

January 31, 2004

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

It is my pleasure to forward the Annual Report of the U.S. Arctic Research Commission for Fiscal Year 2003 as required by the Arctic Research and Policy Act (ARPA) of 1984 (as amended).

Fiscal Year 2003 was a watershed year for the Commission. Its events reflected our increasing interaction with Arctic research entities at the local, state (Alaska), national, and international levels. Through these efforts, it became clear that there should be a greater presence of the Commission in Alaska, which is "America's Arctic." Thus, in August, a new, autonomous office was formally opened in downtown Anchorage staffed by a full-time deputy.

A summary list of the "Highlights of Commission Activities—FY-03" is appended. It documents the Commission's expanding role as a proactive 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.

As Commission Chairman, I am both privileged and proud to lead this agency whose achievements belie its small size of 7 (part-time) Commissioners and 3 full-time staff.

Respectfully submitted,

George B. Newton, 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 2003**

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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. In fulfillment of the provisions of the Act, the Commission presents the following report for fiscal year 2003 (1 October 2002 through 30 September 2003). For a description of the activities of the Commission in previous years, see previous Commission Annual Reports shown on Table 1 on the inside back cover.

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Highlights of Commission Activities – FY-2003

- Conducted four meetings: at the U.S. Army Corps of Engineers Cold Regions Research & Engineering Laboratory in Hanover, NH; in Washington, DC; at the Arctic Institute of North America on the campus of the University of Calgary, Alberta, Canada; and, in Unalaska and Dutch Harbor, Alaska. At the Hanover and Calgary meetings, the Commission met with key members of the Canadian Polar Commission. The full commission participated in a field trip to Iceland to review that country's science and technology policy and its research infrastructure in fishing and alternative energy.
- Negotiated invitations from the governments of Denmark (Greenland) and Canada extended to the U.S. Navy and NOAA for our ships and nuclear submarines to enter their respective Exclusive Economic Zones (EEZs) and conduct bathymetric surveys in support of claims under Article 76 of United Nations Convention on the Law of the Sea (UNCLOS).
- Identified, negotiated and gained authority for declassification and release of more than 123,000 nautical miles of submarine Arctic bathymetry. More than 750,000 data points (including data from the United Kingdom) have been made available to the science community through the efforts of the Commission since 1997.
- Continued to construct a link between the National Imagery and Mapping Agency (NIMA)/Maritime Safety Division and the Arctic Ocean research community. NIMA's new system will allow public notification of research instrumentation that can be hazards to submarine and surface navigation.
- Led a meeting of the Arctic Policy Group at the Department of State in early 2003 which described the tasks required to submit a claim for the extension of the outer limits of the U.S. continental shelf in the Arctic Ocean as allowed under Article 76 of UNCLOS. During 2003, the Commission was a primary motivator for the Senate Foreign Relations Committee holding hearings on U.S. accession to UNCLOS and submitted written testimony (requested) at those hearings held in October.
- Met with the Governor of Alaska, members of the Executive Branch, and State Legislators to assist in formulation of (Alaska) Senate Joint Resolution Number 44 (SJR44) which directs development of a long range research and development plan for the state to improve the well being of the citizens of Alaska.

- Took active steps to stimulate and coordinate civilian research use of the Navy's floating ice camp located in the Arctic Ocean during spring 2003. As a result of the Commission's notification activities, the ice camp was oversubscribed by researchers supported by the Office of Naval Research and the National Science Foundation.
- Completed a Task Force Report on 'Climate Change, Permafrost, and Infrastructure Impacts' to advise the federal agencies and State of Alaska on the changing nature of permafrost and its impacts on human and natural systems.
- Undertook a study jointly with the Prince William Sound Science Center/Oil Spill Recovery Institute to develop a research agenda for the recovery of oil spilled on and in sea ice. As part of this effort a workshop of international oil/ice experts was held in Anchorage.
- Played influential roles in U.S. participation in Arctic Council affairs especially with the Arctic Climate Impact Assessment, and working groups on Protection of the Arctic Marine Environment, Sustainable Development/Circumpolar Infrastructure Task Force, and Arctic Monitoring and Assessment Program.
- Established a new Commission office in downtown Anchorage staffed with a full-time Alaska Office Director.
- Formed a working group of international experts to examine the issues related to 'Scaling in Arctic Terrestrial Systems.'
- Participated as a Board Member of the North Pacific Research Board and the Alaska Ocean Observing System. Stimulated a study by the National Academy of Sciences to develop a long range plan for the study of the Bering Sea Ecosystem.
- Authored an article in July entitled "Arctic Ocean Research: Progress and Requirements" that was published in *Sea Technology Magazine*, a journal of marine business, science and engineering distributed worldwide.
- Published its Report, *Goals and Objectives for Arctic Research 2003*, as mandated by the Arctic Research and Policy Act of 1984 (as amended).

Major Research Priorities

During Fiscal Year 2003 USARC published its biennial *Report on Goals and Objectives for Arctic Research*. This report is required by The Arctic Research and Policy Act of 1989 (as amended), and the 2003 edition contains five major research priorities:

Studies of the Arctic Region and Global Change: Specific support for the Study of Environmental Arctic Change (SEARCH) program and the Arctic Climate Impact Assessment (ACIA).

Studies of the Bering Sea Region: Required interagency program equivalent to SEARCH and accelerated research program with emphasis on Pacific salmon.

Health of Arctic Residents: Recommendation that the Interagency Arctic Research Policy Committee (IARPC) commence planning for a third focused, interagency program on health concerns in the Arctic.

Research on Resource Evaluation: Recommendation that the Department of Interior (DOI) resume its resource evaluation activities for Alaska and the U.S. Arctic.

Research on Civil Infrastructure: Recommendation of continued support for the U.S. Army Corps of Engineers Cold Regions Research And Engineering Research Laboratory. Recommendation that the DOI take steps to acquire and make available precise geospatial data for U.S. Arctic maps.

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; and
- 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 Alaska office director in Anchorage, Alaska; an administrative officer, and a secretary in the Arlington office. The regional office of the Commission is located in Anchorage, Alaska.

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 published an annual report and co-sponsors a publication with the Interagency Arctic Research Policy Committee, the *Journal Arctic Research of the United States*. Major recommendations of the Commission on Arctic research policy, program priorities, and coordination efforts are published in the series *Findings and Recommendations* (Table 1), 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 2003 was \$1,076,100.

Response to Mandate, Fiscal Year 2003

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 2003:

October 17 - 18, 2002, 66th Meeting, Hanover, New Hampshire

January 27 - 28, 2003, 67th Meeting, Arlington, Virginia

May 14 - 15, 2003, 68th Meeting, Calgary, Alberta, Canada,

August 4 – 6, 2003, 69th Meeting, Unalaska/Dutch Harbor and Anchorage

The minutes of Fiscal Year 2003 Commission meetings are given in Appendix A. Appendix B is a list of other meetings attended by the Commission members and staff.

Appendix A
66th Meeting, October 17-18, 2002
U.S Army Corps of Engineers Cold Regions Research and
Engineering Laboratory (CRREL)
Hanover, New Hampshire

Thursday, 17 October 2002

In attendance:

a) Commissioners and staff: George Newton, Chairman; John Hobbie, Commissioner; Jackie Grebmeier, Commissioner; Jim Llewellyn, Commissioner; Jack Roderick, Commissioner; Mary Jane Fate, Commissioner; Garrett Brass, Executive Director; Lawson Brigham, Deputy Executive Director; Kay Brown, Administrative Officer.

b) Others: Steve Bigras, Executive Director, Canadian Polar Commission; Dr. Peter Johnson, Chair, Canadian Polar Commission; Vicki Keating, CRREL; Colonel John Morris, Commander of the ERDC Research and Development Center; Michael O'Connor, Director of Research and Development, Corps of Engineers, Washington, DC; Jackie Richter-Menge, CRREL Snow and Ice Division Chief; Terry Tucker, CRREL Geophysicist and Meeting Coordinator; Jim Wuebben, Acting CRREL Director. Additional CRREL staff joined the meeting and provided briefings during the morning and afternoon sessions.

CRREL Introductory Presentation and Discussion

The focus of the first day of this meeting was to better understand the role of CRREL in the Arctic. Following introductions, Colonel John Morris, commander of the Army's Engineering Research Development Center (ERDC) headquartered in Vicksburg, Mississippi, and Dr. Michael O'Connor, Director of Research and Development for the Corps of Engineers in Washington, D.C., briefly welcomed the Commission. Colonel Morris also familiarized the commissioners with ERDC, explaining that it is a relatively new organization encompassing all the Army's laboratories. Not only will one find the expertise of CRREL in ERDC, but also expertise in topographical engineering, geotechnical engineering, environmental science, computers, and other research of importance to the Army.

CRREL History

Jim Wuebben, acting director of CRREL, provided an overview of CRREL including a brief history of the organization and a review of recent research, customers, partners, accomplishments, and facilities. CRREL, in Hanover since 1961, is now part of the ERDC which comprises laboratories specializing in: geotechnical, environmental, coastal engineering, information technology, construction engineering (in Champaign, Illinois), and topographic engineering (in Fort Belvoir, Virginia). ERDC has approximately 2,000 employees and a research budget of \$500 million.

CRREL's history goes back to a time when the Army Corps started building airfields and bases in Alaska. The Corps built the Alcan Highway in 1942 across the heart of Alaska and Canada covering 1,450 miles. Out of this work several laboratories were established to research: frost effects (Boston District), permafrost (St. Paul District in Minnesota), and combined snow-ice-permafrost (Arctic Construction and Frost Effects Laboratory). These are all the predecessors of CRREL.

CRREL Achievements/Funding Issues

Some of the early achievements of these labs were the DEW Line stations, remote construction camps, and Camp Century (a camp for approximately 100 people out on the Greenland Ice Cap where ice cores were recovered). CRREL was heavily involved in advising and consulting on construction of the Trans-Alaska Pipeline. CRREL's mission is to advance and apply cold regions science and engineering, and all-seasons solutions, to the Army and the nation. CRREL's research covers more than 50 percent of the earth's land mass.

CRREL funds a number of key research spheres. These include:

Research Type	Focus	Dollars Funded
Environmental quality	Remediation and cleanup of contaminated lands	\$10 million
Infrastructure	Construction of buildings and airfields, emergency management in cold regions engineering, and flood control for navigation	\$5 million
Broad state of terrains		\$18 million

Wuebben remarked that although CRREL is a government lab with direct funding, somewhat less than half of those monies are directed toward specific Army programs. Many research activities are performed for other entities including: military Department of Defense (DOD) projects, other federal agencies Department of Transportation (DOT), National Science Foundation (NSF), Federal Aviation Administration (FAA), National Aeronautics and Space Administration (NASA), states, universities, and private industry. Some examples of recent CRREL assignments include:

- consulting on the construction of a new South Pole Station
- flood control and navigation studies for civil works in the Corps of Engineers, i.e. overcoming ice accumulation at locks and dams
- studies on cold weather concreting
- research on ground penetrating radars in cold environments
- using GIS techniques to identify where contaminants are located
- winter effects on Army field operations, i.e. mobility on frozen ground
- snow melt hydrology where CRREL scientists go out and collect weather and snow data in order to determine the resulting runoff.

Expertise was provided in Bosnia and now in the Sierra Nevada's studying snowmelt runoff in California. CRREL also operates a Remote Sensing GIS Center that provides significant, emergency management support to the Corps of Engineers. A Frost Effects Research Facility allows researchers to cycle soils and pavements through freeze-thaw cycles through the year.

CRREL staff, numbering 200, incorporates technical personnel organized around broad themes to take advantage of crosscutting expertise in such disciplines as mechanical engineering, hydraulics, physical sciences, geophysics, geology, biology, ecology, etc. To summarize, Wuebben explained that in recent years CRREL had worked in Korea, Bosnia, for the NSF at South Pole Station, and the Arctic. The CRREL staff is serving the nation's needs literally around the globe.

