

UNITED STATES ARCTIC RESEARCH COMMISSION



ANNUAL REPORT FISCAL YEAR 2007

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February 1, 2008

To: The President
The President (pro tempore) of the Senate
The Speaker of the House of Representatives

The past year was another eventful period for the US Arctic Research Commission and I am pleased to present the Annual Report of the US Arctic Research Commission for fiscal year 2007 as referenced in the Arctic Research and Policy Act (ARPA) of 1984 (as amended).

During 2007, the Commission took on a series of new and demanding challenges to better encourage and promote scientific research activities in the Arctic. The Commission began the year by proposing five major research priorities for the *U.S. Arctic Research Plan, 2007-2011*

- Environmental Change of the Arctic Ocean and Bering Sea
- Arctic Human Health
- Civil Infrastructure Research
- Natural Resource Assessment and Earth Science
- Indigenous Languages, Identities, and Cultures

Two of those goals were adopted by the Interagency Arctic Research and Policy Committee (IARPC) as federal agency International Polar Year priorities in 2007: (1) creating the framework for an Arctic Observing Network, a system of atmospheric, land- and ocean-based environmental monitoring capabilities--from ocean buoys to satellites--that will significantly advance our observations of Arctic environmental conditions, and, (2) focusing for the first time on social science concerns, specifically on preservation of indigenous languages, identities, and cultures.

The Commission marked with sadness the passing of a much-beloved Commissioner, Mr. Duane Laible, Glosten Associates, Seattle, WA. Laible was appointed by President Bush in 2003, and served the Commission for more than four years as an active member and subject matter expert on Arctic shipping and maritime matters.

A summary list of the "Highlights of Commission Activities--FY-07" follows. It briefly summarizes the Commission's expanding role as an active and integral force in the planning and implementation of the nation's Arctic research policies, as mandated by the ARPA and as articulated by the Interagency Arctic Research Policy Committee through the National 5-Year Arctic Research Plan.

As Commission Chair, I am both privileged and proud to lead this agency whose activity and achievements, I submit, belie its small size of seven (part-time) Commissioners and four-time staff.

Very respectfully submitted,

A handwritten signature in blue ink, appearing to read "Mead Treadwell".

Mead Treadwell, Chair
U. S. Arctic Research Commission

**Annual Report
of the
UNITED STATES ARCTIC RESEARCH COMMISSION
to the
PRESIDENT and CONGRESS of the United States
Fiscal Year 2007**



*United States Arctic Research Commission
4350 North Fairfax Drive, Suite 510
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Preface

The Arctic Research and Policy Act of 1984 as amended (Public Law 101-609) requires that the US Arctic Research Commission, which was established by this Act, submit to the President of the United States and the Congress, not later than 31 January of each year, a report describing its activities and accomplishments during the immediately preceding fiscal year. The Commission presents the following report for fiscal year 2007 (1 October 2006 through 30 September 2007). For a description of the activities of the Commission in previous years, see its Annual Reports (Table 1 on inside back cover).

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Highlights of Commission Activities, Fiscal Year 2007

- Conducted four public meetings in Woods Hole, MA (Woods Hole Oceanographic Institute); Anchorage, AK, (in conjunction with the North Pacific Research Board's Alaska Marine Science Symposium); Washington, DC (Smithsonian and U.S. Capitol).
- Conducted field trip to Tromsø, Longyearbyen and Ny Alesund, Norway to collaborate with Norwegian scientists and their Arctic research activities.
- Participated in planning and execution of April 27, 2007 Interagency Arctic Research Policy Committee (IARPC) meeting where principals from federal agencies with Arctic interests authorized three specific activities:
 - develop the Arctic Observing Network as the focus of the next Arctic Research Plan update.
 - map out how other Arctic Research Commission's themes fit within the overall National Science and Technology Council's (NSTC) committee structure and other interagency committees.
 - advance common goals and objectives for indigenous languages and cultures.
- Participated in the US opening ceremony for International Polar Year 2007-2009. IPY is an internationally coordinated campaign of research that involves a wide range of research disciplines, including the social sciences. The emphasis is interdisciplinary in approach and international in participation. It aims to educate and involve the public, and to help train the next generation of engineers, scientists, and leaders.
- Continued proactive support for US ratification of the Law of the Sea (LOS-82) Treaty, working with both committees and individual members of the Senate, and various offices of the Executive Branch.
- Organizing committee member and sponsor for the Alaska Marine Science Symposium.
- Participated in planning and execution of the "Impact of an Ice-Diminishing Arctic on Naval and Maritime Operations" symposium that focused on naval operations and national strategic issues as well as impact on other maritime operations such as commercial transportation, oil and gas exploration and exploitation, fisheries and oceanographic research.
- Co-sponsored Alaska Marine Science Symposium held in January.
- Continued an active and influential role in U.S. involvement in Arctic Council affairs under the leadership of the State Department. Provided leadership and management, staff support for the Council's Arctic marine Shipping Assessment (AMSA, 2005-2008) for which the Deputy Director is Chairman and U.S. lead contact. Participated in the meetings of the Council's working group Protection of the Arctic marine Environment (PAME).
- Attended and made presentations at Arctic Science Summit week in Durham, NH.
- Attended the quarterly meetings of the State Department ad-hoc committee on the Law of the Sea and Article 76 surveys to extend US sovereignty over its ECS.
- Attended the annual Meeting of the Arctic Research Consortium of the United States (ARCUS) held in Washington, DC.
- As full member of the Governance Board of the Alaska Ocean Observing System (AOOS), led effort to establish an Alaska sea ice subcommittee within AOOS to address stakeholder and research requirements for sea ice in Alaska's coastal seas.
- Continued through the work of its former chair and current Commission advisor, George Newton, to submit recommendations to oversee implementation of improvements to the Arctic Maritime Safety Information (AMSI) database system. AMSI is the International Arctic Ocean equivalent to the temperate ocean Notices to Mariners system, managed by the National Geospatial-Intelligence Agency (NGA). Motivated the US to propose creation of

- five new navigation areas (NAVAREAS) in the Arctic Ocean as part of the Worldwide Navigation Warning System (WWNWS).
- Continued leadership of a working group of international experts examining issues related to 'Scaling in Arctic Terrestrial Systems.'
 - Supported the re-established Science Advisory Committee (SAC) in support of of the Scientific Ice Expedition (SCICEX). The focus of the SAC will be to develop and help implement an arctic science plan for use with U.S. Naval submarine assets. Ultimately, the goal of this renewed effort is to conduct high quality under-ice science in support of the academic and government arctic science communities. The SAC consists of representatives from sponsoring agencies and 7 members from academia with one serving as chair.
 - Participated as a member of the North Pacific Research Board.
 - Called for the development of an international Arctic marine transportation agenda.

Major Research Priorities

In Fiscal Year 2007, USARC published its biennial *Report on Goals and Objectives for Arctic Research*, which is required by The Arctic Research and Policy Act of 1989 (as amended) containing five major research priorities. The Commission took a thoughtful approach in choosing its defined areas of emphasis and activity—which is to realize its broad mission to renew and vigorously sustain America’s Arctic scientific research programs and infrastructure. For the first time, the Commission took up a goal with a sociological mission—to preserve indigenous languages, identities and cultures.

Environmental Change of the Arctic Ocean and Bering Sea: Considering the Bering Sea and Arctic Ocean’s vast untapped natural resources, largely unknown energy supplies and expanding fisheries harvest, as well as a predicted global transportation pathway, this marine realm is an obvious priority for scientific research. The Commission has for several years supported the activities of the Study of Environmental Arctic Change (SEARCH) program, an interagency effort to understand the nature, extent and evolution of system-scale Arctic variations. SEARCH is now being internationalized through the International Study of Arctic Change (ISAC) and broadened to include the Arctic Observing Network (AON). USARC now recommends increased support for SEARCH programs, such as NOAA’s Russian-American Long-Term Census of the Arctic (RUSALCA). It also recommends support for forthcoming programs as well as integration with other efforts such as the U.S. Climate Change Science Program and the U.S. Climate Change Technology Program.

Arctic Human Health: The Arctic Research Commission supports the development of an Arctic human health research plan to coordinate and emphasize research on health concerns in the Arctic and to build links to the health research programs of other Arctic nations. USARC commends the Arctic Council’s Arctic Human Health Initiative (AHHI), a major U.S.-led contribution to the International Polar Year.

Civil Infrastructure Research: Climate change ramifications including melting permafrost, reduced sea ice, stronger storms and eroding coastlines require research and innovative engineering solutions to develop new ways to design and construct infrastructure in Alaska. The Commission recommends that that a plan be considered for new infrastructure that will be required for a comprehensive transportation system to address the demands of an increasingly accessible Arctic by land, sea or air.

Natural Resources and Earth Science: The Arctic Research Commission recommends that Federal agencies immediately commence a comprehensive program of research on oil in ice based on the Commission’s Special Report, *Advancing Oil Spill Response in Ice-Covered Waters*. It also recommends that the affected agencies include new research funding in their requests for re-authorization of OPA 90.

Indigenous Languages, Identities and Cultures: Language helps us define the cultural diversity of our planet, allowing us to separate one population from another. Although critical, language is one of the most vulnerable elements of our cultural heritage. Of the thousands of known languages, less than 10 are used by nearly 60 percent of the global population and more than 500 are extinct. In the Arctic, language vulnerability is especially acute where loss stems from separation of indigenous people from their cultural past. Without a research plan to address Arctic language preservation, the path to language extinction is likely to shorten. This plan should incorporate:

- regular, permanent census processes to understand the diversity of languages spoken by Arctic people, and the viability of those languages for future generations;
- documented procedures to ensure that languages and place names spoken and given by Arctic people are recorded and preserved; and
- defined policy options and processes for language preservation that have succeeded in the Arctic and elsewhere that are made available to Arctic policy makers and residents.

Background

The main purposes of the Arctic Research and Policy Act as amended (Public Law 101-609, see Appendix B) are:

- 1) to establish national policy, priorities and goals and to provide a Federal program plan for basic and applied scientific research with respect to the Arctic including natural resources and materials, physical, biological and health sciences, and social and behavioral sciences
- 2) to establish a US Arctic Research Commission to promote Arctic research and to recommend Arctic research policy
- 3) to designate the National Science Foundation as the lead agency responsible for implementing the Arctic research policy
- 4) to establish the Interagency Arctic Research Policy Committee (IARPC) to develop a national Arctic research policy and a five-year plan to implement that policy.

The Arctic Research and Policy Act of 1984 was amended in November, 1990 to increase the number of Commissioners appointed by the President of the United States from five to seven voting members. Four members are from academic or research institutions; two members from private industry undertaking resource development in the Arctic; and one member from among the indigenous residents of the US Arctic. The Director of the National Science Foundation serves as an ex officio member.

The Commission staff consists of an executive director in Arlington, Virginia; the Deputy Executive Director and Alaska Office Director in Anchorage, Alaska; an administrative officer, and a secretary in the Arlington office. The Alaska regional office of the Commission is located in Anchorage.

The Commission holds business meetings and conducts public hearings in Alaska and elsewhere to receive input, and makes site visits and field trips to research facilities and projects throughout the Arctic. It publishes an annual report and co-sponsors a publication with the Interagency Arctic Research Policy Committee, the *Arctic Research of the United States*. Major recommendations of the Commission on Arctic research policy, program priorities, and coordination efforts are published on page 7 of this publication, as well as in letters to appropriate agencies.

Funds for the operation of the Commission are appropriated by the Congress in the National Science Foundation budget and expended by the Commission with administrative support from the General Services Administration. The budget in FY 2007 was \$1.45 million.

Response to Mandate, Fiscal Year 2007

For the effective accomplishment of its mandated duties, the Commission must identify problems, needs, and make recommendations on basic and applied Arctic research. Most of the issues to be addressed emerge from public meetings regularly held in Alaska, Washington, D.C, and from field visits to relevant sites in the Arctic and institutions conducting Arctic research.

Meetings during Fiscal Year 2007:

October 10-11, 2006, 81st Meeting Woods Hole, MA

January 22-25, 2007, 82nd Meeting Anchorage, AK

April 16-17, 2007, 83rd Meeting Washington, DC

The summary of Fiscal Year 2007 Commission meetings are provided in Appendix A. Appendix B is a list of other meetings attended by Commission members and staff.

**Appendix A: Summary of Commission Meetings
Fiscal Year 2007**

**US ARCTIC RESEARCH COMMISSION
81ST MEETING
10-11 October 2006
Woods Hole Oceanographic Institute, Woods Hole, MA**

In attendance:

Commissioners

**Mr. Mead Treadwell, Chairman
Mrs. Michele Eder
Mrs. Vera Kingeekuk-Metcalf**

**Dr. Thomas C. Royer
Dr. Susan Sugai
Dr. Charles Vörösmarty**

Staff

**Dr. John Farrell, Executive Director
Kathy Farrow, Publications**

**Dr. Lawson Brigham, Alaska Office Director/
Deputy Executive Director**

Attendees

Charles Abernathy, State of Alaska; Carin Ashjian, WHOI; Andy Bowen, WHOI; Jerry Brown, IPA; Henry Dick, WHOI; Arthur Gaines, WHOI; Michael Hicks, USCG; John Hobbie, MBL; Sharon Hoffman, WHOI; Robert Holmes, WHRC; Konrad Hughen, WHOI; Terrence Joyce, WHOI; Lloyd Keigwin, WHOI; Jim Luyten, WHOI; Larry Madin, WHOI; Jerry McManus, WHOI; Michael Moore, WHOI; Bradley Moran, URI; Breck Owens, WHOI; Robert Pickart, WHOI; Dick Pittenger, WHOI; Andrey Proshutinsky, WHOI; Ed Ratstetter, MBL; Rob Reeves-Sohn, WHOI; Gaius Saver, MBL; John Toole, WHOI; Betsy Weatherhead, University of Colorado; Peter Winsor, WHOI.

October 10, 2006

The meeting began with the introduction of the two newest commissioners, **Vera Kingeekuk-Metcalf**, director of the Eskimo Walrus Commission and **Charles Vörösmarty**, director of the Complex Systems Research Center at the University of New Hampshire.

As its director, **Vera Metcalf** oversees the Eskimo Walrus Commission that was created in 1978 by Kawerak, Inc., Nome, to address resource co-management issues on behalf of Alaska natives. Vera Kingeekuk **Metcalf** was born and raised in Sivungaq (Savoonga) on St. Lawrence Island, Alaska. She now lives in Nome and has been the Director of the Eskimo Walrus Commission (EWC) with Kawerak, Inc. since 2002. She works to promote local community participation in research that involves a community's natural and cultural resources. As the EWC Director and with support of the EWC, she has begun several community-based projects documenting local traditional ecological knowledge and resource management practices, which she proposes as effective Pacific walrus management tools today. **Metcalf** serves on the Pacific Walrus Technical Committee and is currently the Chair of the Pacific Walrus Conservation Fund. Vera also represents EWC on the Indigenous People's Council for Marine Mammals, and for eight years served as Vice President and Repatriation Officer of the Bering Straits Foundation. She consulted with museums around the country and assisted in the return of ancestral remains and objects. For seven years, she was a member of the Native American Graves Protection and Repatriation Act Review Committee, which recommends and advises the Secretary of the Interior on regulations and disputes. She continues to participate in subsistence activities in Nome and Savoonga. She is currently a commission member on the Carrie McLain Memorial Museum in Nome and member on the Nome Arts Council.

She and her husband Bob have one son, Mattox. **Metcalf** will serve as the indigenous representative on the USARC through February 2009.

Charles Vörösmarty is a Full Research Professor at the Institute for the Study of Earth, Oceans, and Space at the University of New Hampshire. He serves as founder and Director of its Water Systems Analysis Group. His research interests focus on the development of computer models and geospatial data sets used in synthesis studies of the interactions among the water cycle, climate, biogeochemistry and anthropogenic activities. His studies are built around local, regional, continental and global-scale modeling of water balance, discharge, constituent fluxes in river systems, and the analysis of the impacts of large-scale water engineering on the terrestrial water cycle.

