of us are committed to maintaining and building upon that excellence. Our promise to our members and to the community is to serve you to the very best of our abilities. We are well positioned to take the consortium to the next level. It's going to be an exciting journey; I'm looking forward to our time together."

We are very excited about Fox's appointment and ask that you join us in welcoming her to the arctic science community. Fox can be contacted at fox@arcus.org or at 907-474-1600.

—Vera Alexander

Capitol Updates

Budget article continued from page 8.

International Polar Year synthesis activities to transform Arctic System Science by shifting greater attention to high-level synthesis informed by modeling and observations and using cyberinfrastructure to improve the ability to predict and model regional climate change;

- level funding of \$12 million for the Arctic Observing Network (AON; see *Witness* Winter 2008/2009);
- an additional \$3.5 million for cyberinfrastructure, to a total of \$4.0 million;
- \$750,000 in support of Climate Change Education; this new multidisciplinary, multi-faceted program will support a variety of partnerships to help develop environmentally engaged scientists and engineers and increase public understanding and engagement; and

- an additional \$500,000 for Arctic Social Sciences, to a total of \$4.0 million, to build on results from the natural science component of the Bering Ecosystem Study (BEST; see *Witness* Spring 2006) to explore the dynamic relationship between the ecosystem and the humans who depend on it.

The OPP request also includes level funding of \$54 million for operations and maintenance of the U.S. Coast Guard (USCG) icebreakers *Polar Sea* and *Healy* (see *Witness* Winter 2008/2009). The FY 2009 Department of Homeland Security budget includes \$30.3 million for the USCG to reactivate *Polar Star*.

For more information, see the NSF Budget Division website: www.nsf.gov/about/budget. ■