Commissioner Roderick asked about 'bio-defense research' being conducted by CRREL researchers. Wuebben answered that CRREL has been looking at ways to decontaminate things like anthrax. Studies have been conducted on the various states of anthrax (vegetative and spores) to see what states are more easily killed.

Discussion of CRREL as a National Resource

Before the day's individual presentations began, Chairman Newton shared with CRREL and Army Research and Development's senior leadership the Commission's positive relationship with CRREL. The Commission had come to CRREL in the past for meetings and that he, Dr. Garrett Brass, executive director, and Dr. Lawson Brigham, deputy director, United States Arctic Research Commission (USARC), have had numerous collaborations with CRREL staff during several decades. He said that CRREL "is a national resource that provides the nation with key capabilities for understanding and operating in the Polar regions. The Commission understands that many organizations—federal, state and private—have come to rely on CRREL's national and international reputation in Polar research. Well known individuals such as Andy Assur, Willy Weeks, Malcolm Mellor, Ed Link, Terry Tucker, and many others, have provided their expertise to solve important problems and serve on a host of national committees and study groups."

Newton continued that he and the entire Commission believe that as the country comes to understand climate change in a more comprehensive manner, CRREL has even more important roles to play. Issues such as permafrost and sub-sea permafrost degradation, coastal erosion, Arctic sea ice changes, river ice reduction, and changes in Arctic hydrology, all will place CRREL's expertise at the forefront of Arctic research. There are many changes ongoing in the Arctic and any alteration of the critical mass of expertise at CRREL would be a false economy. Newton added he understood that providing stability to the organization and the leadership at CRREL is critical at this juncture. He stated that he, the Commissioners, and staff wanted everyone to know how deeply we feel about the importance of CRREL and its resources.

Commissioner Fate thanked the Chairman for his strong remarks and commented about the importance of communicating CRREL's expertise particularly in Alaska.

CRREL Funding Concerns

Wuebben responded to the chairman's comments in saying that it is a very challenging environment when well over 50 percent of CRREL's funding is reimbursable. It was only a dozen years ago that the laboratory was predominately direct-funded. Now if the direct funding declines even more, the lab might be faced with reducing the size of the staff, which in turn would cause the problems that Newton identified—the loss of a critical mass of expertise. He continued that certainly the Polar regions are very important to CRREL, but on the other hand, CRREL was trying to increase its activities in Alaska, both in Anchorage and Fairbanks.

Brigham suggested that CRREL is similar to other national resources or assets involving the Polar regions, such as the U.S. Coast Guard icebreakers with which he is familiar. He said that the Coast Guard was trying to service a wide spectrum of customers outside the Coast Guard with these half billion dollar ships. The question asked many times during strategic planning exercises was where should national Polar assets be located within the federal government. This is quite similar to the situation for CRREL within the Army Corps of Engineers. With greater than 50 percent of CRREL's funding coming from other than direct Army funds, this successful laboratory is central to many other Polar activities throughout the country. CRREL happens to be, for historic and logical reasons, 'housed' in the Army, but provides services to many others, just like the Polar icebreakers. Brigham believes that the Army Corps of Engineers is not alone in facing this situation of a 'national Polar asset' conducting significant research and providing key services to a host of other entities outside the parent or 'owner' of the asset. In times of tightening or shrinking budgets, and changing priorities, how does the owner deal with this situation and what are the potential consequences (of any action by the owner) for overall Polar capability of the U.S.?

Permafrost Research

Wuebben thanked the Commission for all the positive comments and support. He indicated that these are indeed very challenging times for CRREL. Chairman Newton noted that there are two ongoing reports and studies that have relevance to CRREL. One is a Commission Taskforce on Permafrost which Terry Tucker, geophysicist, CRREL, and Brigham are members. The other is an Alaska State Infrastructure Taskforce that is drafting a strategic research and development plan for the state. Both should echo a strong need for a renewal of permafrost research in the U.S. and both should show how climate change can impact people in their daily lives.

Wuebben said that permafrost research is definitely a key issue and that CRREL has been putting a lot of thought into how it can renew its past expertise that was developed during the design and construction of the Trans-Alaska Pipeline. Although permafrost research is a recognized need, CRREL has not had the resources to fully develop a current body of expertise. Brigham mentioned that the Commission's taskforce report states that there is no focused federal permafrost research program today in the U.S. He said the report indicates that during the 1970s and 1980s CRREL and US Geological Survey (USGS) conducted world-class permafrost research and both organizations had tremendous impacts on Polar engineering. Today, there are individual researchers and small teams funded by National Science Foundation NFS to do some modest permafrost studies. The taskforce believes that NSF should not be the sole fund agency of permafrost research and that the Departments of Interior, Minerals Management Service (MMS), National Park Service (NPS), and the Agriculture Department, as well as CRREL, NASA, USGS, National Oceanic and Atmospheric Administration (NOAA), and the Environmental Protection Agency (EPA) have critical roles to play in conducting permafrost studies; particularly in this era of unprecedented climate change in Alaska and throughout the circumpolar world.

Scope of Commission

Dr. Michael O'Connor, Director of Research and Development, Corps of Engineers, asked where the taskforce report would go and who the Commission's reports to. Chairman Newton responded that the Commission is charged to report to the President and to Congress. The Commission's reports go directly to the President and the Congress; USARC is a separate, but small, agency funded through the committees that deal with VA, HUD, and independent agencies such as NSF. USARC works with committees dealing with Science, Armed Forces and Appropriations.

But the Commission works closely with individual members of Congress such as Senator Judd Gregg, (R-NH) and the delegation from Alaska. Senator Gregg has supported our efforts to get the U.S. to respond to the Law of the Sea opportunities to extend the outer limits of the continental shelf. The Commission is given rather wide latitude in its ability to communicate directly with many in Washington. The taskforce report will be distributed to many agencies and to anyone who wants it. Brigham added that the taskforce report findings and recommendations would be fed into the Commission biennial 'Goals and Objectives Report.' At the end of the taskforce report will be a list of specific recommendations for each federal agency. If the Commissioners so choose they can take the recommendations and use them to formulate their goals and objectives, thereby passing to various agencies what the USARC believes are critical issues for the U.S. in Arctic research. Newton added that the Commission has no research budget per se, only enough funding to function—pay salaries, office space, etc., with a small amount for study reports. He said that the primary function of the Commission is to use the bully pulpit to hopefully make convincing arguments (to folks who make funding decisions) that cold regions and Arctic research are critically important to the Nation's well being.

Commissioner Hobbie, from his perspective as a practicing scientist in Alaska, appreciated

the support of CRREL scientists for many years. He stated that CRREL researchers have been extremely helpful in many endeavors and this fact should be better communicated to the wider science community. His view also is that CRREL is a national resource since no other federal agencies can provide the broad range of Polar research and services that CRREL offers.

O'Connor responded that the Army could use all the support for CRREL that can be provided. With a potential war looming, and the DOD budget getting tighter and tighter, it is not going to get any easier to justify certain facilities and the Army needs the assistance of the Commission and the Polar science community on the Hill.

Fate sees good improvement in communications between CRREL and the state of Alaska, and she hoped for improved communication with Alaska by all the federal agencies.

National Snow and Ice Data Center (NSIDC)

Roderick asked about how CRREL might be involved with data from funded projects that is to be archived at the National Snow and Ice Data Center (NSIDC) in Boulder. Terry Tucker, CRREL geophysicist and coordinator of this meeting, responded that NSIDC is a public facility that holds considerable satellite data and some submarine Arctic data. The permafrost taskforce wants to make sure relevant data gets into the system since most of it is scattered around in the hands of many researchers. Brigham added that NSIDC is another national Polar asset. It is funded by several federal agencies and serves the broad Polar community. NSF-funded projects are required to send their data to the center. Currently, a permafrost data center is being formed but there is a lack of funding. Short-term funding has been received from the International Arctic Research Center at University of Alaska, Fairbanks (UAF), but the taskforce recommends that USGS and NOAA fund the permafrost effort ongoing at NSIDC.

CRREL's Polar Science Program

Jackie Richter-Menge, snow and ice division chief, began the CRREL topical presentations with an overview of CRREL's Polar Science Program. She said there are a large number of programs that are pulled together by common objectives to investigate the properties and processes that govern air, ice, land, ocean interactions in the extreme and complicated Polar environment. Observations are incorporated into models that help predict changes and impacts in the Arctic.

Approximately \$4 million is available to execute the program; 15 percent comes from Army direct program funding and 10 percent from the Office of Naval Research. However, the bulk of funding comes from NSF with collaboration with several universities, NASA, and other federal agencies. She indicated that the Army basic research funds are targeted to the terrestrial sciences and that her group had focused on competing for funds related to climate change research. The program conducts research on ice cores, Arctic sea ice, glaciers, snow properties and distribution, Arctic vegetation, autonomous drifting buoys, the Northern Sea Route, ports and harbors, and other topics where climate change will be a factor. The Polar Science Program also assists the Army in achieving its ability to have an all-weather, all-season fighting force.

Eagle River Flats

Marianne Walsh, chemical engineer, CRREL, then provided an overview of Army environmental projects, spending most of her talk on the cleanup effort of the Eagle River Flats at Fort Richardson, Alaska. The area was a training area where rounds of ammunition went into the marsh and waterfowl were inexplicably dying. CRREL's research beginning in 1990 studied the explosive residue of those rounds. Their analysis uncovered that the white phosphorous, used for smokescreens by the Army was the culprit. As a result, the site became a Super Fund site and a large-scale remediation program was initiated. In addition, field and laboratory studies are also being conducted to determine the impact of a dredging effort in the region.

Two other CRREL efforts involve determining the environmental impacts of placing a new brigade in Alaska and a monitoring program for Fort Greeley. Commissioner Hobbie asked about the draw down in the ponds and Walsh said the ponds were pumped out awaiting a series of flooding tides. Brigham mentioned that in the permafrost taskforce, one of the frequent concerns raised involves various DOD toxic sites where chemicals would be released into the water in the future as the permafrost thaws.

Arctic Perspective on Antarctic Logistics

George Blaisdell, research civil engineer at CRREL, spoke to the Commission about Antarctic logistics, work that is highly applicable to the Arctic. Conducted on behalf of the NSF's Office of Polar Programs and several other national entities; the projects comprise transportation, building technology, and general operations/logistics. CRREL has investigated using snow tractors to transport fuel to South Pole Station rather than using C-130 aircraft (it would take 335 hours compared to 6 hours by air, but twice the fuel load can be delivered using the same amount of fuel). CRREL has also conducted extensive work on developing ice and snow runways—they developed a runway on the Ross Ice Shelf that can be used by heavy wheeled aircraft year-round.

At the reconstruction site for South Pole Station, CRREL has consulted on a new waste treatment system and developed a mobile sewage transporter. It is also studying the settling of the new station that is being built on stilts with jacking capability. Roderick asked about the giant pad at South Pole and the settling rate. Blaisdell said that the pad was left for a year and nobody expected any additional settlement after an initial creep. CRREL was then brought in to provide some consulting on the physical properties of snow.

Climate Change

John Weatherly, ice geophysicist, CRREL, global climate models with CRREL, uses models to study present climate changes in the Arctic and attempts to make projections of what might be happening in the next 50 to 100 years. He said that there have been increasing global surface temperatures through most of the 20th century and during the last 20 years, the largest warming trend in the instrumental record has taken place. This period also corresponds with the era of using satellites to monitor the decreasing extent of Arctic sea ice. Weatherly uses the National Center for Atmospheric Research (NCAR) Community Climate System Model, trying to better include sea ice and snow cover processes in the system. He said that he receives coastal ice data from the Barrow Environmental Observatory, and buoy data from the North Pole Observatory, and runs new climate model simulations. The climate models assist him in looking at the impact on the Arctic when there is an increase in greenhouse gasses. Some of his models show that the Arctic Ocean could be ice-free in 20 to 50 years.