Vörösmarty serves on several national and international panels, including the Arctic Research Consortium of the United States (ARCUS), the ARCSS Committee (AC), the Arctic HYDRA International Polar Year (IPY) Planning Team, and the Steering Committee of the newly formed Global Water System Project (as co-Chair). In the US, he served on a National Research Council (NRC) panel to review NASA's polar geophysical data sets and is co-Chair of the NSF-Arctic CHAMP hydrology initiative. The Water Systems Analysis Group serves as the Northern Eurasia Earth Science Partnership Initiative (NEESPI) Focus Research Center on Hydrology. He is also a Convening Lead Author on global fresh water resources for the recently completed Millennium Assessment. For the United Nations he served as consultant to the 24-agency UN World Water Assessment Programme and represented the International Council of Scientific Unions at recent UN Commission on Sustainable Development meetings.

On the educational front, **Vörösmarty** has brought to the classroom an innovative blending of research and formal instruction, including preparation of peer-reviewed publications (including to *AMBIO* and *Science*) by class members at the graduate level and hands-on hydrological modeling for undergraduates. Student advising is also central to his educational contributions.

Welcome to WHOI

Once USARC commissioners introduced themselves, **Jim Luyten**, acting president and director of the Woods Hole Oceanographic Institution (WHOI), welcomed the Commission and provided a brief history of WHOI and overview of the facilities. He emphasized the importance of long-term Arctic research programs in a funding climate that prizes short-term investment and instant payoff. Scientific results are continuing to flow out of the research pipeline from projects that were initiated as long as 30 years ago. However, newly funded projects are not replacing the previous initiatives, to the extent necessary, for it appears that the nation has lost some of its appetite for protracted research on natural system. He announced a \$10 million award recently conferred on WHOI by benefactors Jim and Ruth Clark to focus on Arctic research.

Chairman's Report

To be distributed at the 82nd Commission meeting in Anchorage.

Commissioners' Reports

Since the last Commission meeting, **Commissioner Susan Sugai** assisted in drafting **Commission Chair Mead Treadwell's** icebreaker and IPY congressional testimony.

Commissioner Vera Kingeekuk-Metcalf represented the Commission at the conference on wildlife biology in Anchorage in September. Presentations were made on climate change and the impact on Alaska, contaminants on marine mammal resources and effects on humans who consume these mammals. Erosion, induced by climate change, is also an issue. Indigenous hunters have had to go further into the ocean to find game, which causes a safety issue especially when they cross into Russian waters.

Metcalf asked about the impact the mapping initiative will have on native hunters. She also expressed concern about the loss of native languages. **Treadwell** noted that the Commission is interested in a variety of marine and terrestrial mapping efforts and has taken a hands-on position on marine safety issues through the multi-agency Notice to Mariners effort. He invited **Metcalf** to represent the Commission on the Working Group on Occurrence and Contaminant Selection.

Commissioner Michele Eder published an article in *National Fisherman* endorsing the Senate's ratification of the Law of the Sea treaty because it will benefit, among others, fisherman in the Bering Sea. She expressed concern regarding the pace of progress of US accession to the treaty.

Eder has participated in a variety of North Pacific Research Board (NPRB) activities and highlighted the release of a special request for proposals (RFP) for a Bering Sea Integrated Ecosystem Research Program (BSIERP) starting in 2007. BSIERP, which will be launched in partnership with a separate National Science Foundation (NSF) solicitation later this year regarding the 2005 Bering Ecosystem Study (BEST) Program, will help achieve NPRB's vision of building a clear understanding of the ecosystem that enables effective management and sustainable use of resources, in this case on the eastern Bering Sea shelf north of the Aleutians and south of St. Lawrence Island. This joint venture encourages widening the purview of the BEST program to include the Aleutian Islands, improving consistency in modeling efforts, greater funding of research platforms and a focus on applied sciences. This is just one of the 139 projects in several categories that NPRB has funded at a total of \$24M over the past few years.

Treadwell endorsed NPRB's role in this joint venture and encouraged greater NPRB leadership in interagency endeavors. He underscored Clarence Pautzke's efforts in NPRB's success.

Commissioner Thomas Royer, as part of the NPRB Science Panel, will, with other panel advisors, select one major program for the BSIERP program by mid-December. He serves on the ecosystem modeling committee, in support of the NPRB science advisory committee.

Royer reported on his resignation as chair from the Exxon Valdez Oil Spill (EVOS) Trustee Council's Gulf Ecosystem Monitoring Program (EVOS-GEM) because the program shifted away from supporting monitoring efforts that had included a continuous plankton recorder study and observations of thermal salinographs on a tanker. He wrote a piece in the *Anchorage Daily News* out of concern for the loss of monitoring in the EVOS program. Since his resignation, the trustees dissolved the science and technical committee and formed an *ad hoc* science committee that wrote a new science plan for FY07 containing one monitoring effort in Seward.

Commissioner Charles Vörösmarty discussed his role on the Commission and representing the voice of the academic community. Their concerns include the continuity of monitoring networks and making substantial investments in Arctic Observing Network (AON), IPY, and other programs, long-term, sustained commitments to infrastructure and collaboration between government agencies and private sector especially in light of the President's American Competitiveness Initiative. In May, as part of an ARCUS effort, **Vörösmarty** gave a presentation to 15 or 20 congressional staffers regarding the importance of integrated international networks explaining how the Arctic works as a system. The ARCUS group held a follow-up meeting with Sen. Lisa Murkowski and sent a letter to the Foreign Relations committee outlining the issue. He also facilitated a workshop on oil spills, sponsored by NOAA, which involved 35 experts from biology, toxicology, ecology, physical science and weather forecasters. That challenge was to get participants talking to one another, to devise a collective response to oil spills and to determine how to track the "insult" of a spill on the ecosystem. There is no consensus among these participants. The response and restoration communities need to come together.

Charles Abernathy, Associate Director of the Washington DC Office of the Governor of Alaska, asked for the Commission's help in locating external funding sources for Alaska terrestrial mapping. The state has struck out in trying to obtain Federal funding and the private sector has proprietary data issues for it envisions future marketing opportunities. \$2.7M of state funds have been allocated for mapping. Alaska representatives plan to meet with the state of Virginia that has had success in this type of endeavor.

Executive Director John Farrell provided a brief overview of his activities since the last meeting. In addition to overseeing the Commission's administrative matters, he attended several meetings with staff representing the Office of Naval Research, the State Department, Office of Management and Budget (OMB), Marine Mammal Commission, National Science Foundation (NSF), Office of Science and Technology Policy (OSTP), International Arctic Science Committee (IASC), and others. Farrell has also met with representatives of entities (e.g., Univ. Alaska, NIH/CDC) conducting research into Arctic-related human health issues including Karen Perdue, Jim Berner, Carl Hild, and Alan Parkinson. He worked with **Vörösmarty** and others to set-up a Union Session at the 2006 American Geophysical Union meeting. He met with Anders Karlqvist of the Swedish Polar Research Secretariat to learn more about their recent expedition to the Lomonosov Ridge. They discussed icebreakers (and particularly the chartering of *Oden* for NSF-sponsored activities), observatories and Sweden's research infrastructure. He learned that SNF has chartered the Swedish icebreaker *Oden* to assist with ice breaking activities in the Arctic.

Deputy Director Lawson Brigham served as a reviewer of the NAS icebreaker study. While the study is robust, one perceived weakness reported by **Brigham** is that the study did not catalog the polar icebreaking needs of the federal agencies beyond the US Coast Guard. Since the last meeting, **Brigham** has worked on North Pacific Research Board (NPRB), Alaska Ocean

Observing System (AOOS), and North Slope Science Initiative (NSSI) issues, focusing on sea ice and its retreat. He endorsed a comprehensive sea ice atlas suggesting that a federal agency should take responsibility to create the publication. He has traveled widely to Sweden, Russia and Finland in support of the **Arctic Marine Shipping Assessment** (AMSA). He also attended ICETECH '06. **Brigham** participated in a 2-hour teleconference last week with the Panama Canal Authority as Panama prepares for their referendum on widening the canal. They discussed the potential volume of trade and the need for a new set of locks—at a cost of \$6-8 billion—considering the northern passage impact.

WHOI

Larry Madin, a senior scientist in biological oceanography at WHOI, offered a brief overview of the Institution and its facilities and indicated an institution-wide growing interest in a coordinated Arctic research program. This interest was recently amplified thanks to an Arctic-specific \$10 million grant given by Hays and Rosamond Clark, longtime supporters of WHOI's work. The grant is meant to focus on effects of change in the oceanography and ecosystem of the Arctic in coordination with IPY activities and coupled with the acquisition of additional federal funds. An RFP was issued shortly after the Commission's meeting that asked the principal questions:

- What are the likely regional and global effects of changes in the Arctic on ocean circulation and climate?
- What are the likely implications of these changes on coastal processes, including river flows nutrient levels and erosions and sediment transport?
- What are the likely effects on fisheries and other ecosystems within and beyond the Arctic?

Commissioner Michele Eder asked about the specific industry sponsors WHOI is pursuing for funding. Madin said that WHOI has an office of applied oceanography to develop these opportunities that include oil offshore services, deep-sea mining among others.

Arctic Research Projects

Andrey Proshutinsky, Senior Scientist, Physical Oceanography, WHOI, and the Institute's Arctic Research Coordinator, discussed the major directions of WHOI's research that are fundamental studies of Arctic's atmosphere, sea ice, biology, water properties and circulation and geology. WHOI is developing and designing technology and instrumentation for Arctic Ocean observing. It is also fabricating and implementing field and numerical experiments for these research areas. Its focus is directed toward autonomous underwater vehicles (AUVs) because of the type of work and conditions inherent to Arctic research.

Current research projects include whale studies, an array of ice-tethered profilers (ITPs), hydrothermal vent exploration on the Gakkel Ridge using AUVs, fresh water flux, shelf-basin exchange, Arctic profiling floats, Arctic ocean boundary current, investigation of Arctic sea level rise and the Beaufort Gyre Exploration Project.

Proshutinsky noted that Arctic science is becoming a science of systems—it is evolving from studying particular system elements such as atmosphere, ice, ocean, and land to investigating systems of interacting parameters and systems of interacting processes. This evolution is driven in part by the increase of observational data spatial and temporal resolution and by developing of a new generation of the Arctic system models.

Royer asked why none of the sea level data used in his compilation came from North America. Proshutinsky said that the goal was to assess the rate of sea level rise, and the North American data set, which are no longer than 10-15 years, are inappropriate for his purpose.

Treadwell asked Proshutinsky to outline the needs to allow for improved Arctic research.

Proshutinsky said his primary concern was data and model integration, the availability of and access to data. He said while all models are ultimately “wrong,” they do provide useful information. Their development represents a high level of integration and synthesis. He also noted the need for reanalysis of the Arctic climate system to better understand processes in Arctic Ocean and innovative Arctic observation technology.

Ice-tethered Profilers

John Toole, Senior Scientist, Physical Oceanography, WHOI, takes ice-based observations to document and understand interannual changes through sustained observations of the polar ice pack, the overlying atmosphere, and upper ocean water properties. While ship-based human observations continue to this day, three ice-tethered profilers (ITPs) are also employed to measure real time data of the climate and ecosystem to gain long term measurements including: temperature, salinity and oxygen. They plan to add a fluorometer, ocean bottom seismometer (OBS) and other sensors. The ITP doesn't measure velocity or wind data.

Toole discussed the installation of the profilers and WHOI's goals for them in the future. The three ITPs are now in place north of Alaska in the Beaufort Gyre. Toole said they plan to deploy two additional ITPs in spring 2007 and have proposed continued installations at this level through the IPY period and beyond. They are hoping to collaborate with European and other investigators to field ITPs throughout the ice-covered Arctic. Scientific research using data recovered so far is already underway. Toole envisions the profilers to contribute to an Arctic-wide observing network.

Royer asked about the cost of a profiling float? Toole said the cost is about \$60K for two profiles a day.

Arctic Shelf-Basin Exchange

Robert Pickart, a Senior Scientist in physical oceanography at WHOI, discussed shelf basin exchange of waters in the western Arctic. He talked about storm impact (Pacific-origin and Arctic-origin) on the western Arctic margin and that the dynamics of the boundary current system in the Beaufort Sea are principally responsible for the shelf-basin exchange in the western Arctic. Pickart says there is a need to quantify this and address the role of ice cover in modulating the response. He also discussed the new technology that offers the opportunity to investigate the response over the entire shelf.

Pickart addressed the deployment of a high-resolution profiling mooring in the core of the Beaufort boundary current, approximately 150 kilometers east of Barrow Canyon in the Arctic Ocean. An array in this location is optimal, because it will measure the cumulative outflow of Pacific water from all three branches exiting the Chukchi Sea, where models and observations imply that a large offshore flux is taking place.

The four main objectives of the experiment are to

- quantify the mean and seasonally varying transport, structure and water mass content of the boundary current system downstream of the Chukchi Sea outflow points
- determine the nature and cause of the mesoscale variability of the boundary current, and assess the impact of the variability on the cross-stream exchange of mass and properties
- identify the dynamics of the secondary circulation

- elucidate the source of the interior eddies by comparing the seasonally changing boundary current water to the observed characteristics of the mid-basin eddy field.

Meeting these objectives will fundamentally advance understanding of the nature and cause of shelf-basin exchange in the Arctic Ocean and, thereby, elucidate how this high-latitude ocean will respond to variable climatic forcing.

Thorium-230 (^{230}Th) Deficit

Jerry McManus, Associate Scientist in marine geology and geophysics WHOI, discussed the potential for a Thorium-230 (^{230}Th) deficit in Arctic sediments. He asked how ^{230}Th behaves in the Arctic Ocean? Why is ^{230}Th an important research tool in terms of cycling of elements and paleoclimate studies? What were previous estimates of ^{230}Th inventories in Arctic sediments? What are the new estimates for ^{230}Th inventories in Arctic sediments?

His research suggested that the apparent deficit in Arctic sediments was not supported by his research results. A few studies from the 1960s - 1980s, using low-resolution sampling with little age control, suggested that the excess ^{230}Th measured in Arctic sediments was insufficient to balance the water column production. Sedimentation rates were thought to be on the scale of $\sim\text{mm/kyr}$. The excess ^{230}Th in the sediments was thought to balance only between two and 60 percent of water column ^{230}Th production at coring sites. This would imply that ^{230}Th is exported from the Central Arctic.

However, these conclusions were based on cores with no independent age measurements, and in which the full ^{230}Th inventory of the sites had not been measured. McManus reexamined published excess ^{230}Th data, combining these data with radiocarbon dates, to calculate new budgets of ^{230}Th and determine whether this geochemical tracer can be used in Arctic research.

He concluded that there is no Arctic sedimentary ^{230}Th deficit. When radiocarbon dates are used to interpret the ^{230}Th data, ^{230}Th inventories in Arctic sediments approach the amount of ^{230}Th produced in the water column during the period of sedimentation, especially for the current interglacial period.

Wind-Forced Flows

Terry Joyce, a Senior Scientist in physical oceanography at WHOI, discussed a model that looked into wind-forced flows in the Arctic Ocean, specifically around Greenland where ocean-plane dynamics are often ignored in simple models. In this model, the dynamics are central, and give a new twist to these wind-forced flows. From the model he concludes that:

- Wind-driven, frictional circum-Greenland ocean transport of several Sverdrups can be anticipated by the "Island Rule" applied to Greenland. This cyclonic circulation reduces the volume transport in the East Greenland Current and augments, if not totally explains, the net southward flow observed to the west of Greenland in Davis Strait.
- Interannual changes in wind stress associated with the Arctic Oscillation, are expected to produce large fluctuations and possibly reversals of this transport.
- This wind-driven flow can affect a large amount of the net liquid freshwater export from the Arctic with salty, North Atlantic inflow to the east and fresh, Arctic outflow to the west of Greenland.
- Inflow from Bering Strait augments this circum-Greenland flow due to pan-Arctic vorticity and mass transport balances, but is not the dominant driving force.
- Friction within the Canadian Archipelago substantially reduces the wind-driven transport, assuming that the mean transport predicted is that found in multi-year measurements in Davis Strait.