Commissioner Hobbie asked about the NCAR model and the role of the five models in the Arctic Climate Impact Assessment. Weatherly responded that he had briefed the ACIA group in Stockholm and the results of the NCAR model are incorporated in the ACIA analysis. He said that permafrost has not been represented well in the models and added that as general warming occurs, a more vigorous hydrologic cycle is assured. He also showed the output of the NCAR model when CO₂ is doubled.

White Brightness

Don Perovich, CRREL geophysicist and Surface HEat Balance of the Arctic Ocean (SHEBA) chief scientist, said that the key characteristic from space of Arctic sea ice is its white brightness. This effect reflects most of the incident solar radiation on it, a result called the ice albedo feedback. He showed that when the ice melts and is replaced by ocean, a dramatic increase results in the amount of solar radiation that is absorbed. Perovich discussed the SHEBA program that was

conducted aboard the Canadian icebreaker *Des Grossiere* from October 1997 to October 1998 in depth. This was a major climate change initiative conducted to understand the ice albedo feedback and then use this new information to improve climate models. He showed aerial photographs of the sea ice around the ship from April through September and commented about the meltwater and its effect on albedo. He summarized SHEBA by saying that sea ice albedo is strongly dependent on the surface state and there are five states found key: dry snow, melting snow, pond formation, pond evolution, and fall freezing. For the large-scale models, it is important to get the timing of these transitions right.

Missile Silo Placement

Peter Smallidge, project engineer with CRREL, discussed CRREL's applied engineering work for the Missile Defense Agency (MDA) involving the placement of missile silos and related equipment in Alaska. CRREL has done work on the site's foundation designs and building envelopes. Smallidge and his team have worked with the prime contractor, Boeing, on the winter performance of the silos. One of the concerns has been the problem drifting snow causes for the silo covers. In addition, studies were conducted on the icing impacts on all the facilities. This appears to be even more of a problem for the silos covers than snowdrifts. Most of this work is done by the Corps of Engineers at Fort Greeley with construction costs ranging from \$500 to \$700 million. CRREL staff has also surveyed the area using ground penetrating radar to search for glacial masses (these can upset the augers used in excavation of the silo sites). CRREL has been called upon to provide additional consulting for building large radar (5 million pound weight) at other sites around the state.

Fate noted that some of the work has been outsourced to the communities and the whole project has been very positive for the interior of Alaska. Brigham asked about the problems of situating any of the sites in permafrost environments. Smallidge responded by saying that CRREL had led the site team to Greeley since it is extremely stable with no permafrost in the missile field area. If MDA starts looking at additional sites further north, then climate change and the resulting impacts on permafrost would be serious factors.

Remote Sensing GIS Center

Tim Pangburn, Chief, Remote Sensing/GIS and Water Resources Branch, addressed the Remote Sensing GIS Center located at CRREL, a national center for this technology and a core center of expertise for the Corps of Engineers. The Center focuses on transferring technology out to the working districts, particularly for issues related to navigation, water control, and operation of reservoirs. Approximately 300 people are trained there annually. Pangburn presented several case studies about using remote sensing and advanced geographic information and spatial referencing (GIS) technologies to study a dam/reservoir near Lockhaven, Pennsylvania. He also discussed using satellite imagery to map the whole Sierra Nevada for the Sacramento District and develop a snowmelt model grid for forecasting runoff. Pangburn also showed how his Center had developed Web-based tools for emergency mapping management necessary in situations such as hurricanes, floods, and tornadoes. Finally he showed some of the Center's work using Radarsat imagery to view ice-clogged rivers such as the Mississippi.

Brigham asked whether the Center had complete coverage of the coast of Alaska in Landsat-TM and Radarsat because the Commission has found, when talking with other groups, that *usually the entire country has coverage, except for Alaska*. The Commission is very interested in making sure that Alaska has complete coastal coverage. Pangburn responded that there might be TM coverage, but not Radarsat. He said obtaining complete coastal coverage for Alaska is possible but it is a budget issue for the Corps of Engineers. He also mentioned that the Center was working with Terry Tucker in the development of an Alaska Engineering and Design Information System. This would also be useful in emergency management. Chairman Newton

asked if the Center receives accurate elevations. Pangburn responded that it did in terms of particular project areas such as the Mississippi Flood Plain where there is high-resolution data.

Farmer's Loop Road Site

Karen Henry, research civil engineer, CRREL, presented information regarding the Farmer's Loop Road site (in Fairbanks) which has been named to the National Geotechnical Experimentation Site Program (NGES). It is essentially a national asset operated by CRREL where researchers can study permafrost. The University of New Hampshire coordinates the NGES. The Fairbanks site also provides frozen ground education to graduate students from all over the country. The site has been used for ongoing pavement testing, foundation design, and bio-remediation. Close by in Fox, Alaska is CRREL's permafrost tunnel. With these national facilities, CRREL can partner with UAF, Alyeska, future gas pipeline organizations, the International Permafrost Association, and many other research institutes and universities.

Commissioner Grebmeier asked if Henry had collaborated with UAF, in particular the Engineering Department using these facilities. Henry mentioned that she did with both UAF and UAA, and researchers from both campuses have used the facilities. Terry Tucker stated that there was a formal educational partnership with University of Alaska (UA), but most of the teaching has been done at University of Alaska at Anchorage(UAA). Brigham said that the Fairbanks site would be included in the USARC Permafrost Task Force report. He recommended that Henry add the USGS to her list of agencies that should be conducting extensive permafrost research. Henry added one final point about the excellence of the CRREL library staff and their importance archive work.

Turbulent Air-Sea-Ice Interaction

Ed Andreas, physicist, CRREL, gave a presentation on turbulent air-sea-ice interaction; in particular, his interest in the theoretical aspects of turbulent exchange and three exchanges:

- momentum flux—the wind driving across the ice
- sensible heat flux—temperature difference between the surface and air
- latent heat flux—difference in the specific humidity at the surface and in the atmosphere.

He said without turbulence in the Arctic, there would be no sea ice in summer and in winter, the ice might be 10 meters thick at temperatures of -50° and even -100° . The temperature never gets much colder than -40° today because of turbulence. He reviewed the measurements taken during SHEBA using a 20-meter tower on the sea ice where a sonic anemometer (a wind-speed and temperature instrument) was used.

During SHEBA he and his team had the main tower and four remote sites around the ship so as to develop a drag coefficient for a time series from October 1997 through September 1998. They could determine the drag coefficient for different winter and summer regimes (surface of the sea ice); during summer the ice is quite heterogeneous with melt pond edges and other features such as ridges. In summary the drag coefficient was found to respond to the amount of open water from ponds, the amount of edges present, and the coverage of leads.

Battle Space Environment Military Program

Bert Davis, , CRREL research physical scientist and, one of the technical directors at CRREL, presented an overview of a direct military program regarding the battle space environment. This DOD taxonomy includes space and upper atmosphere, ocean environments, lower environments (troposphere to the surface), and terrestrial environments. The Army has responsibility for 95 percent of the research on the terrestrial environments but the Navy claims a terrestrial component in their definition of the littoral zone.

The Army has the responsibility to do the micro-forecasting down to 300 by 500 kilometer areas. CRREL's research on cold regions really spans most of these environments. Davis spoke about the Army's tight/extensive reporting requirements and outlined one project—the Interim Thermal Model (ITM)—a one-dimensional model for heat and mass transfer between the atmosphere and surface. This was a basic research project at CRREL to determine whether ITM can measure and model the radiant temperature of tank tracks and assess how long it has been since a tank moved through the area. The answer turned out to be “No” since the complex nature of the question required too much data. But ITM started other projects and advances, such as developing an ability to synthesize infrared scenes for tactical use, whereby a helicopter pilot or jet pilot can preview the area they are entering and get an idea of what the targets look like. Other projects reviewed included snow models with improved snow processes, a forest canopy model, and new snow mapping approaches.

Davis said that a number of reimbursable projects directly improved several direct-funded projects related to the battle space environment. CRREL has done some direct-funded work in the ERDC's Battlespace Terrain Reasoning and Awareness program, a 5-year, \$15-20 million flagship program of the Army. Essentially it is a GIS-based program that brings in how humans and vehicles and different activities become constrained or are enabled by terrain. Another Army project where CRREL will contribute is the Joint Rapid Airfield Construction Project. CRREL's models will be used to assess the state of the ground for building based on climatology. He also mentioned that the models support the Alaska Engineering Atlas that Terry Tucker is developing; a program can take climatology and other near real-time data and determine the annual expected frost penetration depth at any building sites. Overall, CRREL's support to all-seasons solutions has led to work in software development, model improvement, and getting back to basic research in its cold heritage.

A discussion ensued between Davis, Brass, and several Commissioners regarding DOD and its reluctance to study climate change. Davis reiterated that the battlespace environment research is totally focused on tactical issues and the Army has not been interested in the longer-term climate change impacts. Richter-Menge, engineer, mentioned that she hoped to coordinate a DOD-funded conference on climate change and long-term national security issues.

ERDC System

Nancy Liston, CRREL's librarian, outlined the new ERDC system that shifted the responsibility for the Cold Regions Bibliography to the Information Technology Lab (ITL) in Vicksburg, Mississippi. She reinforced that the product of CRREL is knowledge—knowledge of the winter battlefield, of the environment, of basic physical processes, and of engineering technology in cold environments. NSF has sponsored the preparation of the Antarctic Bibliography since 1962, and CRREL the Cold Regions Bibliography since 1951. However in 2000, NSF awarded \$860,000 to the American Geological Institute to continue these bibliographies for the next five years. Liston concludes that since databases, such as the Cold Regions file, will be around for many years. But she is concerned about the loss of gray literature upon the retirement of Polar researchers that these transitions could bring. (CRREL accepts collections from academic Polar scientists from around the world.)

Commissioners Hobbie and Roderick, and Nancy Liston discussed the changing access for documents by researchers. There are some charges associated with getting a copy of a specific document. Brigham expressed some concern about the short time frame of five years for a contractor of the bibliographies. If after every five years there must be a change in contractors, there may be some dysfunction when transferring to a different firm. Perhaps the NSF contact should be for a longer period.

Sea Ice Modeling

Mark Hopkins, ice engineer, CRREL, discussed CRREL's sea ice modeling efforts. Nearly all other sea ice models in the world are continuum models (developed by Bill Hibler of CRREL in the 1970's). His team's approach was to follow individual sea ice parcels. The goal was to attempt to model every ice floe in the Arctic (they are at 10-13 kilometer size today, with one kilometer the goal in 10 years). Since they are dealing with individual floes, the physics that is taking place between the ice floes is paramount. Models can show how ice can impact a structure with a capability of computing the forces on the structure. He showed one configuration that had 50,000 ice floes in an area 13 kilometers across. The team is modeling the fracture mechanics where floes are frozen together and then can break apart under loading from other floes or the wind. The Large Scale Basin Model can incorporate some ridging and Hopkins showed what the deformation of the sea ice in the Arctic Basin would look like after one day of deformation. The model's output has been compared and validated with deformation maps derived from Radarsat images. Another project is to use a finer scale model for Cook Inlet to study how floes might interact with an oilrig in the inlet.