- Favorable comparisons can be made with a barotropic numerical model, although it is somewhat less sensitive to AO variations than our Island Rule model.
- Inflow of Atlantic Water into the Arctic Ocean is driven by the Island Rule – forced circulation – without it, Atlantic Water would re-circulate southward in the GIN seas.

Gakkel Ridge Vent Cruise

Rob Reeves-Sohn, an Associate Scientist in marine geology and geophysics at WHOI, discussed a 2007 expedition to Gakkel Ridge involving robotic exploration for deep-sea vent fields. The cruise will take place on the Swedish icebreaker, *Oden*.

Sohn and colleagues have designed and fabricated several new systems for the project including two new AUVs for Arctic applications, robotic manipulator w/ computer vision for JAGUAR AUV, wire line camera and sampling system. These will help explore the nine vent sites located to within ~2-5 km of the ridge, at least one vent site every 100 km.

Participants include representatives from the United States, Norway, Germany and Japan.

Chukchi Sea Level Rise

Lloyd Keigwin, a Senior Scientist in marine geology and geophysics at WHOI, discussed deglaciation, after the last ice age, and associated sea level rise on the Chukchi Shelf and Slope. Three new sediment cores from the Chukchi Sea reveal localized sedimentation and flooding of the Chukchi Shelf by sea-level rise. Radiocarbon dates on foraminifera provide the first marine evidence that the sea entered Hope Valley, southeastern Chukchi Shelf, as early as 12 ka. The lack of significant sediment buildup since 7 ka in Hope Valley is consistent with decreased sediment and fluvial discharge to the shelf as deglaciation of Alaska ended. These results show that carefully selected core sites from the western Arctic Ocean can be similar chronologically to cores from other regions and that they allow for high-resolution studies. Keigwin's results were published in a recent issue of *Geology*.

Polar Profiling Floats

Breck Owens spoke about the development and field testing of autonomous polar profiling floats (PPFs) where the goal is to modify profiling floats that have been successfully used at temperate latitudes, such as those used for the Argo float program, in polar oceans. This will enable Owens to monitor the temperature and salinity of the upper 2000 m of the Arctic Ocean. The process would involve repeated search for open water (leads) at surface as well as from 50 m. Time between surfacing is programmable and could be as little as five days or once a year. The data resolution is comparable to ship-borne instruments.

The float design is same as that for Argo floats and has a five-year lifetime and profile to 2000 meters. The communications system uses an Iridium satellite phone system with higher data rate and two-way communications. A global positioning system (GPS) is used for positioning the float. Ranging And Fixing Of Sound instrument (RAFOS) floats use moored acoustic beacons with acoustic receivers. Systems exist for regional tracking—a basin scale system for medium ranges can be achieved immediately but basin-scale for longer ranges are likely to take many years to achieve. For transferring data to shore from beneath ice-covered regions, the system needs to be simple, reliable and relatively inexpensive and requires small modifications to existing float design.

Amore Cruise

Henry Dick, a Senior Scientist in marine geology and geophysics at WHOI, discussed the findings of the Arctic Mid-Ocean Ridge Expedition (AMORE), a nine-week cruise involving Germany's research icebreaker *RV Polarstern* and the U.S. research icebreaker *USCGC Healy* on

its maiden scientific voyage. From the end of July until early October, 2001, the expedition was undertaken to map and sample the Gakkel Ridge and its surrounding basins.

Among other important milestones from the cruise, scientists discovered an as yet unexplained "discontinuity" of volcanic activity along the Gakkel Ridge. Because the southern end of the ridge is spreading relatively quickly and the northern end extremely slowly, the researchers expected volcanic activity to gradually die out as they sailed north. Instead, there were irregular pockets of activity as the cruise moved northwards. The ridge changes dramatically where normal troughs turn into mantle.

They said they were also pleased to discover that they were able to map the ridge in great detail from the *Healy* because the vessel was much quieter than expected when breaking ice.

Dick said the Gakkel Ridge is completely unexplored on the northeastern side and that Japan, Germany, Russia and the US endorse another cruise to explore the area with three or four ships.

Alaska Regional Research Vessel

Rear Admiral Richard Pittenger (ret.) discussed the Alaska Regional Research Vessel (ARRV) design and the need for it to be substantial enough to accommodate Norwegian and Arctic seas. The ship is very robust for its size, has a full compliment of ice going features: sea keeping ability, shallow draft, retractable centerboard, fisheries capability and disability access throughout the vessel. Research opportunities on the ship could accommodate studies concerning Arctic Ocean influences on oceanic and atmospheric circulation, high productivity of Alaskan continental shelves, marine geological studies, increasing anthropogenic contaminants and native subsistence. Pittenger said the search continues for an operator and builder whom he expects will be located in Alaska.

Commissioner Metcalf asked about the cost and construction timeframe. Pittenger said the cost to build would be approximately \$100 million over three years. He believes the ship could well be over-subscribed.

Using HROVs in the Deep Arctic

Pittenger also discussed the Hybrid Remotely Operated Vehicle, or HROV, which will be able to work in the deepest parts of the ocean, from 6,500 meters to 11,000 meters (21,500 feet to 36,000 feet), a depth currently unreachable for routine ocean research. Scientists also plan to use HROV, named *Nereus* to explore remote, difficult-to-reach areas, including under the Arctic ice cap. Engineers and ship's crew will be able to transform *Nereus* from a free-swimming vehicle for wide-area ocean surveys to a vehicle tethered by a cable to a surface ship that can be used for or close-up investigation and sampling of seafloor rocks and organisms. The transformation will take 6 to 8 hours and happen on the ship's deck.

The \$5-million, battery-operated vehicle will be the first ever designed to transform from a guided, tethered robot to a free-swimming vehicle. Each capability offers advantages to deep-sea researchers. In its autonomous mode, the vehicle will be able to fly on pre-programmed missions over swaths of ocean bottom to map the seafloor, to gather remote data, or to search for scientific targets such as hydrothermal vents.

In its tethered mode, it will remain connected via a hair-thin, 25-mile long cable that will enable scientists on the surface ship to send instant commands to the mechanical arm, used for gathering samples of interesting undersea rocks and organisms.

Sea trials will take place offshore Woods Hole in early 2007, and scientists will plan to use it for research later that year at Challenger Deep, a trench in the Pacific Ocean southwest of

Guam. It is the deepest area of any ocean, deeper than Mount Everest is high, extending almost 11,000 meters (36,000 feet) beneath the sea surface.

Studying Balaenid Whales

Michael Moore, a Senior Research biologist at WHOI, studies Arctic and Sub-Arctic Balaenid whale populations and their viability in the region to determine whale mortality. As the result of archeological digs, he and his colleagues extract DNA samples from bone samples—much of which was obtained from Red Bay in Labrador, Newfoundland. Moore stressed the need to import techniques from Inuit whalers as well as acquiring baseline conservation biology data as Arctic industrialization accelerates with climate change.

As commerce expands in the Arctic through shipping and fisheries activity, Moore expects whale morbidity to increase as the result of chronic line entanglement, blunt and sharp ship trauma and noise accompanying seismic surveys. To combat the damage, Moore recommends speed restriction to 10-12 knots, at most, is preferable. He suggested organizing fisheries in such a ways to manage the way the equipment is used in the water. He asked the Commission's help in encouraging the renewal of the Marine Mammal Protection Act.

Bowhead Whale Concentration in Barrow Area

Carin Ashjian, an Associate Scientist in biology at WHOI, discussed environmental variability, Bowhead whale distributions, and Iñupiat subsistence whaling. Bowhead whales are found during fall on the northern Alaska shelf near communities such as Barrow and are hunted there. All villages depend on subsistence hunting of marine mammals to obtain at least part of their food supply. Archaeological evidence shows that whaling has been a way of life for coastal Arctic peoples for centuries. Whaling is an intrinsic part of the Iñupiat culture.

Her research focuses on why bowhead whales stop at Barrow during their migration and the impact of dense zooplankton patches that form there during the fall. She also wants to describe the oceanographic conditions that make Barrow a good place for food, understand how climate variability might change the locations of good feeding spots when the whales are near Barrow and also to understand how these changes may impact whaling success and hence the whaling tradition in the Northern Alaska coastal communities. They are using physical and biological modeling, field sampling, interviews and retrospective analysis to help reach conclusions.

She has found that Barrow is extremely dynamic, with short-term variability driven by the wind. The location has considerable interannual and shorter-term variability. There is also good agreement between ship-based observations and local knowledge.

Poster Session

The sessions were followed by a period for poster review. Those posters presented included:

- Paleoclimate Synthesis to Reconstruct the Average Temperature Over 200 Years –Show Temperature and Arctic Oscillation and the Relationship Between the Two
- Unmanned Aircraft Systems in the Arctic
- Cross-Shelf Transects Offshore of Barrow, Alaska Using the EMUS AUV
- Upper Ocean Observations from Ice-Anchored Buoys
- Eddies in Canadian Basin, Arctic Ocean, Observed from Ice-Tethered Profilers
- Investigation Of the Beaufort Gyre Freshwater Reservoir and Its Role in Arctic Climate Variability
- Variability in Summer Arctic Temperature and Arctic Oscillation Over the Past 600 Years

October 11, 2006

Marine Biological Lab

Senior Scholar, John Hobbie, Marine Biological Laboratory (MBL), provided a brief overview of MBL—their facilities, expertise and educational outreach. Every summer, hundreds of biologists arrive in Woods Hole with their graduate students and technicians, their equipment, their ideas and their passion to learn from each other. They find a scientific community that allows them to launch into research almost immediately upon their arrival. Research includes: cellular, developmental, and reproductive biology; molecular biology and evolution; population genetics and sensory biology; ecology and ecosystems studies; global infectious diseases; and marine biotechnology and aquaculture.

Free from academic duties at their home institutions, some veteran summer scientists report they do more hands-on research in three months at the MBL than they do during the rest of the year at their home institutions. During a typical MBL summer, researchers look for basic principals of life in organisms from *Aplysia* to Zebrafish (and, now, canaries and mice). They ask how nerve cells communicate, how cells regulate their complex processes, and how they proliferate. These investigators bring a diversity of approaches and questions enriching MBL, the largest and biological laboratory in the world.

MBL is the home to the Bay Paul Center, a program in microbial diversity, The Ecosystem Centers, whose mission is to investigate the structure and functioning of ecological systems, predict their response to changing environmental conditions and apply the resulting knowledge to the preservation and management of natural resources. MBL also strives to educate both future scientists and concerned citizens and the U.S. Long Term Ecological Research Program (LTER) which focuses on experiments and models related to tundra.

Student Research Partners

R. Max Holmes, Woods Hole Research Center (WHRC), after providing Commissioners with an overview of Arctic-related research conducted at the WHRC, discussed the Student-Partners Project: A Pan-Arctic Science and Education Collaboration. The project began with one student who helped collect samples of river water from the Lena River and define the water's chemistry to study the Arctic hydrologic cycle. She helped to chemically fingerprint rivers to trace freshwater circulation through Arctic Ocean, investigate watershed hydrology and biogeochemistry and establish current chemical fluxes in order to detect future changes. From one student's participation, the project has grown to include several students from her school. Holmes is trying to get the same student effort started for trips to the Yenisey, Ob', Kolyma, Yukon and MacKenzie rivers. He is trying to establish the same program in the US in Vermont and Massachusetts.

Determining the Carbon Balance of Systems

Gus Shaver, the Ecosystems Center, MBL, discussed climate change and ecosystem response at Toolik Lake in reference to scaling up to the Pan Arctic region. He said that the problem with scaling is that there are very different kinds of vegetation. Tundra ecosystems, for instance, vary greatly in their carbon stocks and turnover rates, both locally and across the Arctic. Local variation at one site, Toolik Lake, Alaska, is representative of much of the low Arctic. In addition, Shaver said that whole-canopy photosynthesis varies widely among vegetation types and throughout the growing season.

Shaver questioned whether in order to understand controls over carbon fluxes at the Pan Arctic scale, must we define these controls separately for each vegetation type. He discussed the normalized difference vegetation index (NDVI) as a good predictor of leaf area in tundra vegetation. Leaf area alone explains 80 percent of the variation in canopy photosynthesis among diverse low Arctic ecosystems. Shaver wants to make comparisons with similar ecosystems in other parts of the Arctic. His work demonstrates that experimental plots in Alaska

show the same relationships between photosynthesis, NDVI, and leaf area as diverse tundra types in Scandinavia. This was determined through cross-site modeling. Shaver concluded that getting together time series data, scaling ideas and Holmes' partners projects would put them in a position to bring some of these pieces together and get solid picture of Pan Arctic biogeophysical changes for a comprehensive comparison.

Spatial-Temporal Projections

Ed Rastetter, senior scientist, MBL, discussed the carbon budget for the Kuparuk River basin on the North Slope of Alaska between 1920-2100. He wants to quantify carbon in the landscape and determine how to make comparisons. In order to do that, Rastetter and colleagues prepared a process-based ecosystem model calibrated to plot-scale data and applied that to represent each 10km x 10km pixel as if it were homogeneous. By comparing data for temperature, irradiance, vegetation index and land cover, they were able to come up with a map rate of carbon exchange and photosynthesis measurements. He also discussed how nitrogen can be determined similarly. One has to know how the hillside works in order to understand how the Arctic stores carbon. Down-slope movement of water and nitrogen result in different responses along the hill slope to changes in CO₂ and climate.

Vörösmarty asked how long it would take using these small scale models to sufficiently get data that could address the national discussion about what to do with carbon. Rastetter said five-years of funding and a good team. John Hobbie agreed to work with **Vörösmarty** on a scaling report before the next Commission meeting.

Patrolling for Icebergs

Commander Mike Hicks, International Ice Patrol (IIP), gave an operational talk discussing the origins of the IIP and a general overview of its functions and responsibilities. IIP's core purpose is to promote safe navigation in the northwest Atlantic Ocean when danger of iceberg collision exists, monitor iceberg danger and provide the limit of all known ice to the maritime community.

IIP was formed after the *Titanic* sunk. It is still in force because of the continuing risk of iceberg collision, the most recent July 2006. Icebergs calf from west coast of Greenland and then work their way into the North Atlantic shipping lanes. Seventeen countries are involved governance process. However, no icebergs south of 48N degrees were found last year.

The Coast Guard has established drivers for change to guide its future efforts. They looked at climate which helps determine continued iceberg threats and future shipping lanes. Technology is considered when determining the best options for reconnaissance: aircraft or satellites and deterioration models. They also look at the USCG's own resources to ensure that the C130s are fully engaged.

Hicks thinks that satellite-borne Synthetic Aperture Radar is IIP's future. These are more cost effective and are not limited by weather (except sea state). Additional funding is needed, however, to effectively use new technologies.

The Commission then heard from three attendees: Arthur Gaines, who was asked to submit a letter to **Treadwell** explaining the proposed Marine Policy Workshop on the Arctic. The Commissioners would then consider the letter request; Betsy Weatherhead, University of Colorado who led a brief discussion on the uses and advantages of Unmanned Aircraft Systems (UAS) and Jerry Brown, who also provided a brief overview of IPY research related to permafrost.

Prior to adjourning the meeting, Commissioners discussed a schedule surrounding the release of the goals report and upcoming meetings for 2007 and 2008.

**US ARCTIC RESEARCH COMMISSION
82ND MEETING
22-25 January 2007
Anchorage, Alaska**

In attendance:

Commissioners

**Mr. Mead Treadwell, Chairman
Mrs. Michele Eder
Mrs. Vera Kingeekuk-Metcalf**

**Dr. Thomas C. Royer
Dr. Susan Sugai
Dr. Charles Vörösmarty**

Staff

Dr. John Farrell, Executive Director

**Dr. Lawrence Brigham, Alaska Office
Director/ Deputy Executive Director**

Attendees

Denis Wiesenburg, UAF; Steve Jones, UAF; Ross Coen, ARCUS; Phil Mundy, NOAA; Bernard Zak, Sandia Labs; Michael Faust, Conoco Phillips; Sherron Perry, Fairweather Inc., Betsy Weatherhead, CIRES

January 24, 2007

Mead Treadwell, Chair of the US Arctic Research Commission, called the meeting to order and the Commission approved the meeting agenda. **Treadwell** introduced **Fae Korsmo**, staff associate, National Science Foundation (NSF), who offered some brief remarks about her role within the agency's Office of Polar Programs, specifically as it relates to the Interagency Arctic Research Policy Committee (IARPC) and the International Polar Year (IPY).