Bio-remediation

Mike Reynolds, research physical scientist with CRREL, spoke about soil microbiology with particular applications to bio-remediation. He stated that the problem for CRREL is the large number of contaminated sites in Alaska from past DOD activities. The largest problem in Alaska tends to be petroleum due to the nature of the sites and its transport and storage at sometimes-remote locations. Another concern for bio-remediation in Alaska is the state's short 'operational season' in the summer. One approach is to use plants for petroleum cleanup (bio-remediation). The rizosphere at the interface between the roots and soil is an area of intense microbial activity. He showed the results of experiments using winter rye on soils that were taken from near the Fairbanks airport and other work done on plots at the Farmer's Loop site. While the use of plants is a inexpensive, it offers a very slow method of cleanup and there is the question of how to continue to monitor the site after the plants are installed. Chemical methods have been developed for monitoring using selected compounds that degrade more quickly.

Microbiology has undergone a 'revolution' during the past 5 to 10 years, so measuring continues to improve. One uses DNA to identify community composition and changes. Another method is real-time preliminary chain reaction (PCR) that assesses a measure of activity in the plant. When asked about the DNA technique and adenosine triphosphate (ATP), Reynolds responded about the importance of getting a representative sample. He said that CRREL has also been investigating pathogen persistence particularly in snow cover.

Additional Projects

Dave Cole, research civil engineer, CRREL, briefed the Commission on a range of projects being conducted considered in the Arctic and Antarctic:

- modeling the underlying processes of glacial flow – the key physics or real processes at the small-scale that underlie the large-scale behavior of glacial and snow masses.
- research on the mechanical properties associated with the breakup of sea ice.
- observing the breakup of land-fast ice in an area off Barrow used for sea ice roads and runways.
- studying the properties of methane hydrate that can be a solid, ice-like body and attempting to predict its strength and deformation.
- development of a new set of permafrost models to incorporate climate change in determining the mechanical properties of frozen soil.

Measuring Arctic Sea Ice Thickness

Terry Tucker presented an overview on using nuclear submarines to measure Arctic sea ice thickness. He reminded the group that Chairman Newton and Brass were the 'prime movers' during the 1990s for declassification of this data taken by upward-looking sonar. A paper by Rothrock and others (1999) showed that sea ice thickness decreased by 40 percent during the 1950s and 1970s compared with the 1990s. Tucker reviewed all the spring cruise data and came to an alternative conclusion. He determined that during the late 1980's and 1990s, the ice flux through Fram Strait increased dramatically (older, thicker ice was exiting). He has calculated a half-meter decrease in the ice of Canada Basin/Western Arctic, a smaller decrease in thicknesses than other investigators. He believes that ice dynamics have a greater role to play in these extraordinary changes. Chairman Newton stated that he believed Tucker was basically saying that thick ice was being exported in greater volumes rather than melting in place.

Chairman Newton introduced Dr. Peter Johnson, Chair of the Canadian Polar Commission and the Commission's Executive Director, Steve Bigras. Both came from Ottawa to attend the USARC meeting at CRREL. He said that USARC has continued to have close relations with its Canadian colleagues. The two Commissions met together at the last Arctic Science Summit Week in April 2001 at Iqaluit, Nunavut, Canada, and continue to exchange information about their respective cold regions.

Newton asked Johnson if there had been a decrease in the pileup of ice along the Canadian Arctic Archipelago. He responded by saying there had been changes in the sea ice within the entrance to McClure Strait, but not along the entire archipelago. Grebmeier said that in July and August, 2002, there was open water sailing aboard the *Healy* at 75 degrees North. Roderick asked if there was open water to the North Pole this summer and Grebmeier responded in the negative, although she believed the ship could have reached the North Pole in a week!

Building Design Issues for Cold Regions

Peter Smallidge returned to discuss several building design issues for cold regions. He showed roofs at Fort Drum (northern New York state) where there were problematic icings—roofs that were too hot rather than cold. Other problems include sliding snow from roofs. CRREL has developed guidelines to maintain cold roofs for the civil engineering community. One significant problem was encountered in a new medical facility completed at Elmendorf Air Force Base in 1999 by the Alaska District. Many of the large glass doors were improperly insulated or thermally broken; 30° below temperatures (15°-20° colder than normal in Anchorage) caused huge icing on the glass (high moisture levels must be maintained inside for the patients). The original design was altered by requirements for seismic improvements, thus changing the thermal characteristics of the doors.

Friday, October 18, 2002

Dartmouth University's Arctic Programs

Dr. Ross Virginia, a professor within Dartmouth's Department of Environmental Studies, addressed the Commission concerning Dartmouth's Arctic programs and future vision for Polar studies and research. His talk covered three topics: a brief history of the relationship of Dartmouth and the Arctic; a description of the Institute of Arctic Studies; and the current efforts by the College to expand its studies of all northern regions and the Antarctic. The last should provide even more opportunities to link CRREL with Dartmouth. He said that the history of the Arctic and Dartmouth revolved around Stefansson and an earlier president named John Sloan Dickey, who transformed Dartmouth College into realizing that it should play an important role in the world.

He brought Stefansson to Dartmouth in 1947 as an Arctic Consultant to the College and a Northern Studies Program was developed. In 1982 the John Sloan Dickey Center for International Understanding was founded and later in 1989 the Institute for Arctic Studies was formed as a research center with Oran Young as Director.

Virginia said that the Institute has focused on several areas of research:

- the relationships among institutions in the North
- co-management regimes in the Arctic (involving fisheries)
- studies trying to understand how traditional ecological knowledge can be used in modern management schemes
- studies on reindeer and caribou systems.

The Institute of Arctic Studies has played a large role in the establishment of the University of the Arctic. Another core project has been coordinating the International Human Dimensions Program on Global Environment and Change. One aspect has been to look at issues that affect the Circumpolar North (such as the carbon cycle) compared with a set of issues important to Southeast Asia.

Dartmouth has begun to develop an undergraduate curriculum much like the Northern Studies Program of several decades ago. An introductory course (for a new undergraduate minor) will be introduced which will focus on the major scientific issues facing the Arctic and Antarctic, and the institutions and political issues that face both regions. Dartmouth is particularly interested in developing further relationships with CRREL scientists. In summary he believes new resources and energy are now being devoted to expand Dartmouth's views of the Polar regions and its linkages with CRREL.

Commission Considerations

A lengthy discussion followed Virginia's talk regarding the linkages of Dartmouth to UAF and Alaska and the future of the relationship with CRREL. Fate remarked that it should be very possible to get Dartmouth's students into the Alaska's villages for a host of field experiences. In response to a question by Roderick, Virginia said that cooperative opportunities between Dartmouth and UAA and UAF are being explored. Brass, expanding on Fate's remarks, mentioned that Dartmouth should link with the Alaska Federation of Natives and explore opportunities for internships and for exposure to the Native corporations and villages. Brigham and Tucker mentioned that there had been a long history of Dartmouth students doing their research at CRREL, both undergraduates and graduate students. Chairman Newton and Virginia discussed the relationship of CRREL and Dartmouth in terms of both teaching and research. Dartmouth is interested in both from the CRREL staff.

Law of the Sea (UNCLOS) Article 76

Dr. Larry Mayer, University of New Hampshire, (UNH) was invited to present on the implications of the Law of the Sea (UNCLOS) Article 76, in particular what this means for Arctic bathymetry requirements. He is head of the Center for Coastal Mapping and he said that any potential claim for an extended margin had tremendous implications for the Arctic Ocean. Mayer showed how much of the U.S. coast has been surveyed that can be used to establish a potential claim around the U.S.; the least sampled region is off the Alaskan Arctic. His work was to review all the regions where there was a potential for a U.S. claim (the West Coast was excluded right away because of its narrow margin) and attempt to determine what surveys will be necessary to conduct. He and his team found very little high-resolution bathymetric data. Two high priorities are the East Coast and the 'Donut Holes' in the Bering Sea. He said that the Commission had estimated that an estimated cost to use a submarine and icebreaker to

adequately survey the Arctic (near the Chukchi Cap and off the northern coast of Alaska) would be \$12 million.

A long discussion was held among Chairman Newton, Commissioners Grebmeier and Roderick, Executive Director Brass, and Mayer regarding the use of a nuclear submarine for the surveys and the international arrangements (with Canada, Denmark and Norway) necessary to conduct effective surveys in the North American Arctic. Commissioner Newton said that Admiral Watkins and the Commission on Ocean Policy had been presented this issue and hopefully they will have some influence. Brass mentioned that when he went to the UN last November advising State on this topic, the White House had approved a statement that the U.S. intends to accede to the LOS Treaty. Mayer said that there is funding in the 2003 budget for LOS studies, so there appears to be continued interest in the Congress for the Treaty. Chairman Newton stated that the Commission would continue to push for these surveys; he also said he was pleased Peter Johnson and Steve Bigras were in attendance since they know of USARC's efforts to work with Canada (Dave Monaghan) so that submarine and icebreaker surveys can be a cooperative venture.

Bathymetric Chart of the Arctic Ocean

Dr. Martin Jacobsson next presented his continuing work at UNH to create a new bathymetric chart of the Arctic Ocean. The original intent of the project was to assemble and rationalize all available bathymetric data north of 64 N for creating a coherent database (so as to create better maps of the Arctic Ocean sea floor). Jacobsson showed the most recent maps from the database...including a 1 by 1 minute grid. He said that he now has contours available so that people can download contours as well as the actual maps. The web site for the Arctic Bathymetric Chart has attracted some 600-1000 people per week. He also showed some of the maps in 3-D that provide remarkable perspectives of the Arctic Ocean basin. Additional data to be added will be that gathered during the *Healy* and *Polarstern* expedition to the Gackel Ridge in summer 2001. He said that the continuing cruises of the *Healy* add significant tracks to the database.

Canadian Polar Commission

Steve Bigras then briefed the Commission on the history and operation of its Canadian counterpart.. He thanked USARC for inviting them to CRREL and he felt that two organizations are working quite well together. He said that the Commission's mission statement had been changed from 'advancing Polar knowledge to advocating and developing Polar knowledge.' The CPC was established by an act of Parliament in 1991 with up to a 12-member board and a staff to be located in Ottawa; the mandate was to monitor the state of Polar knowledge and advise the government on the strengths, weaknesses and opportunities with respect to Polar research in Canada. The CPC also attempts to enhance Canada's international profile as a circumpolar nation and it advises various departments and ministers on Polar issues. Today the CPC has seven members with five from the North. The staff of six has offices in Ottawa and he operates with a budget of \$1 million Canadian (approx \$ 600 K U.S.). He then turned the presentation over to Dr. Peter Johnson, Chair of the CPC.

Johnson said that during the past two years he was pleased to see such close cooperation and interaction between the two Commissions. He hoped this would continue as there were many issues to deal with including ones related to the UNCLOS 76 surveys. It was important that the CPC had knowledge of what is going on from a foreign affairs perspective. Johnson said that there were several strategic objectives of the CPC including the dissemination of information on both the Arctic and Antarctic, addressing the whole issue of where Canada sits within the international Polar science community, and to place pressure on the Canadian government to increase its commitment to Polar science. He said that during his 3.5 years on the CPC they have

reorganized to put the CPC in a *position as a national advisory body on Polar issues*. The CPC has increased its connections with aboriginal groups and the granting councils in Canada. They have been mandated to maintain connections to International Arctic Science Committee (IASC) and to Scientific Committee on Antarctic Research (SCAR), but they also taken a much greater role with the Arctic Council and various UN processes.

Johnson said that the CPC was increasing the amount of material to get out in published form; the CPC co-hosted the January 2002 conference on 'On Thinning Ice.' They received permission to host the Northern Research Forum in 2004 and have forwarded to several ministers plans for a Canadian Antarctic research program. The CPC has established during the past 3 years an information network that is now in a fairly robust format; they have created a report that monitors the state of Canadian Polar knowledge using a set of indicators. He believes Canada now has fairly close ties with Iceland, Norway and Finland with regard to Polar science, and is increasingly close to the EU in terms of trying to promote Polar science activities between the EU and Canada. The CPC finds itself increasingly submitting briefing notes to various government officials on a host of Polar issues. One of the major issues the CPC is focusing on is the maintenance of monitoring programs in the Canadian North, a critical issue related to climate change. In summary, he said that there is more awareness of Polar science issues in the Canadian government and other organizations and the CPC looks for increased funding support.