University of Alaska Fairbanks

Steve Jones, Chancellor of University of Alaska Fairbanks (UAF), addressed the Commission, pairing UAF's strengths with the work of the Commission. He identified several research infrastructure matters important to UAF including the Alaska Region Research Vessel, (ARRV), Toolik Lake, other existing marine and terrestrial programs, Specialized Neuroscience Research Program (SNRP), National Undersea Research Program (NURP), Bering Icefield Research Program (BIRP) and the Juneau Icefield Research Program (JIRP).

As America's only "Arctic University," Jones wants UAF to be the "go to" university for Arctic research in partnership with others, to be recognized for its accomplishments, its strong academic teams, and its broadening funding sources. He emphasized that UAF is defined by place more than other university in nation because the research it does locally could not be carried out in the lower 48. Several programs of distinction, for instance, include climate change, native peoples, fisheries and ocean sciences, atmospheric science and environmental sciences. The school is also emerging as a leader in Arctic human health research. Commissioners discussed International Arctic Research Center (IARC) and its future with the impending departure of Syun-Ichi Akasofu. **Treadwell** suggested making Akasofu an advisor to the commission.

Commissioner Vera Metcalf endorsed collaboration—engaging rural campuses and a potential linkage with shared research initiatives. In other words, bridging the university with the bush.

Denis Wiesenburg, Dean, School of Fisheries and Ocean Sciences, UAF, described the breadth of UAF's educational outreach which includes Institute of Marine Science, Fisheries Division and the Alaska Sea Grant in Fairbanks, Seward Marine Center and Alaska Sealife Center in Seward, Fisheries Division in Juneau, Marine Advisory Program (MAP) Main Office in Anchorage and the Fishery Industrial Technology Center (FITC) in Kodiak.

In addition to the quality of students UAF attracts, and its growing funding sources, Wiesenburg discussed the school's major research programs including Coastal Marine Institute (CMI), Pollock Conservation Cooperative Research Center (PCCRC), West Coast & Polar Regions Undersea Research Center (WCPRURC) and Rasmuson Fisheries Research Center (RFRC). It is also actively pursuing the following major initiatives:

- Census of Marine Life (CoML)
- Arctic Ocean Diversity (ArcOD)
- The Sea-Air-Land Modeling and Observing Network (SALMON)
- ADF&G Marine Mammal Coop Steller sea lions
- Virtual Tsunami

In the coming months and years, UAF plans to add 15 faculty in 2007-2008, complete the Lena Point Fisheries Facility in Juneau, place MAP agents in additional coastal

locations, accomplish major initiative in ocean observing in partnership with Alaska Ocean Observing System, conduct new studies in the Bering Sea that are funded by NSF and NPRB, upgrade its Undergraduate Fisheries degree and continue advocating for the Alaska Region Research Vessel (ARRV) and solutions to their current docking problems. Wiesenburg believes that the proposal the school submitted, in conjunction with Glisten Associates, to serve as builder and operator will stand above other proposals.

Phil Mundy, Director, NOAA's Auke Bay Laboratories (ABL), discussed the Alaska Fisheries Science Center's four labs that conduct scientific research on fish stocks, fish habitats, and the chemistry of marine environments. The fishing industry and several government agencies utilize the data collected at the lab. In addition to its headquarters located at Auke Bay, north of Juneau, the ABL comprises three other facilities located at Auke Creek, Little Port Walter, and downtown Juneau. In 2007, the headquarters of the Auke Bay Laboratories will move to the newly opened Ted Stevens Marine Research Institute, an office and laboratory building. The present headquarters site will serve as ABL's primary dive and dock facility. <http://www.fakr.noaa.gov/lana/default.htm>

ABL packages its marine survey data on Rockfish, Sablefish, Salmon, Pollack, plankton, Steller sea lions, and Harbor seals for use by the fishing industry, state and federal regulators, and international treaty bodies. ABL's data also provide information related to fish concentrations, marine ecosystem pollutants, and the structure and functioning of marine food webs. ABL is organized into the four major research programs: marine salmon interactions, marine ecology and stock assessment, ocean carrying capacity, and habitat assessment and marine chemistry. There is an international effort involving the Japanese and Russians.

The Commissioners discussed North Pacific Research Board's (NPRB) role in funding ABL's research in place of Federal funding. Mundy said it is a struggle every year to fund long-term funding surveys. They are vigilant to limit NPRB's role in favor of Congressional funding.

John Madden, Deputy Director for Homeland Security, state of Alaska, discussed the primary foci of the Division of Homeland Security and Emergency Management's (DHS&EM) use of unmanned aerial vehicles (AUVs)—science, safety and security. Madden suggested the Alaska could be a great test bed for this technology. He discussed the many opportunities AUVs could afford to the state and the country overall by inaugurating this science in a secure manner. One flight could incorporate several missions or a coalition of AUVs could add to the research potential.

AUVs have a high potential to achieve mission success that would meet the needs of many institutions. Alaska has the highest chance of attainment since its low population provides the lowest risk to people. The key problem is to balance privacy, safety and national and international interests with civil liberties. The technology for these types of flights exists but governance does not; largely the result of privacy concerns because of the proximity of the AUVs to the ground, sometimes flying as low as 150 feet above terra firma. It would take cooperation between government and other interested parties to ensure a harmonious use of the technology. Senator Stevens is very interested in having testing and building of them in Alaska and wants the state to take lead.

Its uses are broad, however, including search and rescue, non-intrusive wildlife monitoring and resulting surveys as well as weather prediction.

The Commissioners then discussed variations in needs of planes and what is the best environment to make them work most effectively.

Betsy Weatherhead, Cooperative Institute for Research in Environmental Sciences, University of Colorado, discussed unmanned aircrafts systems (UAS) and their abilities to pinpoint changes and make short or long-term predictions about conditions in Alaska. The technology could help counter inadequate monitoring of Arctic sea ice, Alaska's coasts and marine sanctuaries, search and rescue activities, monitoring of the Alaska pipeline, homeland security, pollution, mapping and fisheries enforcement. The vast area that makes up Alaska is so large and geographically diverse that a UAS would greatly increase the knowledge of what is happening in these sanctuaries. Long migration paths can require long-range monitoring capabilities.

A large number of entrepreneurial efforts are underway to develop new unmanned aircrafts. Size varies from less than two feet wingspan to adapting ten passenger jets. Different scientific questions require different requirements.

- high altitude—long endurance
- low altitude—ability to “see” the surface

Global monitoring with UAS can supply *in situ* measurements to aid satellite and ground based observations. Some UAS's have already been used and are being used in the Arctic and elsewhere. NOAA, NASA and DOE are looking at three critical areas as potential test areas: Arctic, Pacific (Hawaii), hurricane regions.

There is a void between satellites and surface-based sensors and UAS's have great potential to fill this void and take observations to complement our existing platforms.

The meeting was adjourned until Thursday, January 25, when the Commission met with Jim Berner, Director of Community Health, Alaska Native Tribal Health Consortium, and other Consortium representatives about Arctic health research. An afternoon site visit was held at Elmendorf Air Force Base where Commissioners exchanged views with a team of military personnel, headed by Lieutenant General Douglas Fraser, regarding military missions and operations underway in Alaska and throughout the Arctic. The meeting was then formally adjourned.

A Commission retreat was held on Friday, January 26 to discuss a variety of internal-Commission activities, actions and objectives.

Memorandum – January 22, 2007

To: USARC Commissioners

From: Mead Treadwell, Chair

Subject: Chair's Report, January 23, 2007

Since our last meeting at Woods Hole, I have the following items to report to the Commission:

- A. Trips taken on behalf of the Commission, or in which Commission business was done
 - B. Meetings taken on behalf of the Commission
 - C. Correspondence
 - D. Status of issues
 - E. Recommendations for action
 - F. Upcoming events
- A. Trips taken on behalf of the Commission
- Ottawa, with John Farrell, to meet w/Canadian Polar Commission and speak to Association of Canadian Universities in Northern Studies Annual Meeting, meet with Alan Kessel, Legal Adviser, Kenneth Wong in the Oceans Law Section, and Robert Kadas, Deputy Director for Circumpolar Affairs at Canada's Ministry of Foreign Affairs and International Trade re extended Continental Shelf issues, meet with U.S. Ambassador David Wilkins and Embassy officials Brian Mohler, Minister Counselor for Economic Affairs, Nancy Nelson, Environment and Fisheries Officer, and Lonzell (Bud) Lockyear, specialist in Environment, Science and Technology, UNEP GRID Arendahl Representative John Crump, and Yukon Representative to Parliament Larry Bagnell, October 18-20
 - Tacoma, October 24, to address the Port of Tacoma Alaska Conference
 - Washington, DC, to meet with DOE Undersecretary David Garman, Congressional Staff Steve Wackowski, Tod Bertosen of Sen. Stevens Commerce Committee staff and John Dodson of Sen. Murkowski's staff, OMB Staff, White House Science Advisor John Marburger, IARPC Chair/NSF Director Dr. Arden Bement, Office of Polar Programs staff, Martin Jeffries re AON, Coast Guard Commandant Allen, Representative of Russian Duma Vice-Chair Chillingarov w/Comm. Vorosmarty, Iridium senior officials, State Department officials, Former USARC Commissioner and Univ. of Akron President Luis Proenza, meeting of the Council on Competitiveness, meeting of the Polar Research Board, meet Bruce Molnia, USGS, re Civil Applications Committee and digital mapping. October 18, November 12-16, and December 5-8.
 - Fairbanks, December 4, to meet International Arctic Research Center leaders Syun Akasofu and Larry Hinzman, UA Vice President for Research Craig Dorman, and IAB's Brian Barnes; attend the swearing in of Governor Sarah Palin.
 - San Francisco, to attend the meeting of the American Geophysical Union, with Commissioner Vorosmarty, John Farrell, and Kathy Farrow, Meeting on NSF Ice Camp, meeting with Pete Worden, head of NASA Ames Research Ctr., December 9-11.
 - Seattle, to join the meeting of the Arctic Marine Transport Working Group chaired by Commissioner Laible, January 17-19.

For Commissioner's information, the Tacoma trip and one of the Washington trips, all or part of travel and lodging expenses were paid by outside sources.

- B. Meetings taken on behalf of the Commission
- Mike Sfraga, UA, October 23, re Association of American Geographers panel April 19-20, 2007.
 - Former Alyeska Pipeline Chief David Wight, re gas to Toolik Lake, Oct. 23

- Canadian Consul Karen Matthias and Rudy Brueggemann, on return from Ottawa, October 25.
- Conference call with Newton, Farrell, Coakley, and Mayer re ECS Mapping, October 26
- Telephone conversation with Glenn Sheehan, BASC, re goals report
- Meet with Hans Neidig, Department of Interior, Office of the Secretary, October 31, USARC brief, discussion of issues with Interior, including extended continental shelf, USGS mapping, NSSI funding, infrastructure research, resource assessment, participation in SEARCH, Arctic Council. Discussion of DOI workshop in Barrow in February with Mayor Itta; ways to get various agencies working on oil spill issues there.
- Meeting with UA Dean Thomas Case on Arctic Transportation; Airships
- Alaska Congressman Don Young, re Coast Guard icebreaker, oceans research and staffer John Rayfield; November 2 and 7.
- Governor-elect Sarah Palin, congratulations and discussion re research policy during Challenger Center Event, November 10.
- General Fraser, Alaska Command, with Lawson Brigham, November 17, re USARC January meeting
- Molly McCammon, Alaska Ocean Observing System, re AON and AOOS, November 17
- Bob Curtiss Johnson, Anchorage film preservation expert, re indigenous language preservation, November 20.
- Mark Hamilton, UA President, Speech to Commonwealth North, November 20
- Alice Rogoff, Alaska Native Arts Foundation, November 30
- Arctic Science Summit Week Planning Conferences, December 4 and thereafter
- David Monsma, Aspen Institute, re Arctic Policy and IPY
- Email interview with Andrew Revkin, New York Times, re study related to thinning Arctic ocean ice.
- Meet Japan's Ministry of Foreign Affairs, Taka Mori, director of First North American Division, with Consul Yoshio Uchiyama, to discuss U.S. Japan cooperation, December 13.
- Arctic Eskimo Walrus Commission, presentation for USARC with Commissioner Metcalf, December 14
- Dr. Al Wong, UCLA Physics and HIPAS Director, December 16, re Space Weather and Arctic Pipeline corrosion
- Telephone interview (live) with Canadian Broadcasting Corporation show "The Current," re Arctic shipping, January 4.
- Lunch with Federal Coordinator, Alaska Natural Gas Pipeline Project Drue Pearce and Administrator, Pipeline and Hazardous Materials Safety Administration (DOT) Thomas J. Barrett, January 10, re oil spill research and space weather research
- Frank McQueary, Steve Colligan (ETerra) and Nicholas Mastrodicasa, (Alaska Dept. of Military and Veterans Affairs) re Alaska Digital Mapping Initiative, January 11.
- Vera Alexander, Wendy Warnick, Public Policy Committee of ARCUS, conference call January 11.
- General Craig Campbell, head of Alaska National Guard and Commissioner, Department of Military and Veterans Affairs, re polar icebreakers and digital mapping initiative, January 12.
- Alaska Cold Regions Engineering Conference, panelist on Climate Change Policy, University of Alaska, January 12
- Dinner with Canadian Consul General for Pacific Northwest Peter Lloyd, January 19
- Speaker, Alaska Marine Science Symposium, January 20.
- Telephone conversation and follow up email, Ragnur Baldursson, Icelandic Ministry of Foreign Affairs, January 23
- Telephone Conversation, Kathie Olson, Deputy Director NSF, re IPY Kickoff scheduled 26 February at National Academy

C. Correspondence of note

- Letter to VADM Conrad Lautenbacher, NOAA Administrator, regarding State of the Arctic Report, November 29
- Letter to Dr. Arden Bement, re IARPC activities, December 6
- Letter to ADF&G Commissioner McKie Campbell re goals report, polar bear listing, December 15
- Letters to Senator Stevens, Senator Murkowski, Congressman Young re IPY and budget issues, December
- Letter to OMB Chief Rob Portman, re IPY and budget issues, December
- Stevens letter to White House Chief of Staff re IPY and budget issues
- Stevens letter to US Navy
- Letter to Ambassador David Wilkins, Ottawa
- Email exchange with Julie Gourley, Senior Arctic Official, following Arctic Council Ministerial, October 29
- (Pending) Letter to Canadian Polar Commission
- (Pending) Letter to NSC re Arctic Policy
- Letters to Governor Palin re Digital Mapping, January 15, 2007 and request for USARC liaison, November 29
- Former Japanese Foreign Minister Machimura, January 15
- Murkowski, re confirmation of John Negroponte as Dep. Sec'y of State, January 9

D. Status of Issues

- Personnel Committee – to be discussed in Executive Session
- Budget Committee – Dr. Farrell will discuss effect of continuing resolution on USARC
- IPY Budget Correspondence – Received by White House; no formal response. Current situation with NOAA, NSF, NASA is very difficult for '07 activity, ARRV, AON, RUSALCA are key examples.
- Arctic Research and Policy Act – amendments being introduced by Murkowski
- Law of the Sea Ratification – Administration support there; calendar uncertain
- Extended Continental Shelf Mapping – traction, may be seen in '08 budget proposal; interest in Canada continues on cooperation
- Icebreaker replacement – discussion with Commandant Allen re next step; tie to Arctic Policy; Commission push for \$1 million planning grant has been presented to OMB, White House chief by Stevens, OSTP discussion.
- Arctic Policy – indications a process is beginning soon. OSTP suggests contact with NSC.
- Canadian Polar Commission: Four areas of proposed cooperation needs USARC approval:
 - Fostering a discussion between technical experts on Arctic Ocean mapping (we are encouraging this to happen at UNH in the margins of Arctic Science Summit Week next spring.)
 - Fostering an international discussion on legal regimes that might become a legacy of IPY (the Canadians, urged by their Commissioner Ron McNab wanted something parallel to an Antarctic treaty; we responded that a shipping harmonization regime, also coming after the Arctic Marine Shipping Assessment, might be more appropriate. In fostering this discussion, along the lines of policy research, both Commissions are cognizant of the fact they would be far ahead of their governments. We will be in touch with the folks at Woods Hole about that perhaps being the venue for the discussion, along the lines of the Marine Policy Conference that was discussed, but I am open as always to Commissioner's suggestions on this one.
 - Working in parallel, with each of our national governments, to see that the Arctic Observing Network is designed with clear objectives and milestones in mind, and that a regular international process of reviewing our progress is established.

- Working in parallel, with each of our national governments, to review the state of Arctic research infrastructure and to look at further cooperation in meeting overall scientific objectives. Peter Johnson, known to many of us, is leading this work in Canada and working with the Defense Science Board.
- Arctic Council: Norwegian agenda to become more evident. Urging US support for Arctic Marine Shipping Assessment
- Digital Mapping: MOA between UA and State of Alaska; need for federal support
- Shipping Study: Good draft report for circulation to Commissioners; need input
- IARC/Fairbanks: Commission resolution of thanks re Dr. Akasofu is in order
- IARPC: Delighted with Bement/OPP appointment of Fae Korsmo; joint work underway
- Toolik Lake Gas: LNG may be possible trucked from North Slope; briefed UAF on other strategies identified by David Wight.
- Oil Spill Research revamp: discussions with Coast Guard, OSRI, Interior, Barrett, Pearce, OMB. We need to push further on this one.
- Iridium Workshop: document posted on ftp site; ready to release to public
- Arctic Science Summit Week – have served on planning committee with George Newton, others.

E. Recommendations for action

- Letter to Canadian Polar Commission
- Sort out Commission event sponsorship policy
- Hire a budget analyst
- Contract to allow more flexible writing, publication support for John, Lawson, Kathy
- Discuss changes in USARC legislation
- IPY Press tour and events
- Shipping study release schedule
- Goals report release and briefing schedule
- Japan trip dates need to be firmed up
- April Meeting Focus
 - IARPC Seniors
 - Identify agency leaders for elements of Arctic Research Plan
 - NOAA/NASA
 - Congressional brief
 - Work with State of Alaska

F. Upcoming Events

- New Orleans Pipeline Safety Conference, February 7 (FYI)
- Alaska Conference on the Environment, February 11 week
- Finland Embassy Dinner, February 13
- IARC Dinner, February 19
- IARPC staff meeting potential that week
- Visit to Juneau, to be scheduled
- National Ice Center visit, February 21
- National IPY Kickoff, February 26
- MT speech to Anchorage Rotary, March 6
- Arctic Science Summit Week, March 14
- Iceland Shipping Conference, March 28
- AMSA Scenarios Conference, early April
- Arctic Council Senior Arctic Officials, Tromso
- Association of American Geographers, April 19-20

**US ARCTIC RESEARCH COMMISSION
83rd MEETING
16-17 April 2007
Smithsonian Institution Castle Building
Russell Senate Office Building, Indian Affairs Hearing Room
Washington, DC**

In attendance:

Commissioners

**Mr. Mead Treadwell, Chairman
Mrs. Michele Eder
Mrs. Vera Kingeekuk-Metcalf
Mr. Duane Laible**

**Dr. Thomas C. Royer
Dr. Susan Sugai
Dr. Charles Vörösmarty**

Staff

**Dr. John Farrell, Executive Director
Kathy Farrow, Communications**

Dr. Lawson Brigham, Deputy Director

Attendees

Jon Berkson, USCG; Heather Brandon, State of Alaska; John Calder, NOAA; Art Charo, NRC; Paulo Clement-Colon, NIC; Chris Elfring, National Academy of Science; Bill Fitzhugh, Smithsonian; Arne Fuglvog, Sen. Murkowski; Joseph Geldhof, Marine Engineers Beneficial Association; Maggie Hays, State Department; Berit Johne, Norwegian Embassy; Rajiv Khandpur, USCG; Igor Krupnik, Smithsonian; Marya Levintova, HIH/FIC; George Newton, USARC; Steve Norquist, USCG; Boris Populoh, Marine Digest and Cargo Business News; Bernard Sandy, USCG; Mike Simpkins, MMC; Joel Southern, Alaska Public Radio Network; Rick Spinrad, NOAA; Cory Springer, National Ice Center; Simon Stephenson, NSF; Martha Stewart, University of Alaska; Andrew Tucci, USCG; Brian Van Pay, State Department; Dan Walker, OSTP; Dick West, CORE; Malcomb Williams, USCG; Tom Wojahn, USCG; John Woods, National Ice Center

April 16, 2007

After **Mead Treadwell, Chair**, United States Arctic Research Commission (USARC) opened the meeting, Bill Fitzhugh, director of the Smithsonian's Arctic Studies Center at the National Museum of Natural History presented the history of the Smithsonian Institution's Castle Building, the site of the first day of this meeting. Fitzhugh gave the Commission an overview of the Smithsonian's Arctic program, an effort that he described as a consistent feature of the museum's work. Fitzhugh described how the Smithsonian enhanced its abundant Arctic collection and reviewed various displays it has staged over the years. The Smithsonian's Anchorage facility, the Arctic Studies Center, is currently collaborating with the Anchorage Museum on an exhibit featuring language preservation and Alaska exploration.

The Commission then spent a few minutes discussing the Smithsonian's budget shortfalls, with Fitzhugh acknowledging that its funding comes primarily through Congressional budget line items and covers little more than salaries. Grants and gifts from foundations make up the remaining budget.

Treadwell then introduced Heather Brandon, an ocean policy coordinator for the state of Alaska, and Fae Korsmo, senior staff associate, National Science Foundation (NSF).

Commissioner Reports

Commissioner Michele Eder attended a congressional consortium on education in Washington, DC, in March 2007. Congressional staff made presentations. The meeting also covered a number of studies produced by the National Academy of Sciences (NAS). **Eder** believes it's important for the Commission to deepen its relationship with NAS to ensure a close, continuing working relationship.

While in Washington, DC, **Eder** met with members of the Oregon congressional delegation to discuss current Arctic research issues.

She also reported that the North Pacific Management Council (NPMC) is looking at fisheries management in the Arctic. Their interest is to determine how the state of Alaska management interests mesh with those of NPMC. The Council seems to have a much better management record. They will look at the current status of fisheries as well as what changes need to be made down the road. There are multiple ways on the state and federal level to help bring information together to make future changes. At this time, most fishery money goes to the Bering Sea.

Commissioner Charles Vörösmarty gave a presentation on the upcoming scaling report sponsored by USARC. He discussed the numerous adaptations the report has undergone and the process he is establishing for its production.

Commissioner Vera Metcalf discussed a co-management agreement with US Fish and Wildlife Service for which she is preparing a new report detailing the walrus harvest. The effort requires some level of Russian collaboration that it has yet to achieve. Metcalf expressed concern that the walrus could reach the same precarious position as currently exists with the polar bear. She also reported that funding for sea lions and sea otters has been cut which could have broad repercussions in US' ability to collaboratively work with Russians.

Metcalf also provided a list of issues of concern to indigenous people including gas and oil exploration in Chukchi Sea, bottom trawling, Arctic marine shipping and the

potential chokehold increases will cause in the Bering Strait, the effect of seismic surveys on marine mammals and issues surrounding search and rescue capabilities. She is pushing for improved communication with US Coast Guard to improve search and rescue capabilities.

Commissioner Duane Laible traveled to San Francisco for a meeting of the USARC Arctic Marine Transportation Working Group. The discussion surrounded the future of marine navigation and in what significant ways it will evolve. Issues that will drive this development include resources, trade and the status of regulatory and legal regimes in the Arctic. ARRIV was also discussed in terms of its chances of becoming a reality.

He also mentioned the USARC shipping study that he anticipates will be published during the summer or Fall of 2007. He believes that the AMSA document will amplify many of the issues undertaken in the AMSA study. The Commission then discussed the US' need to conduct research to prepare for Arctic shipping in all areas—from architecture to social science.

Commissioner Susan Sugai stood in for Lawson in series of IPY lectures last week including the history of IPY. She attended the Cooperative Institute Meeting in Silver Spring February 13-15, 2007. The purpose of this meeting is to support quality research partnerships between Cooperative Institutes and NOAA through dialog and information dissemination.

Commissioner Tom Royer participated in a meeting of the Oil Spill Recovery Institute (OSRI) Science Panel on April 10-12, 2007 at the Alaska SeaLife Center in Seward, Alaska. Royer discussed the panel's deliberation concerning the reduction of sea ice in the Arctic Ocean as well as monitoring options including remote sensing and local observation. The panel recommended funding the one proposal submitted under this category for the full amount of \$99,987.

Staff Reports

John Farrell, USARC Executive Director, announced that the summary goals report was presented at ASSW and would be presented to Senator Murkowski and Congress tomorrow.

He said that Fae Korsmo adopted the Arctic Observing Network (AON) and Languages, Cultures and Identities goals from the summary goals report and is making them part of the IARPC process. AON will be the centerpiece of the U.S. Arctic Research Program Plan to be published in early 2008.

The task force on extended continental shelf has met to discuss the collection of bathymetric and seismic data and to determine how the \$8 million allocated to the task force should be spent. Farrell announced the preparation of USARC press distribution list that is available to Commissioners.

Lawson Brigham, USARC Deputy Director, discussed his work with the Arctic Marine Shipping Assessment (AMSA). Continuing issues include the Arctic's ship capacity now and in the future, lack of full Russian participation and regular refocusing of the study toward a marine shipping emphasis and away from a climate change message. He attended the March 2007 "Arctic Development and Maritime Transportation: Prospects of the Transarctic Route – Impact and Opportunities" meeting where he gave the keynote address on AMSA. Brigham also attended the Senior Arctic Officials meeting in early April explaining to those representing the other Arctic States that the U.S. needs

support in bringing the AMSA study to fruition.

The Case for UNCLOS

Maggie Hays and **Brian Van Pay**, Office of Oceans Affairs, State Department, discussed the US perspective on the country's extended continental shelf (ECS) and why it is important to figure its parameters out now. Whether or not the US ratifies the Law of the Sea Treaty, it remains important for the US to determine the extent of its ECS boundaries. The coastal state gets exclusive rights to the natural resources—oil, gas, and other minerals—of its shelf. The farther its shelf extends from shore, the more resources it controls. The coastal state also has exclusive control over scientific research pertaining to its shelf. In addition, US companies interested in exploiting the natural resources of the ECS will be able to get the financing and insurance needed to do so.

Determining the extent of the continental shelf requires the collection and analysis of data that describe the depth, shape, and geophysical characteristics of the seabed. These three sets of data help to substantiate an ECS delimitation. In addition, bathymetric data will show the shape of the continental shelf, seismic data will display the depths and characteristics of its sediments, and gravity and magnetic data can help differentiate continental crust from oceanic crust.

It is estimated that the US ECS could generate at least \$1 trillion in resources:

Hydrocarbons (Oil & Gas)

- Estimated 10 Billion Barrels
- 750,000 square kilometers where sediment thickness exceeds 1 km

Manganese Nodules and Crusts

- Highest concentration of manganese nodules and at the highest average grades
- Manganese: 182 million tons
- Copper: 9 million tons
- Nickel: 12 million tons
- Cobalt: 5,000 tons

Hayes noted that the remaining data collection and analysis will cost at least \$50 million with the collection of seismic data as the largest component.

Commissioner Vörösmarty suggested that \$1 trillion was a low figure. Hayes agreed saying that with so many areas that could be covered, the resources dollar value could go much higher. **Commissioner Eder** said the Commission endorsed this effort.

Subs Wanted to Define ECS

George Newton, senior advisor, USARC, discussed the Arctic Science Summit Week. Participants at the conference came from China, Russia, Denmark, Sweden, Canada and the United States. They participated fully and openly, sharing genuine Arctic-related problems that they see and experience.

Newton then reviewed a white paper he compiled entitled "Possible Use Of A Us Navy Nuclear Submarine In Ice-Covered Arctic Waters To Collect (Seismic) Data In Support

Of Delimiting The Extended Continental Shelf Of The US.” The paper analyzed the background behind data collection in preparation for the U.S. claim for the Law of the Sea accession by the US. It highlights the extended continental shelf requirements needed to meet Article 76 of UNCLOS-determined geologic and morphological criteria to be followed in delimiting a nation’s continental shelf. These criteria are based largely on either of two formulae: (1) a distance formula that allows an extension of the shelf to 60 nm beyond the foot of the continental slope (defined as the point of maximum change in gradient at its base); and (2) a sedimentary rock thickness formula that allows extension of the shelf to where the thickness of sediments (or sedimentary rock) is 1 percent of the distance back to the foot of the slope. The following two criteria are used to determine the outer limit (maximum cutoff lines) of the continental shelf: 1) it cannot extend more than 350 nm from the coastal baselines; or 2) it cannot exceed 100 nm beyond the 2,500-meter isobath, whichever is more beneficial for the coastal state.

In the U.S. Arctic, the continental shelf may extend as far as 600 M from the baseline. Key to implementing any of these criteria is a clear bathymetric delineation of the 2,500-meter isobath and the foot of the continental slope, and accurate geophysical data to determine seabed sediment thickness. Submission of the continental shelf limits will be based on a combination of high-resolution, state-of-the-art bathymetric and geophysical data, which includes seismic reflection, seismic refraction, gravity, and magnetic data.

Any submission for an extended continental shelf in the Arctic by the United States will likely be based on the sediment thickness formula. This requires precise data on the location of the foot of the continental slope (based on bathymetry) and will be limited in most areas by the position of the 2,500-meter isobath plus 100 nm. The U.S. claim will require accurate and precise bathymetry and sediment thickness data.

The data necessary for the ECS submission will come from:

- 1) Historical archived sources: primarily bathymetry
- 2) Icebreakers- primarily deep multi-channel seismics (MCS) and refraction
- 3) Submarines- primarily bathymetry, gravity, and shallow MCS.
- 4) Other nations have demonstrated that ice camps can facilitate small data collection needs. The US does not anticipate resorting to this method.

The participation of a suitably-equipped SSN in the U.S. Arctic ECS surveys would provide a complementary platform to the efforts of an icebreaker and would mitigate, to a large extent, the accessibility challenges to the data collection process. Surveys conducted by a submarine provide a large measure of certainty to the data collection effort. The submarine is not limited by: (1) the presence of sea ice or its sometimes adverse characteristics (hardness/compression/thickness); (2) the season, thus extending the time available for collection; and (3) the local weather conditions. The submarine, having essentially unlimited access under sea ice, would collect a more extensive data set (in quality, range, and density) than an icebreaker.

Newton recommends, however, that before any research efforts take place, that the US must designate this effort as a “national priority,” and that a submarine engineering feasibility study must be accomplished.

PRB Reports

Chris Elfring, Director, Polar Research Board (PRB) of the National Academy of Sciences (NAS), discussed the beginnings of the NAS and its relationship to PRB—an entity that strives to enhance understanding of the Arctic, Antarctic, and cold regions. PRB

undertakes focused studies and other activities at the request of federal & state agencies, Congress, or other sponsors, serves as the US National Committee to IASC and SCAR and acts as a focal point for US planning for the International Polar Year 2007-2008.

Studies produced by PRB must have real impact on science, an agency, or the nation or contributes something unique to the debate on a given issue. Their objectives are clearly stated and have a well-defined end-product. Studies must be appropriate to the NRC approach, and not better produced by some other entity. Authors must have necessary expertise and a willingness to participate.

PRB's current, interdisciplinary project priorities are the following three studies.

- Polar ice sheet effects on sea level: critical uncertainties
- Impacts of changing permafrost on ecosystems and society
- Assessment of knowledge and technical limitations for construction of gas pipeline in cold regions

Supporting Preservation

Igor Krupnik, Smithsonian Institution, praised the Commission for adding a social issue to goals report. He believes this is increasingly important since the state of Alaska no longer teaches native languages. Languages, cultures and identities preservation needs support since the growing trend indicates a pattern of worsening as one heads east. Scandinavian countries perform better than Russia, where little preservation activity is underway.