Chairman Newton asked Johnson how many times the CPC meets and he responded that four meetings are held with two in the North. Fate recommended contact with UA President Hamilton and VP for Research Dorman. Brass mentioned that in the U.S. has the Interagency Committee and Johnson responded that in Canada the Deputy Ministers had met on Polar issues, but this system had not proved effective. Chairman Newton brought up the subject of 'Canada's Ocean Strategy' that did not include much on the Arctic or research. Johnson responded that it was unfortunate that the document was issued by Fisheries and Oceans and was really a discussion paper. Chairman Newton thanked Johnson for the overview and said he was impressed by CPC's publications and work attempting to evaluate Polar knowledge. Brass said that he would be in contact with Johnson and Bigras to organize a future joint meeting.

Chairman George Newton, USARC

Activities July 2002 to October 2002

- Newton prepared paper for presentation to Arctic Technical Period at OCEANS 2002 meeting during the last week of October.
- Worked with Dr. Brigham to complete and submit abstract of talk to be given at AAAS (Arctic Sections) meeting at UAF on September 18.
- Worked with Dr. Brass to prepare written testimony to the Commission on Ocean Policy prior to the Anchorage hearing on August 21. Prepared an abbreviated version of written text for oral delivery to the Commission.
- Attended the Commission on Ocean Policy (COP) meeting on Federal Ocean Research Facilities held at the COP offices in downtown Washington, D.C.
- Met at USARC offices in Arlington, Virginia with Dr. Brass and Dr. Dennis Conlon, ONR 3zzHL, and his assistant, Dr. Robin Meunch to discuss status of plans for the civilian science ice camp that is to follow the Navy FY-03 ice camp in the spring of FY 03.
- While at the University of Alaska Fairbanks on September 18, Newton met with Dr. Craig Dorman, Vice-President for Research, University of Alaska, with Dr. Brass and Dr. Brigham to discuss the preliminary report from the Commission on Ocean Policy and Alaska legislative resolution SJR44 concerning the preparation of an Alaskan Economic Development research and development plan.
- Newton attended a meeting hosted by the University of Virginia College of Ocean Law and Policy on Capitol Hill (Rayburn Building) at which Admiral James Watkins gave a talk on the mid-term findings of the Commission on Ocean Policy.

67th Meeting, January 27-28, 2003
National Science Foundation
Arlington, Virginia

January 27, 2003

In attendance:

a) Commissioners and staff: Mr. George Newton, Chairman; Mrs. Mary Jane Fate, Commissioner; Dr. John Hobbie, Commissioner; Dr. Jacqueline Grebmeier, Commissioner; Mr. Jim Llewellyn, Commissioner; Mr. Jack Roderick, Commissioner; Mr. Mead Treadwell, Commissioner; Dr. Garrett Brass, Executive Director; Dr. Lawson Brigham, Deputy Executive Director; Mr. Lyle D. Perrigo, Alaska Officer; Mrs. Kay Brown, Administrative Officer; and

b) Others: Jonathan Berkson, US Coast Guard; Paul Bienhoff, John Hopkins University; Commander Bodensadt, US Coast Guard; Dr. Phillip Chen, National Institute of Health; Dennis Conlin, Lee Cooper, University of Tennessee; Office of Naval Research (ONR); Renee Crane, National Science Foundation (NSF); Dr. Sheldon Drobot, National Academy of Sciences (NAS), Polar Research Board (NAS/PLB); Christine Elfring, NAS/PRB; Dr. Anna Kertula, NSF; Dr. James Morison, University of Washington; Charles Myers, NSF; Thomas Pyle, NSF; Dr. Neil Swanburg, NSF; Dr. Bill Woolf, Senator Murkowski's staff.

Reports and Discussion by Commissioners

After Chairman Newton made his report other commissioners commented on their activities since the last meeting in Hanover NH.

Commissioner Hobbie discussed his contribution to the Arctic Climate Impact Assessment (ACIA), a 19-chapter publication written by an international team of scientists. Hobbie is working on a fresh water ecosystem chapter—20 to 30 pages of which can be seen on the Marine Biological Laboratory web site. An item of note is the ultraviolet-B (UVB) effects on fish.

Hobbie also attended a meeting sponsored by a Study of Environmental Arctic Change (SEARCH) that focused on the needs for future research on Arctic change and attracting terrestrial biology and marine biology into the program. He is also working with the national Long-term Ecological Research Program through a special issue of the journal *Bioscience* he edited. The goal of the issue was to report on the long-term ecological program ongoing since 1980, its results, and how the program has affected scientific thought. The program comprises 1,200 scientists working in some 24 types of sites in the US—deserts, forests, arctic tundra, lakes and oceans—two of which are in the Arctic and four in the Polar regions.

Hobbie also elaborated on a report regarding Arctic river discharge into the Arctic Ocean. The University of New Hampshire, in cooperation with the Russians at the State Hydrology Institute, is developing a database developed at

Commissioner Treadwell activities include:

- Continued work as Commission's liaison to the Arctic Council, working as a policy respondent with Dr. Craig Dorman, vice- president of research, University of Alaska, as requested of the State Department. The Council's senior Arctic officials meet in early April in Iceland. This ad hoc group in Alaska, which was formed by the Commission

and made up of federal agencies and others interested in Arctic Council activities, meets once a month. Its Sustainable Development Working Group and Circumpolar Infrastructure Task Force (CITF) are studying ways to link telecom, air routes, and northern sea routes in the Arctic. Workshops have continued with the Russian/US/Far East representatives and the transportation subgroup of that joint committee will meet in late February to focus on air and sea routes. It is expected that CITF will have white papers on research needs and policy options for air and sea routes. Treadwell convened a mapping meeting at the DOI with Drew Pearce, special assistant, where commercial interests for better mapping in Alaska were discussed. There is a proposal for close to \$90 million on the table to finish bringing mapping of Alaska up to national standards.

- Lt. Governor Leman and Senator Murkowski passed a resolution asking the federal and state governments to determine how research institutions could work together and deliver a report to the Alaska's Legislature on research priorities. Dr. Craig Dorman created an inventory of the research in Alaska. Dorman convened the leaders of the funding institutions in Alaska: North Pacific Research Board (NPRB), Exxon Valdez Oil Spill (EVOS), and Oil Spill Recovery Institute (OSRI), commercial fisheries, the Denali Commission and other agencies to work on this. IARPC is also participating.
- Treadwell met with a scientific advisory committee at the Barrow Science Consortium and with Apollo XVII astronaut Jack Schmidt to learn more about NASA and remote sensing especially in conjunction with the Barrow Environmental Observatory and the Barrow Arctic Science Commission (BASC).
- Treadwell attended a meeting at Oil Spill Recovery Institute (OSRI), chaired by John Calder. OSRI held a couple of workshops this fall. Dr. Gary Thomas has moved to the University of Miami and OSRI is recruiting a new director.
- Treadwell also met with representatives of the Aleutian-Pribilof Island Association and with Commissioner Roderick and Deputy Director Brigham, United States Arctic Research Commission (USARC) regarding new office space in Anchorage.
- He attended the swearing-in of Alaska Governor Murkowski on December 2nd on behalf of Commission and also attended the swearing-in of US Senator Lisa Murkowski in January. There he had opportunity to meet with President Bush, thanked him for appointing him to the Commission, and told him about USARC's work.

Roderick stated that he was one of the industry representatives on the Commission. His work has primarily concerned oil and gas matters. He is on the Alaska Science and Technology Foundation board that makes available about \$100 million to help small entrepreneurs in Alaska. He is concerned about what the Arctic Research and Policy Act has mandated, and that is to coordinate the federal agencies in their efforts in Arctic research.

Commissioner Fate introduced herself and stated she had worked with several researchers in the past regarding problems affecting the handicapped on and off reservations throughout the US including Alaska. She also worked on research-focused efforts concerning women and saw positive results in both urban, rural, and reservation Indian communities. Fate said that there is great concern regarding increasing suicide rates in Alaska. Suicide used to be a statistic among men but increasingly more, younger women are being affected.

Commissioner Grebmeier discussed the type of bilateral, multilateral work that is being done with the Russians. She noted a report that Treadwell compiled that provides information about the agencies participating in the Interagency Arctic Research Policy Committee (IARPC) and how interested individuals may access these agencies' web pages to learn about their ongoing programs. Her interest is to deal with issues of Russian access and access to the Russian Arctic.

She is also interested with oceanography in Latvia and would like to see the younger generation and students involved.

Grebmeier participates on a working group that is concerned with how to scale regional studies to a pan-Arctic valuation of global change.

Grebmeier attended the Science Steering Committee regarding SEARCH. She is the chief scientist for the Shelf Base Interactions program meetings as well, and will report on this later in the meeting.

Staff Reports

Executive Director Brass said that in addition to meetings he attended with Chairman Newton, he attended the Executive Committee of the Glacier Society in Connecticut and suggested the creation of useful work with the retired Coast Guard icebreaker. Suggestions included a medical research platform, perhaps public health delivery services and conducting associated studies on both health and environmental questions that may contribute to native health. These possibilities lead to an additional meeting and it looks as though there will be substantial funding for the Glacier and that it may be operational in several years.

He attended the Joint European Ocean Drilling program meeting in Copenhagen to discuss Arctic site surveys. He discussed US participation in Beringia research and the fact the Swedish Academy of Science can conduct surveys in the regions. He also discussed needs for equipment and support to do scientific surveys in the Arctic that will help understand the Russian Article 76 claim. He said there is a great need for the United States to do substantial surveying in the Arctic.

Brigham attended several meetings over the past few months including:

- A meeting in Honolulu discussing the international bathymetric chart of the Arctic Ocean and Article 76 issues.
- Science Steering Committee meeting that centered on the financial limitations affecting the SEARCH programs operations. However, he learned that there is an indication that NASA will have funding for cryospheric research that would be related to SEARCH.
- International Polar Year Forum at the National Academy that was dominated by Antarctic issues at first and other Arctic research later concerned SEARCH.
- University of Alaska at Anchorage (UAA) conference on climate change and engineering aspects of climate change where he presented the USARC permafrost study.
- Marine Science Conference of the Northeast Pacific where 490 marine scientists met in Anchorage. Issues ranged from Bering Sea oceanography to Steller Sea Lion decline.

Brigham also reported that in December guidelines were approved by the International Maritime Organization for ships operating in Arctic, ice-covered waters. This is a major step toward enhanced marine safety and a much-improved measure for protecting the Arctic marine environment. He worked on a chapter in the Arctic Climate Impact Assessment that deals with infrastructure, Arctic shipping, and changes in sea ice. Also, during the past 14 months, Brigham spoke with 58 different newspaper staff regarding issues of sea ice and the Arctic Ocean, Northwest Passage, Northern Sea Route, and strategic implications of all these in Arctic development.

Lyle Perrigo, Alaska Officer, reported he met with NANA Development Corporation and the Arctic Slope Regional Corporation to encourage them to work in using building standards designed for the cold climate. Cold climate building specifications have not been standardized in the US for mechanical, electrical, engineering or building designs. Most of the specifications derived from a lower 48 "recipe" books lead to problems. He also, worked on several oral histories of Commission.

At this time Newton announced that Perrigo would be retiring shortly. He congratulated Perrigo for his 18 years of service to the USARC and his remarkable attendance record since he was able to attend all but three meetings. Roderick made a motion for a formal resolution of appreciation for Perrigo's service to the Commission. A second was made and the motion was passed by unanimous consent.