Krupnik advocates increasing public awareness of the role and lasting value of Arctic languages, cultures and identities. He believes it is important to document endangered languages and cultural traditions for future generations. He wants to improve funding for the ongoing Federal, state, and community programs to launch new efforts in support of Arctic languages and cultures and enhance inter-agency collaboration by improved data, resource and expertise sharing among the entities. Krupnik also says there is a need to identify current threats to Arctic languages and cultures by responding via specific legislative, policy, research, and outreach initiatives. He also wants to create an effective, long-term monitoring system to track the status of Arctic languages, cultures, and identities and produce a detailed road map with long-term vision and action items needed to support them.

Commissioner Royer compared the problems Alaska is having with similar recent concerns in Hawaii. However, Hawaii has revitalized itself, a step largely made by its indigenous people. Krupnik believes the end-result has to be placed in the hands of Alaskans. **Commissioner Vörösmarty** and Krupnik discussed using the SEARCH program as a template, by creating two separate structures: assembling an interagency working group made of agency representatives and a science steering committee made up of researchers and local experts. **Vörösmarty** believes that SEARCH is a hard path to follow because of complexities of the program, effort & money raising. He suggested building a tactical mission to rejuvenate Arctic languages, cultures and identities and then build a more comprehensive program closer to ISAC. He said that if no one is willing to start program and fund it, it probably won't work.

Commissioner Metcalf supports consideration of humanitarian needs in the process by consulting with the Alaska Federation of Natives, ICC and the natives themselves. Including them provides some level of control for the native people. Commissioners agreed to look at building alliances and leadership as is part of the SEARCH program to foster the program and give it visibility.

Funding Stumbling Blocks at NIH

Marya Levintova, International Program Officer for Russia, Eurasia and Arctic Affairs, Fogarty International Center, National Institutes of Health (NIH), discussed Arctic research efforts underway at NIH that focus on health disparities, chronic diseases, infectious diseases and environmental health. Most budgets are declining in Arctic research at the agency. Funding that is awarded comes through grants, cooperative agreements and contracts that are investigator initiated or generated through funding opportunity announcements (FOAs).

Arctic research at NIH represents one percent of total agency funding. Levintova said it is unlikely that budgets for Arctic health initiatives will increase because, at this point, it is doubtful that any research request could meet the strict qualification standards imposed by the highly competitive nature of the NIH funding process. FOAs are typically dismissed because of capacity issues that generate a consistent conflict over disease vs. region, population vs. disease and/or domestic vs. foreign research decisions.

Levintova suggested that Congressional intervention is required in the form of an integrated health plan for the Arctic. The agency's future research priorities specifically involve broader recognition, focus and funding for the Arctic Human Health Initiative as well as general capacity building and training in the Arctic.

Editor's Note: In a post-presentation discussion, Levintova recommended that the Commission prepare a letter for Dr. Elias Zerhouni, NIH director, suggesting the development of an FOA, focused specifically on the Arctic. The FOA would center on the multiple health disparities prevalent in the lives of Arctic residents and the limited human health research funding present in the region. Its foci should be broad enough to appeal to as many NIH institutes as possible but narrow enough so that the FOA could pinpoint specific health research generally unavailable to Arctic residents. Regardless of the focus, Levintova recommended attaching infectious disease, cancer and heart disease concerns to an FOA because these disease categories are the concerns of the largest, most affluent institutes. Should the FOA's focal point be Arctic mental health issues, the relationship between physical health disparities, especially in these three categories, as well as those in mental health must be mutually emphasized.

A listing of participating NIH institutes can be found at: <http://www.nih.gov/icd/>

USCG

Tom Wojahn, Commander, US Coast Guard (USCG), discussed the Coast Guard's role at the poles and broad infrastructure needs to manage the regions effectively. He also provided an overview of the frail condition of the US polar icebreakers today. He argued for a changing responsibility of the US polar ice breaking mission, moving from a defense focus to a polar research emphasis.

Future polar icebreaking mission needs and concerns include:

- Polar research—climate
- Global geopolitics (security)—exploitation of resources or trade routes and/or asserting sovereignty.
- Defense and homeland security readiness (security)—nuclear threats, re-supply, protect people and infrastructure, and shipping
- Natural resources—energy, minerals, fisheries
- Mandatory arctic ship structural standards
- International standards for arctic mariners

- Terrorism

Wojahn discussed the need for a comprehensive polar icebreaking program, arguing that the Coast Guard should be the entity to continue to operate, maintain, and manage the nation's polar icebreaker fleet. *(Editors note: Since this meeting, Congress has allocated \$100 million for the Coast Guard to operate and maintain its existing fleet of three polar class ships and to build two new icebreakers.)*

Other Coast Guard research efforts currently underway include HAZMAT spill behavior and trajectory modeling, heavy oil recovery and training and resource needs analysis.

April 17, 2007

After **Commissioner Treadwell** opened the meeting by introducing **Heather Brandon**, Ocean Policy Coordinator, Alaska Department of Fish and Game, and Fae Korsmo, senior staff associate, NSF, the Commissioners introduced themselves.

He then introduced **Senator Lisa Murkowski** who discussed the Congress' increasing interest in Arctic research activities as they have grown in political importance. In order to understand changes, research has to be funded and coordinated to allow an unprecedented long-term strategy. Murkowski sees this time as an opportunity to draw together scientists for hundreds of science project and hopes it will establish as lasting legacy and a long-term Arctic research program.

The Commission challenged the Senator regarding the general state of research in the country, particularly in Alaska. The current budget concerns are causing a decline in funding which has a direct effect on the pipeline of people. **Commissioner Sugai** expressed concern that this environment is causing students to leave science for more lucrative alternatives. The students need to see a future bright with extramural funds. Funding needs to come from sources other than NSF and it requires congressional support.

She answered that she advocates significant funding for the International Polar Year (IPY) and reinvigorating the "pipeline of people." She sees this financial support as an investment in the future. **Treadwell** then presented the USARC Report on Goals and Objective 2007 Summary to Murkowski.

NOAA's Research Focus

Richard Spinrad, Assistant Administrator of the National Oceanic and Atmospheric Administration (NOAA) Office of Oceanic and Atmospheric Research (OAR) discussed NOAA's research goals including those related to IPY, the general nature of conducting research, preeminence research projects and the value of research to society.

NOAA restructured its own labs, in order to focus their research, and have worked collaboratively with international labs in Alert and Eureka, Canada; Tiksi, Russia, Ny-Ålesund, Norway and Summit, Greenland, on research such as the Arctic Atmospheric Observing Network, Arctic Change Detection and System Analysis, Russian American Long-term Census of the Arctic (RUSALCA) and the Arctic Sea Ice Thickness Observing Network.

He emphasized (RUSALKA), whose goals are to make observations where Arctic sea ice is reducing, monitor fresh water and nutrient fluxes, examine ecosystem indicators of

climate change, improve international Arctic science collaboration and explore the unknown Arctic. Spinrad said the most exciting work comes where these areas merge. He feels it is important to get beyond single source research and look at entire ecosystems. NOAA is learning a great deal from coupling earth science and climate research. What are the climate forcing activities that influence oscillation? What do they do to fisheries dynamics?

Spinrad said NOAA is sensitive to the value of research to society and feels it is part of the agency's mission. The US needs to invest in research and resources to invest in social science studies.

NAS Decadal Study

Dr. Arthur Charo, National Research Council (NAS), updated the Commission on the NAS decadal survey titled *Earth Science and Applications from Space (ESAS)*. He reviewed the organization and strategy of the committee. The NRC decadal survey consists of an executive committee, as well as seven additional panels organized by theme:

1. earth science applications and societal needs
2. land-use change, ecosystem dynamics, and biodiversity
3. weather (including space weather and chemical weather)
4. climate variability and change
5. water resources and the global hydrologic cycle
6. human health and security
7. solid-Earth hazards, resources, and dynamics

Each of these panels is composed of 10-15 participants charged with conducting outreach in their fields and preparing a document to contribute to the executive committee. The ESAS charge is twofold: to recommend a prioritized list of flight missions and supporting activities to support national needs for research and monitoring of the dynamic Earth system during the next decade, and to identify important directions that should influence planning for the decade beyond.

The final study report recommends a path forward that restores US leadership in earth science and applications and averts the potential collapse of the system of environmental satellites. It presents an integrated group of missions for which panel recommendations were rolled-up, missions were sequenced and overall cost matched to anticipated resources plus reasonable growth. The highest priorities of each panel were preserved. The report also offers some guidance on how to handle budget or technology development problems.

The report's key agency recommendations for the currently planned observing system was that NASA maintain continuity of precipitation and land cover by launching a GPM by 2012 and obtaining a replacement to Landsat 7 data before 2012. It also recommends that NASA continue to seek cost-effective, innovative means for obtaining land cover change information. The main recommendations to be phased in during the next decade include that NOAA and NASA undertaking a set of 17 recommended missions. In addition, the report urged NOAA to embark on, from research to operations, studying vector ocean winds (CMIS-LITE plus Scatterometer), GPS radio occultation temperature, water vapor and electron density profiles and total solar irradiance and earth radiation (CERES on NPP also) restored to NPOESS. During the next decade, NASA should carry out 15 missions in small, medium and large categories.

Commissioner Treadwell commented that the only way this will get done is for additional funds to come to NASA. He said it has to be presented. If this research isn't

completed, the implications on society will be tremendous. He recommended to the Commission that members look at this study very carefully and offers Commission support. **Commissioner Vörösmarty** noted that with any of these, there has to be a vibrant research program.

Research at MMC

Mike Simkins, Assistant Scientific Program Director, Marine Mammal Commission (MMC), reviewed several of the Arctic related research projects ongoing at MMC, focusing on two:

Assessing the Impacts of Climate Change on Arctic Marine Mammals—examination of the scientific history of the Arctic Ocean, the effects of climate change, the impacts and resilience of the Arctic Ocean and potential conservation efforts.

Workshop to Develop Monitoring Plans for Arctic Marine Mammals—discussion of ongoing changes in the region’s climate for which monitoring plans were developed to determine changes in population status, identifying causes (anthropogenic vs. natural), and employing time parameters to allow effective management. The initial focus was on beluga whales and ringed seals. Participants on these projects included scientific and indigenous experts from around the circumpolar Arctic.

At present, MMA is working on a number of issues including a proposed listing of polar bears as threatened, the bowhead whale “quota,” Steller sea lion and northern fur seal research permits, MMS’ report to congress on marine mammals and noise, seismic surveys in the Beaufort and Chukchi Seas and co-management.

The meeting’s outcome was to review past and current research and monitoring efforts across the Arctic, share regional perspectives, identify key parameters and regions/sites for monitoring, discuss implementation strategies including study of other Arctic marine mammals and develop a summary report.

NSF/USARC Goals

Fae Korsmo, gave an overview of the work of IARPC and plans for the IARPC meeting where USARC’s goals report summary was discussed. The IARPC meeting focused primarily on two of the report’s goals: the Arctic Observing Network (AON) and Languages, Cultures and Identities goals. Participating IARPC agencies were charged with developing AON, the focus of the updated US Arctic Research Plan, mounting a strategy on languages, cultures and identities research including education, preservation and outreach, and charging IARPC staff with generating national, state and local partnerships. Korsmo said that the purpose was to focus on the possible, to make sure there is broad community input and buy-in.

The Commission and Korsmo then discussed the need to promote USARC’s other goals that were included in the goals report summary—Arctic human health, civil infrastructure research and natural resource assessment and Earth science—but are not part of IARPC’s immediate agenda. The consensus was that ringleaders for each goal are required in order to organize an integrated crosscutting process.

Arctic Observing Network (AON)

Martin Jeffries, AON Program Director, Office of Polar Programs, NSF, provided an overview of AON including the program’s launch and solicitation strategies. To date, 16 of the eventual 18 awardable proposals have been funded at \$256 million over three years. Awards were made in the categories of atmosphere, oceans and sea ice, hydrology

and cryosphere, terrestrial ecosystems, human dimensions and data and information management. Another 13 projects are being funded in long-term observation, making the total number of projects funded under AON 31.

Oceans and sea ice research projects make up the largest funded proposals and include the study of aerial hydrographic surveys, switchyard and seasonal ice zones, ice-tethered profilers, ice dynamics and weather buoys, and seasonal ice zones.

He discussed how the data coming from these projects could be used and by whom. AON is an interagency effort domestically and an interorganizational program internationally. International program partners include DAMOCLES, CEON, ISAC, GEOSS and SAON.

Ultimately, AON was created to build a network that will make effective use of the human and technological dimensions of cyberinfrastructure, fill gaps and human dimensions, hydrology, biological oceanography, sustain a growing network toward an IPY legacy and create conditions for a transition from research-driven observing to operational observing.

Ice-Diminishing Arctic Symposium

Pablo Clemente-Colón, Chief Scientist, U.S. National Ice Center (NIC), NOAA, discussed its upcoming symposium on the Impacts Of An Ice-Diminishing Arctic On Naval And Maritime Operations. This Arctic symposium served as follow-on to the very successful ice-free arctic workshop the Ice Center conducted in 2001. USARC cosponsored the event.

Clemente-Colón provided an overview of NIC history and activities stating that it supports coastal and marine sea ice operations and research globally. This includes broad responsibilities to monitor Polar and non-Polar ocean regions of the world and the Great Lakes. For the Arctic, in particular, NIC provides operational strategic basin-scale sea ice charting with the production of a hemispheric chart and over 30 individual regional charts, sea ice tactical ice navigation support, Chukchi Sea and Beaufort Sea ice seasonal forecasts, support for the development of a sea ice climatology for the Arctic, co-manages the US Interagency Arctic Buoy Program (USIABP) and actively participates in the International Arctic Buoy Program (IABP). Additionally, NIC is participating directly or indirectly in a number of research and application cooperative projects with other national and international groups as part of International Polar Year activities throughout 2007 and 2008.

The symposium addressed the immediate and future impact of rapid changes in the Arctic. While the 2001 workshop focused mainly on naval operations and national strategic issues, the 2007 symposium expands the discussion to influences on other maritime operations such as commercial transportation, oil and gas exploration and exploitation, fisheries, and oceanographic research. The 2007 symposium provided a forum for the review of the dramatic changes in Arctic sea ice conditions observed over the last several years, an assessment of recent adjustments to sea ice forecast model predictions, and the impacts on present and future operations in the region. In addition to US and Canadian participation, contributions from other circum-Arctic countries as well as other nations with significant interest in maritime operations in the Arctic were presented. The symposium also brought nationally and internationally recognized experts on Arctic observations, climate change, policy, and marine operations to provide a sound basis for the development or update of present and future postures for operations in a rapidly changing Arctic environment.

Ocean Priorities

Rear Admiral Dick West, US Navy (retired), president and CEO of the Consortium for Oceanographic Research and Education (CORE). West gave overview of CORE, a Washington, DC-based non-profit association representing ocean research and education institutions. Its mission is to advance ocean research, education and policy by:

- 1) facilitating ongoing ocean research programs and fostering new ocean research investments by public, private and government institutions
- 2) promoting high quality education in the ocean sciences, fostering collaborations between scientists and educators and enhancing public ocean literacy
- 3) advocating ocean policy issues by representing the academic and industry ocean research community before Congress, partnering with and advising government agencies, and collaborating with non-governmental organizations
- 4) cultivating and promoting awareness and appreciation of the oceans among government agencies, non-governmental organizations and the general public.

West also discussed the US Ocean Action Plan that includes 226 recommendations affecting ocean policies. Part of this plan is to encourage the United States to maintain its traditional international leadership role on oceans issues, particularly by acceding to the UN Convention on the Law of the Sea at the earliest opportunity. The Action Plan emphasizes the importance of accession to the treaty, which will serve the interests of the American people. Many of the other actions involve working with the international community, including efforts to protect ocean ecosystems, strengthen international ocean science, and work towards sustainable fisheries. These measures will ensure that the US continues to play a leading role in vital global arena.