Interagency Arctic Research Policy Committee

Chuck Myers of the National Science Foundation (NSF) spoke about three of the current activities of the Interagency Arctic Research Policy Committee:

- US Arctic research plan revision 2004-2008 being prepared; plan to be sent to White House by July 31
- joint Arctic research in the US
- collection of budget information on Arctic research in federal agencies.

Myers continued to explain that the Commission has made recommendations in the *Goals and Objectives Report* for programs on Arctic environmental change, varying sea studies, and Arctic health research. These recommendations cycle from the Commission's 2001 report. Brass commented that originally the reports reflected a huge laundry list of items that needed attention in the Arctic. He has since focused on at least three major items that may have a reasonable chance of being accomplished. Other items are noted in the report and may become major initiatives in future reports. Myers said other items in the report include Arctic infrastructure and resource assessment.

Issues of resource expansion, sustainability, contaminants, culture, and health drive commission recommendations and many of the agency activities. The research community has different view of need for the Bering Sea research such as more focused research on ecosystems, environmental change, and modeling. Brass said his hope is to meld the two needs closer together and that means taking a broad, ecosystem approach. The scientific community desires working with resource agencies to develop scientific management of Bering Sea systems including fresh water impact from wetlands and rivers, a long-term program, perhaps 10 to 15 years.

As for environmental and public health (concerns), the broad issues include disease, occupational injury, limited health care, elimination of health disparities, to name a few.

Maintaining The Icebreaker Fleet

Commander Bodenstadt of the Coast Guard spoke about the *Healy* assisting the *Polar Seas* with re-supply and ship escort mission. The *Healy* should be ready to deploy in the middle of June for the coming summer's Arctic missions. Both of the above named icebreakers are 25 years old. In order to extend their service life for another 30 years, \$365 million will be needed. Actual renovation would not begin until FY 08 and it will take about two years to renovate each ship.

Brass asked if the research community could look at proposed renovations to see whether scientific capabilities of the ships can be done at the same time. Bodenstadt said some of the limitations for scientific equipment upgrades stem from the existing configuration of the flight deck and hanger. He stated that the national requirement is for four icebreakers.

Newton said that it is important to keep the dialogue open as was done with the icebreaker *Healy* as use of the ship has proven beneficial for the science community and the US Coast Guard.

Murkowski's Participation

Bill Woolf from Senator Murkowski's staff spoke to the Commission about his anticipation that Senator Murkowski will continue strong support for activities of the Commission. She will be on the Energy and Natural Resources Committee and will also take a seat on the Environment and Public Works Committee. Her sub-committee assignments have not been finalized at this time.

Radioscope Pollutants

Brass said that there were concerns about radioisotope pollutants in the Russian Arctic because they are planning to bring fuel rods to Mayak for reprocessing. Woolf asked Hobbie for a report on the increase flow out of Russian rivers and Hobbie said he was happy to supply a copy from this NSF Arctic System Science project.

National Science Foundation Activities

Dr. Tom Pyle from NSF announced that the new program director in the Arctic Social Sciences Program is Dr. Anna Kertula. The new program director at Arctic systems Science program is Dr. Neil Swanburg, and Renee Crane works in the area of Arctic education and outreach.

Pyle spoke about the 2001 *Healy* cruise conducted jointly with the Germans on the *Polarstern* to study the Gakkel Ridge in the Arctic. The science papers are already being published. Also, the Shelf Basin Interactions (SBI) program met with some objections from native whalers but that has been satisfactorily corrected by changing the timing of the cruise. This brought up an important point that better interaction was needed with local groups. Next is the need to develop a guidelines document with Barrow Arctic Science Consortium (BASC) and the Alaska Native Science Commission (ANSC) for the improved cooperation. The guideline document will then be expanded to include State Fish and Wildlife and organizations of that nature. Pyle noted that it is important for every Arctic scientist to be aware of the culture and people who may be affected by scientific studies.

Brass asked if ANSC might be the logical liaison for this purpose since it is familiar with the science and the communities that may be affected. Pyle confirmed that including ANSC is part of the plan. He continued to say that Grebmeier has more information about the SBI programs. The fieldwork is focused in the middle of the Arctic Ocean, along the north coast of Alaska, including interactions with water from the Bering Strait currents and transfer across the shelf in places like Barrow Canyon. SBI has three phases planned over a 10-year period. The *Polar Star*, *Alpha Helix* and the *Healy* are assets that have been or are planned for use during SBI.

Pyle then spoke about Global Positioning System (GPS) surveys to note position and change of Alaska glaciers. They seem to be generating twice as much melt water as Greenland's do across the entire ocean. This represents several millimeters of change. On another note, Pyle said there is a plan to add a Bering Sea Ecosystem component to SEARCH.

Community Hydrological Analysis and Monitoring Program (CHAMP) covers a wide variety of problems in atmospheric and land surface dynamics, estuarine flow into the ocean, sea ice, permafrost, and includes interaction with biological dynamics and systems that may affect people. Many Arctic people are dependent on food in the rivers and they are concerned about interactions with construction and infrastructure. CHAMP will look at a variety of these concerns. The Arctic and Subarctic Ocean Fluxes (ASOF) program will measure ocean fluxes that connect the Arctic and Atlantic Ocean systems. It is certainly important to look at the physical drivers, ecosystems, and the interface of the academic and fisheries world. Pyle said they are working closely with NOAA on this project. Brass commented that the facts that are known about the Bering Sea are not being shared between scientists with different study focuses. Fate said the federal agencies were not sharing information with the state agencies either. Pyle replied that they are working to get the competing groups together. There are several groups working on the Bering Sea.

Treadwell said that the Environmental Protection Agency has approached the Bering Sea from the contaminants side. He is also aware that North Pacific Research Board \$14 million for large research grants with the authority to make international grants. There may be an opportunity to make a single organized program. Pyle said the whole process that began with the Commission is beginning to bear fruit in different places and it is time to bring people together. He said there are infrastructure issues that may need to be addressed and his organization may or may not be able to provide everything. Help is welcome.

Pyle stated there is a proposal to bring over the Swedish icebreaker *Oden* in 2005. The US and several other countries were represented in discussing the plan to have a joint operation with the *Healy*. The idea is to run along the Northern Sea Route in Russia and work would be done off Beringia, basically off the Alaska coast. *Oden* and *Healy* would then cross the Arctic Ocean, particularly across the Canada basin, conducting oceanographic work along the track.

Pyle also discussed the need for an international SEARCH meeting. Planning needs to be done far in advance of the meeting date. Treadwell said he would hope to start discussing proposed international aspects of SEARCH at upcoming meeting in New Hampshire. Pyle said an 'International SEARCH' would be a good follow-up to the Arctic Climate Impact Assessment.

Pyle reported the Commission assisted The Arctic Research Logistics Program that benefited from an increase budget from Congress. He went on to say that it might not be obvious how NSF prioritizes funding. Project support means every year the first priority is to decide which project is the best science. Proposals are reviewed to decide if they are fundable projects. Then NSF looks at improvements to safety, health, and for access, whether airplane or helicopter, etc. Then NSF looks at maintaining and increasing any long-term observations funded in the past and that includes projects like community planning, coordination, outreach, long-term cooperative agreement with Arctic Research Consortium of the United States (ARCUS), projects that improve communications and projects that keep the community together. By the way, the Arctic information, which the global Arctic community uses, is the prototype for the Antarctic community being developed. Newton said he is interested in creating an Arctic Maritime Safety Hazards Information System. Discussion continued as to the value of information offered by Arctic information.

Newton asked Pyle for a description of the Greenland Summit Station and how it operates. The station consists of two buildings: one to work in and another that provides backup in case

of fire, etc. It is located at the site where the ice core was drilled. The ice core revolutionized the ideas about climate change and its rapidity. NSF has learned that scientists from Denmark, Germany, and Sweden are interested in using the site. Four people stayed in the camp during the winter but a dozen people could stay there in the summer if they are willing to stay in tents.

Treadwell asked Pyle if NSF had assessed the Wide Area Network communications for the Arctic. Pyle said he did not have a formal report at this time. Treadwell continued to say that a better understanding of the science needs for telecom, especially in widely distributed data gathering points (with devices away from a ship north of 70 degrees where V SAT is inoperable) would be beneficial for the Arctic.

Brass mentioned that the 406-megahertz locator transmitters that were banned have been redesigned and are now pocket size and safer; they will transmit rescue coordinates and notification within 15 minutes anywhere on the planet. Also, Brass said the Russians have communication satellites that give better access to the far North. Treadwell said that the Arctic Council and especially the Northern Forum, specifically gave the CITF a grant to hold a workshop on this matter. Walt Parker is the chairman of CITF for both groups. Also, Treadwell reported that Parker said the Russians are building fiber networks in their country (Russia) so as to advance its technology. Brass said the problem is that nobody lives north of 82° but that scientists operate there. Treadwell replied that Boeing said they have a market that can pay for high arctic telecommunications for Boeing jets.

Pyle proceeded to inform the Commission about projects in Russia that have some NSF support including the weather station at Wrangell Island, the asteroid crater at the AE site for past climate information, the long-term observatory at Diksa Island, etc.

Pyle stated that the Arctic needs the terrestrial atmospheric project that would have some observatories on land, part of a Circum-Arctic Environmental Observatory Network. There would be the oceanic part that Pyle nicknamed the Pluto Array. As many of the land observatories would be cabled to get real time data, more unmanned vehicles: floats, gliders, autonomous underwater vehicles (AUVs) and such could be supported somewhere in Barrow. Some information would have to come via satellite and in real time. It may also be useful to expand capabilities of the current drifting buoy network. Grebmeier asked if NSF had interest in the marine station laboratory in Svalbard. Pyle said that NSF has agreed to participate.

Shelf Basin Interaction Program

Grebmeier spoke about the Shelf Basin interaction program. Resolutions were being worked out with the Alaska Eskimo Whaling Commission with discussions held in Girdwood. With the help of NSF, the Coast Guard, and this Commission, resolutions were made and made the field program a success. Grebmeier talked about the four-page handout outlining 115 days at sea on four different cruises. She pointed out that the production, transformation, and fate of carbon off of the shelf have been transformed and recycled below the ice, above the ice and below the halocline. The region they sailed through was Alaska, Chukotka, and Wrangell Island in an area called the Chukchi borderland. The seasonal spatial variability is important and it is critical to have access during the spring months. More cruises will occur in the fall; a late winter sampling will be made available by helicopter. Under scrutiny is the processing of material and then looking at the patterns in temporal time and space of where that material goes and the impact on the ecology, ecosystem, and what could be impacted by global change.

Two moorings have biochemical sensors relaying salinity, temperature, ice, and other data, including information on nutrients, nitrate and chlorophyll. There is one instrument on the deep mooring line that has an acoustic monitor for marine mammals by the National Marine Mammal Lab. Grebmeier showed images of the *Healy* where people were deployed on the ice to facilitate hydrographic measurements using 30 liter bottle (12 per rosette). Brass commented that the bottles were triggered by electronic signals sent down the conducting wire. Grebmeier continued to say that other projects included sediment cores to look at organisms in sediment, flux of material, carbon utilized by that system, and how CO₂ comes back out of the sediments as well as how the inorganic nutrients (nitrate) loop between the shallow and deep part of the system. All process studies had to be done in real time. US Fish and Wildlife Service had an observer doing marine mammal and seabird surveys. NSF sponsored a teacher to be on board as well who provided daily journals made available on the web.

More mooring cruises Plans for 2003 include a survey cruise in late June through July. A mooring cruise on the *Healy* will be in September and October and a mooring cruise in the Bering Strait that goes out annually is on the *Alpha Helix*. Finally, Grebmeier said she is the chair for the Pan-Arctic Shelf Basin Exchange at the request by the Arctic Ocean Sciences Board. It is a working group with ten nations involved including: Canada, China, Japan, Germany, Norway, Sweden, Russia, and the United States. The idea is to review ongoing, planned programs and see how best to coordinate where the ships will go, and standards of measurements. They are also working on gaining access to the East Siberian Sea. Brass said access was denied last year. Information for many of the projects should be available on a web site. They are still working on the Arctic Ocean Science support website.

Observing the Arctic

Dr. Lee Cooper, University of Tennessee, spoke about the Arctic Environmental Observatories. In a proposal submitted in 1999, Little Diomed Island was chosen as a site because it is located near a mooring that is located in the Bering Strait that requires servicing every year. There is a limit to the data that can be collected from this mooring.

Little Diomed has electricity, communication, and a local community of about 140 people. This land base site could be used for pumping water onshore in order to take chemical and other measurements. Cooper said they built a shed connected to the high school for a pumping station and scientists use the school to sleep in during the summer months. One of the needs of the community is to have safer drinking water and Cooper believes he may be able to assist. Because of the three million birds on the island, a lot of nitrates end up in the drinking water. Cooper said that one of the cooperative projects he is involved in is with Gay Sheffield who works for the Alaska Department of Fish and Game. As part of her project, hunters are donating tissues and they are sent to labs in for contaminant studies, food web studies, and also the biological health of the animals that are harvested. Cooper has installed some computers to back up data being collected. Last March, with support from the NSF Arctic Logistics Program, they helped facilitate an exploratory geotechnical survey. This team was aware of local concerns that noise would not scare off animals the community hunted. This forced a lot of interaction with the community who assisted with some of the work.

Cooper continued to say that there is evidence of water runoff that is probably from the Yukon River. This is important as a tool to study sea ice melt and freshwater runoff.

January 28, 2003

National Academy of Sciences (NAS)/Polar Research Board (PRB)

Chris Elfring, NAS/PRB introduced PRB's new study director, Sheldon Drobot. Elfring explained that the NAS/PRB was developed as an independent science advisor to government officials to promote excellence in Polar science and to provide independent advice. Their work is based on requests from others. In order to solicit information, the PRB is involved in setting up workshops, round table discussions, and other information exchanges. In this way PRB can pick a topic and go into depth to provide clear conclusions and recommendations that can be implemented. PRB is involved in all relevant science disciplines, engineering, technology, and resource management as long as the issue is concerned with cold regions. Another part of the PRB is the US National Committee to the Scientific Committee on Antarctic Research (SCAR) and the International Arctic Science Committee (IASC). In that role, the PRB is responsible for choosing the US delegations. PRB tries to facilitate communication of issues from the SCAR and International Arctic Science Committee (IASC) to the US community. The current chair is Dr. Robin Bell, a geophysicist from Lamont Doherty. A current project is Frontiers of Polar Biology in the Genomic Era being conducted at the request of NSF.

In part due to Dr. Brass and the USARC, the North Pacific Research Board (NPRB) is developing a science plan. PBR is working with the Ocean Studies Board to help NPRB with the plan. Drobot said a committee has been picked to work on the science plan. Observers are welcome to attend meetings and the session is open to everyone. Meetings for committees actually in the process of writing are closed. Elfring said that Commissioners were welcome to go to the sites PRB visits that include: Barrow, Seattle, Juneau, Kodiak, Bethel, Dillingham, Nome, Dutch Harbor and Kotzebue.

Grebmeier asked if institutions such as the University of Alaska were tied to the visits. Drobot indicated that they were not; PRB was looking for more grassroots input from local stakeholders. PRB hopes to work with the Alaska Native Science Commission as well. The committee will break into smaller teams and go to rural communities to speak with elders. Any assistance from the Commission would be appreciated. Grebmeier said that Renee Crane, NSF, with Arctic Education Outreach might be able to assist Drobot with establishing contacts. Hobbie asked why PRB was considering Kotzebue and Barrow. Elfring answered that the two sites have been suggested, but not selected, and she welcomes recommendations from the Commission. Fate recommended that PRB go to Anchorage and Fairbanks to visit the sub-regional and village native corporations in order to make contacts in the different communities. Perrigo suggested that PRB consider Dillingham over Bethel because of the fishing constituents living there. Treadwell asked if the PRB committee had an international element. Drobot and Elfring said PRB has established an international committee with representatives from Norway, Russia, and two from Canada. Elfring clarified that PRB is not writing the science plan for NPRB but is rather working as part of a steering committee to gather information and give it to NPRB to assist with their development of a plan. Elfring said that she sees a two-year window from the time PRB forwards recommendations to NPRB to the time that NPRB publishes their science plan. Brass reiterated that first, the PRB white paper will be written, and then NPRB will write the science plan. In the meantime, NPRB is distributing money now. NSF is also beginning the Bering Sea Research program.

NAS/PRB has been working on a congressionally mandated study on the cumulative affects of oil and gas development on the North Slope in Alaska. This has been a two-year effort; 22 committee members visited almost all the communities on the North Slope. They wanted to

identify the impact on the North Slope of all issues ranging from birds, whales, caribou and the biological side to the actual oil exploration and technology change, including the human dimensions. The report is in draft form and should be completed in a few months. Treadwell asked where the funding is coming from and the genesis of it. Elfring said that British Petroleum asked Senator Stevens to request this study. NAS cannot accept money from Congress, so the appropriations went to EPA and EPA requested the study.

Elfring mentioned that the year 2007 is the 75th anniversary of the Second International Polar Year (IPY) and the 50th anniversary of the International Geophysical Year. The anniversaries can be a way to get attention through television and magazines for projects and accomplishments. NAS is not picking a theme for the IPY but is interested in gathering ideas and suggestions. There may be more than one of them because Russia will have a version, the European Polar Science Board or the European Science Foundation will also have a version of IPY. Newton said that realistically that there are two years to get additional money and additional support in order to have a sponsored theme and someone needs to decide on a common theme. Brass commented that Tom Pyle's suggestion about International SEARCH might be a great theme for IPY if it can be organized in time. Treadwell said that he would also like to see a social sciences theme within IPY of issues in the North.

Submarine Use In the Arctic

Captain Thomas Hawkins discussed the Arctic Submarine Laboratory (ASL). Hawkins said that, although he had to remain outside classified information, much could be passed to the Commission.

ASL has several reasons to support submarine operations in the Arctic.

- If the submarine can sail in ice-covered waters, it can operate in any waters.
- The Arctic also offers access to many parts of the world with a shorter transit distance.
- Submarines have to be able to move into different theaters during winter months. Operating submarines in the Arctic is a sure test of the submarine and the operational skills of the crew in cold regions.
- Supporting research is another reason to be able to operate in the Arctic waters. SCICEX benefited from the submarine cruises in the past.

Hawkins said he is looking for a senior scientist to join the team to continue assisting with research capabilities as well as for a new ice pilot. These reflect their commitment to the Arctic. Ice pilots are not easy to find.

While Hawkins noted that there are fewer submarines at this point that in prior years, there will be opportunities to piggyback science experimentation with operational missions as much as possible. He hopes to partner with the science community in order to have the necessary equipment to collect data the science community needs. The science interests would set priorities and the submarines would then try to go to the areas that are considered high priority.

Hawkins showed a map with areas the submarines could transit through the Arctic. He commented that there is a good chance to get data from all three legs of the voyage. Brass said that he discovered that Denmark has not set an EEZ around Greenland so the US may want to consider extending the box down to the 3-mile limit off Greenland.

Treadwell asked if there are limitations on collecting samples in Innocent Passage. Hawkins said that international law prohibits collections unless invited by that country to do so. Collections are not allowed at this point. He believes collecting water samples for scientific purposes would be prohibited if it were to be done in a country's EEZ. Brass said that Article 76 (UNCLOS) makes it perfectly clear that it applies only to the sea floor and resources below the sea floor. Hawkins said that even though the US is non-signatory, that the US follows the intent and letter of the international law as well as any country does.

Ice camps are important to understanding the movement of the ice and its characteristics. ASL and the US Navy are planning to establish a camp that is approximately 150 to 200 nautical miles north of Prudhoe Bay in the Deep Ocean Basin of the Arctic. He said there was money in the budget to build ice camps every two years. Newton asked if there is an arrangement to share the ice camp between military science, military research, and basic science. Hawkins responded that at least some portion is included for the Office of Naval Research (ONR); the majority of the cost is the set-up.

Dennis Conlin, ONR, said that it is a good opportunity to share the ice camps. Conlin said he would like them to consider very strongly the use of icebreakers instead of temporary camps on ice. NSF did a careful study when they were setting up the Surface Heat Budget of the Arctic Ocean (SHEBA) experiment about the cost-effective way to do this and they ended up chartering a Canadian icebreaker. The Coast Guard has plenty of assets and not only is it more comfortable, but it is cheaper and safer. Hawkins said he would look at this option.

Treadwell saw an \$8 million budget line for DOD FY 2002 that included Arctic Research and thought it might cover Mr. Conlin's ONR budget. Brigham suggested that might be for CRREL. Hawkins said he could not answer that; the ice camps will cost between \$7 and \$8 million by the time it is all done.

Hawkins said that they are expecting to test the first in a new class of submarines, the *Virginia* class. It can surface through a foot and a half of ice without sustaining mission impairment; it still needs to be tested underneath the ice. It would be good to have that resource on the team for 2007. There is a two-month period out of the year where the Bering Strait itself is ice-free and a large part of the Arctic is ice-free. Thus, most submarines could transit during this time of year. The Navy is still testing the *Sea Wolf* class and the 688 class as well as the *Virginia*. Hawkins went on to say that one of the things being done at University of Washington is the digitization of all the analog top sonar data since *Nautilus* (from 1958). It is available on CD now. He concluded his talk by showing slides of submarines and describing communication abilities.

Paul Bienhoff, former member of the Navy's Pentagon staff, now at John Hopkins University (APL), said there was consideration being made to improve the new class with a composite sail. The mission flexibility of that sail size is probably being looked at for future operations and may outweigh the requirement that the sail will stay up through ice. The main reason for a submarine to surface is to communicate or to get navigational data. If that can be done submerged, times to surface would be minimized. Treadwell asked what the choke points are on the map Hawkins showed earlier. Hawkins said areas of concern are in shallow water or where there are ridges. Ice pile-ups in the wintertime can also make passage difficult. Newton said that the old Beringia, the land bridge, is very flat and predictable. It is the ice that is the problem because the deep ridges; the movement of the Polar pack ice in the Beaufort Gyre creates keels that are 60 to 70 feet and deeper.

SEARCH

Dr. Jamie Morison, Biophysics Laboratory, University of Washington, was introduced with accolades citing his work on the first SCICEX cruise that remains the foundation for understanding the Arctic.

Morison said the Commission has been important in promoting the Study of Environmental Arctic Change (SEARCH). Morison then gave an update on the actions of the SEARCH Scientific Steering Committee. The two main groups that are trying to put SEARCH together are the Science Steering Committee, which is composed of principal investigators, and the Interagency Working Group that is composed of funding officers from the various agencies that are interested in supporting SEARCH.

Morison said in 1992, Treadwell invited him up to an NSF/USARC briefing and was able to announce substantial funding for SEARCH. As a result, there are about 17 funded projects including several that focus on freshwater in the Arctic including hydrology, the CHAMP program, which looks at the headwaters in the Arctic. Also there are studies regarding the Arctic and sub-Arctic Ocean Flux study that looks at the flow in and of several straits.

At the 2002 Arctic Ocean Modeling and Measurement workshop there was an opportunity to work on ocean aspects of the implementation of the SEARCH program. Also in 2002, Morison was involved with the Biology and Human Dimension workshops with marine and terrestrial biology. Morison commented that the terrestrial part of the community was not up to the level of the marine or atmospheric portions.