West also discussed the need for competitive research, developing an ocean infrastructure strategy, developing oceans observing network, advancing remote sensing, ice breaker buildup and related costs as well as education geared to the general public to personalize their role in ocean health.

Arctic Research in Norway

Berit Johne, Counselor of Science, Norwegian Embassy, discussed the Arctic research plan for Norway and the country's desire to forge a strong relationship with the United States to meet both countries' goals. Norway's primary Arctic goals are to promote knowledge, enhance research cooperation in the Arctic region and to explore unique research potential, climate change, and the needs of Norway indigenous people. She said that Norway has an obligation to work with US to carry out research in the north. Johne offered the embassy's service in helping the Commission plan its field trip to Norway during the summer of 2007.

Chair's Report

Since the previous Commission meeting and retreat in Anchorage, Treadwell has participated in the following Commission-related activities.

A. Trips taken on behalf of the Commission or Commission business

- Washington, DC, February 13-16, to attend a dinner hosted by the Finnish Ambassador on IPY, to meet DARPA official Brian Pierce interested in Arctic Research, to meet with Dr. Meha Shah, National Security Council coordinator for international environmental affairs regarding Arctic Policy review, meet with David Monsma of the Aspen Institute regarding their proposed Arctic commission, visit with USGS scientist Thomas Armstrong and others working on mapping, climate change, polar bear, and Yukon River issues, attend an IARPC+1 (Juniors) meeting and brief on the goals report, to meet with Sen. Murkowski.
- Fairbanks, February 19, to attend the seventh U.S.-Japan meeting on Global Climate Change and the Arctic (GCCA-7) with Dr. Brigham, to speak on US goals during IPY, and to honor Dr. Syun Akasofu. During the day, we were briefed on USGS' Yukon River basin project, and discussed several specific IPY activities with scientists.
- Washington, DC, February 22, to attend the 30th Anniversary celebration of the National Ice Center, where the Commission was recognized for its support, and former chair George Newton made remarks. We held informal discussions with NOAA's Administrator on GEOSS and AON, further discussions with Ice Center leaders concerning the July security symposium, discussions with USCG leaders concerning icebreaker deficiencies. Dr. Farrell and I met with Commission's administrative support and legal counsel at the General Services Administration.
- Washington, DC, February 25-26 to chair a panel during the U.S. opening ceremony of the International Polar Year.
- Hanover, NH and New York, NY, March 12-15, to attend and speak on a policy panel at the Arctic Science Summit Week and to give brief remarks at the Explorers' Club in New York March 15 on the kickoff of the International Polar Year. Dr. Farrell and Commissioner Vörösmarty attended the ASSW with former chair George Newton, a member of the planning committee. Dinner with Dr. Richard Beck, University of Cincinnati, regarding Arctic mapping and telecommunications, March 13. At the invitation of the Canadian consul general for New England, I attended a small dinner March 14 with Dr. Arden Bement, ex-officio Commissioner, IARPC chair, and NSF director, where we had the opportunity to speak at length on IARPC issues.
- Reykjavik and Akureyri, Iceland, March 24-30, with Dr. Brigham, to attend a conference sponsored by Iceland's Foreign Ministry on Trans-Arctic shipping, to meet with President Olafur Ragnar Grimsson, to meet with U.S. Ambassador Carol van Voorst and Embassy staff, and to attend town meetings on the Arctic Marine Shipping Assessment. I dined with Kristján Kristjánsson, Icelandic Centre for Research in Reykjavik, president of IASC at the home of Neils Einarsson, director of the Stefansson Institute in Akureyri, and met with Ásgeir Margeirsson, CEO of Iceland's Geysir Green Energy, a fund seeking investments in geothermal projects in the U.S. and elsewhere. Attending the conference were a large number of leaders from Arctic nations on shipping issues, as well as several Senior Arctic Officials.

B. Meetings taken on behalf of the Commission

- Speeches/presentations as Commission chair, usually focusing on Commission's goals report, Arctic research policy needs and the International Polar Year
- IARPC+1 (Juniors), Washington, DC, February 16
- Hotchkiss School, Lakeville, CT, February 16
- IPY Kickoff, National Academy of Sciences, Washington, February 26
- Resource Development Council of Alaska, Anchorage, March 1
- Alaska World Affairs Council, Anchorage, March 2
- KENI Radio, Mike Pocaro show, Anchorage, March 2

- Anchorage Downtown Rotary, Anchorage, March 6
- Arctic Science Summit Week, Hanover, NH, March 14
- Reuters Interview, Deborah Zabarenko, Hanover, NH, March 14
- Explorer's Club Chapter Chairs Dinner, New York, March 15
- Newsweek Interview, Mary Carmichael, by email and telephone, Anchorage, March 16
- (With Dr. Brigham) Email interview with Paula McCoy, Straits Times Foreign Desk, Singapore, March 24
- Trans-Arctic shipping conference, Akureyri, Iceland, March 28
- Lt. Governor Sean Parnell, chair of Alaska's State Committee on Research, Anchorage, April 6
- Kris Perry, Director of International Trade and Director of Gov. Sarah Palin's Anchorage office, Anchorage, April 11
- Investiture of Deborah Smith as Federal Magistrate, Anchorage Federal Court, April 12
- Backgrounder on Arctic energy issues, Russell Gold, Wall Street Journal, Houston bureau, by telephone, April 12
- Alaska Climate Change Impact Commission, Anchorage, April 13
- ASSW Planning Committee, by telephone, January 29 and subsequent meetings
- Dr. Mike Sfraga, regarding American Association of Geographers annual meeting, Anchorage, February 1
- Dr. Larry Hinzman and Dr. Syun Akasofu, re Japan and IARC, February 2
- Call from Asst. Secretary of State Claudia McMurray, February 2, with follow-up conversation with Deputy Assistant Secretary David Balton, February 5, regarding Arctic policy review
- Adjutant General Craig Campbell, follow up on USARC brief re ice free Arctic, mapping and UAVs, Anchorage, February 9
- Dinner for Dr. Robert Correll, EPA's Elin Miller, and other climate change panelists attending the Alaska Forum on the Environment, arranged by Jackie Poston of EPA, Anchorage, February 11
- Senator Lisa Murkowski, Girdwood and Anchorage, re USARC meeting on Capitol Hill, meeting she called with U.S. Dept. of Education regarding IPY education, February 17, March 2 and April 9
- Margaret Williams, World Wildlife Fund, re shipping risk assessment in the Aleutians, February 26 enroute DC to Anchorage, and follow on conversations via email
- Sharon Anderson, Consultant, regarding Arctic shipping, Anchorage, March 1
- Arctic Policy Group, U.S. State Dept., by telephone, March 1
- Governor Sarah Palin, Anchorage, during Kohanic Broadcast System Auction Event, March 8, and Inaugural Ball, March 9, regarding scheduling a briefing and getting State support for the Alaska Ocean Observing System and the Arctic Observing Network.
- Dartmouth student Dewey Hoffman, regarding native language preservation, Anchorage, March 9
- Dr. Lassi Heinenen, Northern Research Forum, regarding NRF Meeting in Anchorage scheduled for 2008; March 8 and dinner I hosted for him and members of the Alaska Planning Committee, March 12
- Bernie Zak, U.S. Department of Energy, ARM Projected, UAV use in the Arctic, AON, and Geothermal Research at DOE, Anchorage, March 20
- David Wight, former Alyeska Pipeline President, re gas for Toolik Lake, March 20
- Dr. Arden Bement, Fae Korsmo, Simon Stephenson, and Michael VanWoort, NSF, regarding IARPC meeting agenda and goals report, by telephone, March 23 with Dr. Farrell and Kathy Farrow
- Dr. Thomas Litwin, by telephone from Northampton, MA, regarding Bering Sea Expedition and USARC cooperation, April 2
- Lunch with Dr. Mike Sfraga, UAF, Dr. Thomas P.M. Barnett, author of The Pentagon's New Map, and George Canelos, Federal Co-chair of the Denali Commission, Anchorage, re Arctic shipping, April 5

- Glenn Sheehan, regarding talking points for visit of EPA Region 10 Director and climate change coordinator Elin Miller and EPA staffers Marcia Combes, Anita Frankel and Ted Rockwell to Barrow, by telephone April 9
- Telephone meeting with Deputy Assistant Secretary of State David Balton and Evan Bloom, OES, regarding Montreal panel, Arctic policy, and setting up a State Dept. brief on Arctic shipping, April 12
- Molly McCammon, Alaska Ocean Observing System, Anchorage, April 13
- Dinner hosted by Alaska Adjutant General Craig Campbell for U.S. Ambassador to Mongolia Mark Minton, Anchorage, April 13. Discussion on ways IPY, climate research can benefit U.S. – Mongolia relationship

C. Status of issues

- Since the last meeting, I'd like to complement John Farrell for the work he's done to help organize the Arctic mapping effort. We heard at our January meeting that \$8 million would be available as a start toward a \$50 million effort. The April meeting will include several briefings on this issue, including from John Farrell, George Newton, and the State Department.
- Further, we are glad a new meeting has been set to discuss renewal of SCICEX submarine cruises. John Farrell has been active in that area as well, and we are relying also on George's advice.
- Two major public outreach efforts, often combined, occupied most of my time as chair this quarter. We are briefing inside and outside the government on the Commission's goals report and we have been actively getting the word out about the International Polar Year. In these activities, I've had the chance to meet three times with Dr. Bement, and I'm very pleased with his leadership of the IARPC. The IARPC seniors are scheduled to hear from us April 27, and we will hear during our April meeting of steps IARPC is taking to revise the US Arctic Research plan, broaden AON across federal agencies and across national borders, implement the new language goal we've recommended, and –overall— to be much more responsive to the legislation that established both USARC and IARPC. My only disappointment for the quarter relates to the hope I'd had to get a press tour to the Arctic Ice camp – NSF did not follow through on our request for cooperation, and staff resources at the Commission were stretched in getting the goals report out. As things turned out, with the British sub tragedy, it is probably for the best.
- Arctic Policy: terms of reference for an interagency review have, as I understand it, not been released by the NSC. I will discuss at the meeting some of the organizational concerns that came up in meetings at the White House and conversations at State. Our goals report has asked for this, and a number of agency heads and others have told us how important this is for major decisions, including icebreaker replacement, mapping, etc.
- Following our discussions about staff structure at the Anchorage retreat, I have had lengthy discussions with John Farrell and Lawson Brigham about adding to our capabilities, especially in the areas of budget analysis, tracking agency work in the Arctic, being able to determine what intramural and extramural research is budgeted in agencies, having a press plan in place, and other matters. While we have no specific action to report on this, we plan to move forward as the goals report is finished.
- In discussions with the Governor of Alaska, the Lt. Governor and her staff, I am glad to report the Governor has agreed to appoint a liaison to the Commission to replace Chip Abernathy, who has left state service to join Sen. Stevens' committee staff. I am glad Heather Brandon has been asked to join us for today's meeting. Dr. Bement asked me to help bring the State into the AON, and there are a number of other cooperation issues we discussed with the Lt. Governor in his capacity as head of SCOR, the State Committee on Research, and the Governor's staff.

International

- By far and away, the most active international work being conducted by the Commission is Lawson's activity as chair of the Arctic Marine Shipping Assessment. Lawson will brief

on this directly, but from seeing or hearing of crowds gathered to discuss these issues at town meetings in Iceland, and hearing the report of the San Francisco scenarios meeting, I can say we should all be proud of this work. We will brief the Dept. of State on AMSA's progress and to discuss the implications of a warming Arctic for U.S. international policy, following this meeting.

- We have done some (but not enough) homework to put together a Japan trip. The recommended appointment of Syun Akasofu as an advisor to the Commission will help. A large delegation of Japanese scientists attending GCCA-7 convinced me there is much more we can do to build cooperation with Japan.
- At ASSW, Dr. Bement and I were hosted by the Canadian Consul General for most of New England, and Executive Director Steve Bigras of the Canadian Polar Commission confirmed that the CPC is working on a response to the letter we sent after our January meeting. I will travel to Montreal, as will George Newton and Evan Bloom, for an Arctic policy conference after the meeting.
- In Iceland, I met with the President on a number of issues, including U.S.-Iceland-India cooperation on carbon sequestration, potential cooperation on glacial retreat in the Himalayas, and ways to further discussion of shipping research to see where the U.S. and Iceland can cooperate there. Lawson and my meeting with the U.S. Ambassador to Iceland briefed her on AMSA, and the value of Arctic discussions with Iceland as other issues leave center stage. Iceland's President will return to Washington next week.
- The February dinner I attended at the Finnish Embassy was an opportunity to discuss cooperation ongoing now, and to get a sense that a Finnish delegation may come to Alaska late this summer. At the Iceland shipping meeting, Mikko Ninni, the head of Aker Arctic, noted a number of efforts his firm has in bringing icebreaker technology to the U.S. Arctic.
- Norway's Ambassador, whom I had met in Fairbanks, attended the Finnish Embassy dinner. A representative of the Embassy will be briefing our April meeting prior to our June visit to Norway.
- We have a letter to consider sending to Russia. Given pending issues on polar bear, fisheries, RUSALCA, whaling, and Beringia, I am recommending that we try to bring together, with State, some science bilateral across agencies with the Russians. This came up during the Climate Impact Commission meeting in Anchorage as Commissioner and North Pacific Fisheries Management Council expressed her own frustration with the need for common science in the Bering Sea region.
- I had dinner with the U.S. Ambassador to Mongolia, visiting Alaska en route home for consultations, Friday April 13. I told him about NSF's office in China, and common work we have with cold regions on climate change. He may seek our help.
- Kristján Kristjánsson, President of IASC, and I had a long conversation in Iceland about organization of ISAC – the internationalization of SEARCH – and AON. I will follow up with NSF's Karl Erb, but I think we're all of the same mind about getting a plan that makes it easier to understand what research and monitoring objectives are being met, and what objectives aren't.

D. Recommendations for Action

a. Staff and budget issues: schedule a retreat with staff to design job descriptions for internships, etc. Involve the Commission as much as Commissioners want to be involved, but make sure the Personnel and Budget Committees are in the loop. We need to conduct a job evaluation of John Farrell as he reaches his first year of service with us.

b. Commission goals: For the five key thematic goals, I am hoping each will attract a "lead" commissioner to do missionary work to see each goal organized in the federal plan. Likewise, there are a number of infrastructure goals (AON, icebreakers) and federal budget analysis (especially to highlight the extramural funding issue) that we need a strategy to pursue. We need to finish this meeting with a plan from staff to complete the full goals report and the individual recommendations for agencies.

- c. The law requires agencies to consult with the Commission as they start, stop, and conduct Arctic programs. I would like to discuss how we move toward implementing this in a formal, effective matter.

- d. Outgoing correspondence
 - Appointment of Syun Akasofu as Advisor to the Commission
 - Letter to Congress on funding for Ocean observation
 - Letter to Congress on increasing the OSRI program endowment for Arctic/subArctic oil spill research
 - Letter to the directors of the Asia Pacific Center for Security Studies and the Marshall Center regarding an accessible Arctic.
 - Letter to Russian leaders regarding research cooperation
 - Letter or statement regarding US Arctic Policy

- e. Upcoming events
 - Montreal Conference on Arctic policy, April 18-19
 - San Francisco: Association of American Geographers, April 20
 - Fairbanks: IARC naming in honor of Syun Akasofu, April 27
 - Washington, DC: IARPC Seniors Meeting, April 27
 - Washington, DC: ARCUS, May 22-23
 - Washington, DC: National Ice Center symposium on accessible Arctic, July 11
 - Japan trip (TBA)
 - Barrow: BCGRF Ribbon Cutting in June

Appendix B: Meetings and Other Activities During FY 2007

In addition to those meetings and other activities reported in the minutes, the Commission is represented, when possible, by Commissioners and/or staff at the regular meetings of the:

- State Department's Arctic Policy Group
- Interagency Arctic Research Policy Committee's staff meetings
- *Ad hoc* Alaska Arctic Council Working Group
- Interagency Extended Continental Shelf Task Force
- NSTC's Joint Subcommittee on Ocean Science and Technology (JSOST)
- Arctic Research Consortium of the United States (ARCUS)

The Executive Director began participating in an interagency review of the government's Arctic Policy, which began in June and continued into 2008.

Commissioners and/or staff also attend meetings of the National Research Council's Polar Research Board, the annual (spring) Arctic Summit Week, and all meetings of the North Pacific Research Board.

Several Commissioners and staff have attended meetings of the Arctic Council and meetings of the various working bodies under the Council:

- Emergency Prevention, Preparedness and Response working group (EPPR)
- Arctic Climate Impact Assessment (ACIA)
- Arctic Monitoring and Assessment Program (AMAP)
- Protection of the Arctic Marine Environment (PAME)
- Circumpolar Infrastructure Task Force (CITF) under the Sustainable Development Working Group.

In addition, Commissioners continue to attend meetings of the American Geophysical Union, and other science gatherings such as the

- The Oceanography Society
- US Permafrost Association
- Alaska Marine Science Symposium

Commission staff members also attend numerous administrative committees and subcommittees of

- US-IPY Public Affairs Working Group
- Small Agency Council
- Small Agency Procurement Committee

Appendix C: The Arctic Research and Policy Act, As Amended

PUBLIC LAW 98-373 – July 31, 1984
Amended as
PUBLIC LAW 101-609 – November 16,
1990

An Act

To provide for a comprehensive national Policy dealing with national research needs and objectives in the Arctic. Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled:

TITLE 1-ARCTIC RESEARCH AND POLICY

SHORT TITLE

SEC. 101. This title may be cited as the “Arctic Research and Policy Act of 1984, as amended.”

FINDING AND PURPOSES

SEC. 102(a) The Congress finds and declares that:

- 1) the Arctic, onshore and offshore, contains vital energy resources that can reduce the Nation’s dependence on foreign oil and improve the national balance of payment;
- 2) as the Nation’s only common border with the Soviet Union, the Arctic is critical to national defense;
- 3) the renewable resources of the Arctic, specifically fish and other seafood, represent one of the Nation’s greatest commercial assets;
- 4) Arctic conditions directly affect global weather patterns and must be understood in order to promote better agricultural management throughout the United States;
- 5) industrial pollution not originating in the Arctic region collects in the polar air mass, has the potential to disrupt global weather patterns, and must be

- controlled through international cooperation;
- 6) the Arctic is a natural laboratory for research into human health and adaptation, physical and psychological, to climates of extreme cold and isolation and may provide information crucial for future defense needs;
- 7) atmospheric conditions peculiar to the Arctic make the Arctic a unique testing ground for research into high latitude communications, which is likely to be crucial for future defense needs;
- 8) Arctic marine technology is critical to cost-effective recovery, and transportation of energy resources and to the national defense;
- 9) the United States has important security, economic, and environmental interests in developing and maintaining a fleet of icebreaking vessels capable of operating effectively in the heavy ice regions of the Arctic;
- 10) most Arctic-rim countries, particularly the Soviet Union, possess Arctic technologies far more advanced than those currently available in the United States;
- 11) Federal Arctic research is fragmented and uncoordinated at the present time, leading to the neglect of certain areas of research and to unnecessary duplication of effort in other areas of research;
- 12) improved logistical coordination and support for Arctic research and better dissemination of research data and information is necessary to increase the efficiency and utility of national Arctic research efforts;
- 13) a comprehensive national policy and program plan to organize and fund currently neglected scientific research with respect to the Arctic is necessary to fulfill national objectives in Arctic research;
- 14) the Federal Government, in cooperation with State and local governments, should focus its efforts on collection and characterization of basic data related to biological, materials,

geophysical, social, and behavioral phenomena in the Arctic;

15) research into the long-range health, environmental, and social effects of development in the Arctic is necessary to mitigate the adverse consequences of that development to the land and its residents;

16) Arctic research expands knowledge of the Arctic, which can enhance the lives of Arctic residents, increase opportunities for international cooperation among Arctic-rim countries, and facilitate the formulation of national policy for the Arctic; and

17) the Alaskan Arctic provides an essential habitat for marine mammals migratory waterfowl, and other forms of wildlife which are important to the Nation and which are essential to Arctic residents.

b) The purposes of this title are

1) to establish national policy, priorities, and goals and to provide a Federal program plan for basic and applied scientific research with respect to the Arctic, including natural resources and materials, physical, biological and health sciences, and social and behavioral sciences;

2) to establish and Arctic Research Commission to promote Arctic research and to recommend Arctic research policy;

3) to designate the National Science Foundation as the lead agency responsible for implementing Arctic research policy; and

4) to establish an Interagency Arctic Research Policy Committee to develop a national Arctic research policy and a five-year plan to implement that policy.

ARCTIC RESEARCH COMMISSION

SEC. 103(a) The President shall establish an Arctic Research Commission (hereinafter referred to as the "Commission").

b)(1) The Commission shall be composed of seven members appointed by the President, with the Director of

the National Science Foundation serving as a nonvoting, ex-officio member. The members appointed shall include:

(A) four members appointed from among individuals from academic or other research institutions with expertise in areas of research relating to the Arctic, including the physical, biological, health, environmental, social and behavioral sciences;

(B) one member appointed from among indigenous residents of the Arctic who are representative of the needs and interests of Arctic residents and who live in areas directly affected by Arctic resource development; and

(C) two members appointed from among individuals familiar with the Arctic and representative of the needs and interests of private industry undertaking resource development in the Arctic.

(2) The President shall designate one of the appointed members of the Commission to be chairperson of the Commission.

(C)(1) Except as provided in paragraph (2) of this subsection, the term of office of each member of the Commission appointed under subsection

(b)(1) shall be four years.

(2) of the members of the Commission originally appointed under subsection (b)(1)

(A) one shall be appointed for a term of two years;

(B) two shall be appointed for a term of three years; and

(C) two shall be appointed for a term of four years.

(3) Any vacancy occurring in the membership of the Commission shall be filled, after notice of the vacancy is published in the Federal Register, in the manner provided by the preceding provisions of this section, for the remainder of the unexpired term.

(4) A member may serve after the expiration of the member's term of office until the President appoints a successor.

(5) A member may serve consecutive terms beyond the member's original appointment.

(d)(1) Members of the Commission may be allowed travel expenses, including per diem in lieu of subsistence, as authorized by section 5703 of title 5, United States Code. A member of the Commission not presently employed for compensation shall be compensated at a rate equal to the daily equivalent of the rate for GS-18 of the General Schedule under section 5332 of title 5, United States Code, for each day the member is engaged in the actual performance of his duties as a member of the Commission, not to exceed 90 days of service each year. Except for the purposes of chapter 81 of title 5

(relating to compensation for work injuries) and chapter 171 of title 28 (relating to tort claims), a member of the Commission shall not be considered an employee of the United States for any purpose.

2) The Commission shall meet at the call of its Chairman or a majority of its members.

3) Each Federal agency referred to in section 107(b) may designate a representative to participate as an observer with the Commission. These representatives shall report to and advise the Commission on the activities relating to Arctic research of their agencies.

4) The Commission shall conduct at least one public meeting in the State of Alaska annually.

DUTIES OF THE COMMISSION

SEC. 104(a) The Commission shall

1) develop and recommend an integrated national Arctic research policy;

2) in cooperation with the Interagency Arctic Research Policy Committee established under section 107, assist in establishing a national Arctic research program plan to implement the Arctic research policy;

3) facilitate cooperation between the Federal Government and State and local governments with respect to Arctic research;

4) review Federal research programs in the Arctic and recommend improvements in coordination among programs;

5) recommend methods to improve logistical planning and support for Arctic research as may be appropriate and in accordance with the findings and purposes of this title;

6) recommend methods for improving efficient sharing and dissemination of data and information on the Arctic among interested public and private institutions;

7) offer other recommendations and advice to the Inter-agency Committee established under section 107 as it may find appropriate;

8) cooperate with the Governor of the State of Alaska and with agencies and organizations of that State which the Governor may designate with respect to the formulation of Arctic research policy;

9) recommend to the Interagency Committee the means for developing international scientific cooperation in the Arctic; and 10) not later than January 31, 1991, and every 2 years thereafter, publish a statement of goals and objectives with respect to Arctic research to guide the Interagency committee established under section 107 in the performance of its duties. b) Not later than January 31 of each year, the Commission shall submit to the President and to the Congress a report describing the activities and accomplishments of the Commission during the immediately preceding fiscal year.

COOPERATION WITH THE COMMISSION

Sec. 105(A) (1) The Commission may acquire from the head of any Federal agency unclassified data, reports, and other nonproprietary information with

respect to Arctic research in the possession of the agency which the Commission considers useful in the discharge of its duties.

2) Each agency shall cooperate with the Commission and furnish all data, reports, and other information requested by the Commission to the extent permitted by law; except that no agency need furnish any information that it is permitted to withhold under section 522 of title 5, United States Code.

b) With the consent of the appropriate agency head, the Commission may utilize the facilities and services of any Federal agency to the extent that the facilities and services are needed for the establishment and development of an Arctic research policy, upon reimbursement to be agreed upon by the Commission and the agency head and taking every feasible step to avoid duplication of effort. c) All Federal agencies shall consult with the Commission before undertaking major Federal actions relating to Arctic research.

ADMINISTRATION OF THE COMMISSION

Sec. 106. The Commission may –

- 1) in accordance with the civil service laws and subchapter III of chapter 53 of title 5, United States Code, appoint and fix the compensation of an Executive Director and necessary additional staff personnel, but not to exceed a total of seven compensated personnel;
- 2) procure temporary and intermittent services as authorized by section 3109 of title 5, United States Code;
- 3) enter into contracts and procure supplies, services and personal property;
- 4) enter into agreements with the General Services Administration for the procurement of necessary financial and administrative services, for which payment shall be made by reimbursement from funds of the Commission in amounts to be agreed upon by the Commission and the

Administrator of the General Services Administration; and

5) appoint, and accept without compensation the services of, scientists and engineering specialists to be advisors to the Commission. Each advisor may be allowed travel expenses, including per diem in lieu of subsistence, as authorized by section 5703 of title 5, United States Code.

Except for the purposes of chapter 81 of title 5 (relating to compensation for work injuries) and chapter 171 of title 28 (relating to tort claims) of the United States Code, and advisor appointed under this paragraph shall not be considered an employee of the United States for any purpose.

LEAD AGENCY AND INTERAGENCY ARCTIC RESEARCH POLICY COMMITTEE

SEC.107(a) The National Science Foundation is designated as the lead agency responsible for implementing Arctic research policy, and the Director of the National Science Foundation shall insure that the requirements of section 108 are fulfilled.

(b)(1) The President shall establish an Interagency Arctic Research Policy Committee (hereinafter referred to as the "Interagency Committee").

(2) The Interagency Committee shall be composed of representatives of the following Federal agencies or offices:

- (A) the National Science Foundation;
- (B) the Department of Commerce;
- (C) the Department of Defense;
- (D) the Department of Energy;
- (E) the Department of the Interior;
- (F) the Department of State;
- (G) the Department of Transportation;
- (H) the Department of Health and Human Services;
- (I) the National Aeronautics and Space Administration;
- (J) the Environmental Protection Agency; and

- (K) any other agency of office deemed appropriate.
- (3) the representative of the National Science Foundation shall serve as the Chairperson of the Interagency Committee.

DUTIES OF THE INTERAGENCY COMMITTEE

SEC. 108 (a) The Interagency Committee shall

- (1) survey Arctic research conducted by Federal State, and local agencies, universities, and other public and private institutions to help determine priorities for future Arctic research, including natural resources and materials, physical and biological sciences, and social and behavioral sciences;
- (2) work with the Commission to develop and establish an integrated national Arctic research policy that will guide Federal agencies in developing and implementing their research programs in the Arctic;
- (3) consult with the Commission on-
 - (A) the development of the national Arctic research policy and the 5-year plan implementing the policy;
 - (B) Arctic research programs of Federal agencies;
 - (C) recommendations of the Commission on future Arctic research grants;
- (4) develop a 5-year plan to implement the national policy, as provided in section 109;
- (5) provide the necessary coordination, data and assistance for the preparation of a single integrated, coherent and multi agency budget request for Arctic research as provided for in section 110;
- (6) facilitate cooperation between the Federal Government and State and local governments in Arctic research, and recommend the undertaking of neglected areas of research in accordance with the findings and purposes of this title;
- (7) coordinate and promote cooperative Arctic scientific research programs with

- other nations, subject to the foreign policy guidance of the Secretary of State;
- (8) cooperate with the Governor of the State of Alaska in fulfilling its responsibilities under this title;
- (9) promote Federal interagency coordination of all Arctic research activities, including-
 - (A) logistical planning and coordination; and
 - (B) the sharing of data and information associated with Arctic research, subject to section 552 of title 5, United States Code; and
- (10) provide public notice of its meetings and an opportunity for the public to participate in the development and implementation of national Arctic research policy.
 - (b) Not later than January 31, 1986, and biennially thereafter, the Interagency Committee shall submit to the Congress through the President, a brief, concise report containing

- (1) a statement of the activities and accomplishments of the Interagency Committee since its last report; and
- (2) a statement detailing with particularity the recommendations of the Commission with respect to Federal interagency activities in Arctic research and the disposition and responses to those recommendations.

5-YEAR ARCTIC RESEARCH PLAN

SEC.109(a) The Interagency Committee, in consultation with the Commission, the Governor of the State of Alaska, the residents of the Arctic, the private sector, and public interest groups, shall prepare a comprehensive 5-year program plan (hereinafter referred to as the "Plan") for the overall Federal effort in Arctic research. The Plan shall be prepared and submitted to the President for transmittal to the Congress within one year after the enactment of this Act and shall be revised biennially thereafter.

- (b) The Plan shall contain by need not be limited to the following elements:

- (1) an assessment of national needs and problems regarding the Arctic and the research necessary to address those needs or problems;
 - (2) a statement of the goals and objectives of the Interagency Committee for national Arctic research;
 - (3) a detailed listing of all existing Federal programs relating to Arctic research, including the existing goals, funding levels for each of the 5 following fiscal years, and the funds currently being expended to conduct the programs;
 - (4) recommendations for necessary program changes and other proposals to meet the requirement of the policy and goals as set forth by the Commission and in the Plan as currently in effect; and
 - (5) a description of the actions taken by the Interagency Committee to coordinate the budget review process in order to ensure interagency coordination and cooperation in (A) carrying out Federal Arctic research programs, and (B) eliminating unnecessary duplication of effort among these programs.
- COORDINATION AND REVIEW OF BUDGET REQUESTS.

SEC. 110(A) The Office of Science and Technology Policy shall

- (1) review all agency and department budget requests related to the Arctic transmitted pursuant to section 108(a)(5), in accordance with the national Arctic research policy and the 5-year program under section 108(a)(2) and section 109, respectively; and
 - (2) consult closely with the Interagency Committee and the Commission to guide the Office of Technology Policy's efforts.
- (b)(1) The Office of Management and Budget shall consider all Federal agency request for research related to the Arctic as one integrated, coherent, and multi agency request, which shall be reviewed by the Office of Management and Budget prior to submission of the President's annual budget request for its

adherence to the Plan. The Commission shall, after submission of the President's annual budget request, review the request and report to Congress on adherence to the Plan.

(2) The Office of Management and Budget shall seek to facilitate planning for the design, procurement, maintenance, deployment and operations of icebreakers needed to provide a platform for Arctic research by allocating all funds necessary to support icebreaking operations, except for recurring incremental costs associated with specific projects, to the Coast Guard.

AUTHORIZATION OF APPROPRIATIONS; NEW SPENDING AUTHORITY

SEC.111(a) There are authorized to be appropriated such sums as may be necessary for carrying out his title.
 (b) Any new spending authority (within the meaning of section 401 of the Congressional Budget Act of 1974) which is provided under this title shall be effective for any fiscal year only to such extent or in such amounts as may be provided in appropriation Acts.

DEFINITION

SEC 112. As used in this title, the term "Arctic" means all United States and foreign territory north of the Arctic Circle and all United States territory north and west of the boundary formed by the Porcupine, Yukon, and Kuskokwim Rivers; all contiguous seas, including the Arctic Ocean and the Beaufort, Bering, and Chukchi seas, and the Aleutian chain.



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