Morison added that strategies generally define the kinds of actions to be taken. There are three areas of emphasis: detecting change, understanding change, and responding to change. Of interest is an organizational chart that generates which Morison shared to give an overview for the Commissioners. He pointed out the Science Steering Committee, Interagency Program Management Committee, and a new version of the Interagency Working Group. There would be three panels corresponding with the three areas mentioned. Each panel would have less than ten members. They would look at the big picture related to the three areas.

Also on the chart are the activity areas: Arctic system re-analysis, defining and quantifying UNAMI, large scale atmospheric observatories, distributed marine observatories, distributed terrestrial observatories, social and economic interactions, linkages and global coupling, and finally social response. Each of the activities fits into one of the three groups. For each of the activities there would be a working group, usually not very big and not very formal.

Many sites have the infrastructure in place, some sites need additional instruments, and still other sites may need infrastructure and instruments. Barrow, Alaska, of course, has infrastructure and a NOAA station. Svalbard has several large atmospheric observatories. Alert has the infrastructure. Tixie may not have resources but many stations are needed all over Russia. The Japanese and the Canadians have the Joint Western Arctic Climate Study (JWACS). This project has a focus in another direction across the Beaufort Sea and involves some installation of buoys. The Freshwater Initiative, which is seen as part of SEARCH, will have moorings to be put in the Beaufort Sea. One gap is in the Macarof Basin and perhaps a mooring near the Gakkel Ridge. Gateway moorings are basically under the purview of ASOF. Morison also said the Europeans are putting out moorings in the Fram Strait region. One of the main features of the North Pole Environmental Observatory is to place an automated station with buoys measuring atmospheric and oceanographic parameters.

Treadwell asked if the gateway moorings are set so that they are not affected by ice. Morison said the Germans, British, and Norwegians have been devoting a lot of attention to this issue. There is a high flux of ice across the pole and transpolar drift and a device has been developed that is being tested. Treadwell said it appears that the map shown denotes a good database for modeling. Morison continued to explain that there are actually two items to measure: the freshwater that is produced by the ice freezing distillation process and the ice that comes down the rivers into the basin. The Freshwater Initiative is looking at these measurements in the basin.

As for the terrestrial observatories, the main thrust from a workshop last fall is to set up a network of monitoring stations. If multiple scales and multiple disciplinary aspects were considered, there would be about ten different geographically characteristic regions, tundra, and coastal systems. The ten sites would have complete physical measurements, atmospheric conditions, ground conditions, frozen ground conditions, etc. so that changes could be correlated. Perrigo asked about the borehole sites. Morison said the borehole sites are typically through permafrost in order to monitor permafrost temperatures. There may also be environmental measurements that are made to check atmospheric pressure and atmospheric temperature and perhaps some sort of precipitation gauge.

The overarching analyses could be started now with the available data. There are other activities, projects that have just started with the Freshwater Initiative, for instance, that will still need to be funded. Tier two is to fill observational gaps. Tier three is an understanding of related linkages and global coupling and societal response. This is a recommended phasing diagram. All of the activities are important. Another issue is International SEARCH. There is funding needed to continue the ASOF program which is not currently funded through the United States but is considered part of SEARCH. The SEARCH coordination office should establish an operational office. Morison said his office could transition to that sort of office.

Newton asked if Morison had a list of the projects related to SEARCH and to the implementation plan. Morison said that there may be such a list and it is something that needs to be developed. At this time the project office is a one-person operation and it could and may need another coordinator.

Commission Wrap-Up

Then Treadwell made a motion to write of letter from the Commission regarding support for a greater NASA presence in the Barrow Arctic Science Consortium. Specifically, that the Commission recommends NASA establish a high latitude standards validation site for remote sensors on US satellites. The motion was unanimously carried.

Treadwell said it was important to have on the record the general sense of the discussion about committee work or special projects work that were distilled from the retreat that the Commission plan to have an exercise similar to the Permafrost Committee to support terrestrial modeling.

Hobbie said that he understood the Commission would start off with a broader view that would be marine and terrestrial, but with the goal of scaling, and particularly include the biological issues.

Treadwell said his simple request is that the minutes of this meeting reflect the three or four study group priorities discussed at the retreat. This includes, the scaling, the Northern Sea Route, Arctic marine transportation, climate change, sea ice, scaling regional to Pan-Arctic

scaling issues. And then the Commission also discussed International SEARCH. As part of the Russian trip, he thinks it is the Commission's intent to see a general assessment of opportunities Russia prepared for that trip.

Newton said that this is so noted in the minutes. Grebmeier said she supports the biological statement that Commissioner Hobbie stated earlier as a presentation as big as SEARCH is, it is important to keep putting the biology in a human part.

Treadwell said that in preparation for the Commission's trip to Russia a report could be prepared elaborating on the paper that Lee Cooper gave to the Commission. Someone asked who would prepare the report. Treadwell answered that the Commission does not have that person at this time. Perhaps a consultant would do the report and would be hired to plan the trip.

Chairman George Newton, USARC

Activities January 27, 2003 to May 13, 2003

- January 31: traveled to Hanover, New Hampshire, to attend/speak at the retirement ceremony for Terry Tucker of U.S. Army's Cold Regions and Research and Engineering Laboratory.
- February 2: met with Assistant Secretary of State, Marybeth West; Bob Smith, DOS; George Taft, DOS; the Executive Director; and Navy representatives from the Oceanographer of the Navy and the Chief of Naval Operations to discuss Article 76 and UNCLOS.
- Traveled to Anchorage and Juneau, Alaska from February 9 through the 12th and attended meetings with Commissioner Roderick, Commissioner Treadwell, Dr. Brass, and Brigham. Meetings included:
 - Denali Commission
 - Editorial Board, Anchorage Daily News
 - Commonwealth North breakfast
 - U.S. Alaska Command Headquarters, Elmendorf Air Force Base
 - Various candidate office spaces in downtown Anchorage (Denali Commission and other locations)
 - Several Alaska Legislators (Juneau)
 - Governor Murkowski (Juneau)
 - Alaska Science Technology Foundation Board Meeting (Juneau)
- In Juneau the primary discussion included SJR 44, USARC point of contact with the current State of Alaska administration, appointment of a State Science Advisor, climate change in the Arctic, and potential for enhanced Arctic commerce.
- February 19: drafted letter as requested by State Department to go from Secretary West to the National Security Council requesting the national Command Authority to make Article 76, UNCLOS, surveys in the Arctic a national priority and assign a submarine to conduct them.
- March 5: concluded discussions with the Chief of Naval Operations staff and the Office of Naval Intelligence to declassify and release more Arctic Ocean bathymetric data. The data covers 14 SSN cruises over 107,700 nautical miles during the period 1988 to 1992.
- March 29: completed an Arctic Ocean Search and Rescue (SAR) capability study for the Navy submarine force. Used/identified resources in military, civilian, US Coast Guard, Air National Guard, and Canada that could be used in a SAR event. Newton is now seeking release of portions of the effort for wider distribution in the civilian community.
- March 29 to April 21: traveled to Europe to attend three consecutive meetings:
 1. Arctic Science Summit Week in Kiruna, Sweden;
 2. The EGU/AGU/EGS Joint Meeting in Nice, France;

3. The Annual General Bathymetric Chart of the Oceans (GEBCO) meeting in Monaco celebrating the 100th anniversary of the organization's founding by Prince Albert I of Monaco. Announced data release and viewed new International Bathymetric Chart of the Arctic Ocean (IBCAO) chart.
- April 28 to 29: attended the Arctic Research Consortium of the U.S. (ARCUS) annual meeting in Arlington, Virginia.
 - During the month of April, Newton was requested to write articles for two magazines:
 1. *Sea Technology* on "Arctic Research: Actions, Progress, and Requirements"
 2. *Hydro International*, a Netherlands-based magazine on "The Submarine Science (SCICEX) Program."
 - On May 4 had informal meeting with retired Senior Navy Officer (Ex-Director of the National Intelligence Staff) concerning Article 76 UNCLOS and U.S. actions that should be taken.
 - May 5: in a brief meeting with Navy staff members and was informed that they will no longer hold bathymetry data for 10 years before it can be declassified and released. The time period will henceforth be reduced to five years.
 - May 8: discussed the International Polar Year (2007-2008) with Navy Staff and encouraged them to consider active participation in Arctic research activities such as a SCICEX in that period.
 - May 9: met with NIMA/MSD staff to discuss the early field evaluation of the Arctic Maritime Safety Information database and convey to NIMA recommended changes to the handling and display of the Arctic Maritime Safety Information (ASMI) database.

68th Meeting, May 14 -15, 2003
Arctic Institute of North America, Canadian Polar Commission,
and U.S. Arctic Research Commission
University of Calgary, Alberta, Canada

May 14, 2003

In attendance:

a) Commissions and staff: Mr. George Newton, Chairman; Mrs. Mary Jane Fate, Commissioner; Dr. John Hobbie, Commissioner; Dr. Jacqueline Grebmeier, Commissioner; Mr. Jim Llewellyn, Commissioner; Mr. Jack Roderick, Commissioner; Mr. Mead Treadwell, Commissioner; Dr. Garrett Brass, Executive Director; Dr. Lawson Brigham, Deputy Executive Director; Ms. Amanda Saxton, Administrative Assistant; and

b) Others: William Barr, Arctic Institute of North America (AINA) Research Associate; Dr. Carl Benson, Chair, US AINA; Steven Bigras, Executive Director, Canadian Polar Commission; Lars Strom Christensen, AINA; Ross Goodwin, AINA; Sonya Hogg, AINA; Lynne Howard, AINA & ASTIS project; Dr. Robert Huebert, Center for Military & Strategic Studies, University of Calgary; Dr. Cooper Langford, AINA Board Member; Karen McCullough, Editor, *Arctic*; Mike Robinson, Member, Canadian Polar Commission and past chair; Joan Ryan, AINA; Dr. Dennis Salahub, AINA Board Member and Vice President of Research, University of Calgary; Pam Scowen, AINA; Murray Todd, Chairman, Canadian AINA; Dr. Harry Weingarten, President, University of Calgary; Dr. Robert Williamson, AINA; Karla Jessen Williamson, Executive Director, AINA; Dr. John Yackel, University of Calgary.

This historic meeting began with Murray Todd, Chairman, Canadian AINA, who provided some background about the relationship between the two participating North American countries. Canada and the United States not only share the longest undefended border in the world, but they also share a lot of common culture in the Arctic. The Canadian Arctic Institute of North America (AINA) was established by an act of Parliament in 1945 and has resided at the University of Calgary (UC) since 1976.

The mandate for this institute is very similar, he believed, to the United States Arctic Research Commission (USARC) mandate. The language for this document is 53 years old and still captures the theme of the work accomplished at AINA.

The **object** of the institute shall be to initiate, encourage, support, and advance science through financial grants. The **objectives** are:

- the study of Arctic conditions and problems that pertain to the natural sciences, and all of the sciences, and to communicate this science to the public
- to collect, arrange, and preserve records and materials relating to the Arctic regions and especially to other areas contiguous to the continent of North America
- to make such records of material available for peer and applied scientific use by properly qualified individuals and organizations including government agencies
- to arrange for or to assist in the publication of reports, maps, charts, and other documentary material relating to the Arctic regions
- to establish and maintain close contact with other Arctic institutes and organizations engaged in similar or related fields of study.

The **purpose** is to promote and conduct Arctic research and make the findings available to our

stakeholders: the people of the North, the worldwide academic community, governments, the UC, the private sector, and the circumpolar research community.

UC provides a home and administrative support for AINA. The Board of Directors provides the policy and direction. Core areas include field research; publications, the center of which is the scholarly journal *Arctic*; extensive collection of artifacts, rare books, and art in our library; the Arctic Science and Technology Information System (ASTIS) containing 51,000 records; and, research staffed currently by 42 research associates.

Energy ranks high as a research focus. The Canadian oil industry has been active in the Arctic since the mid-1960s. In order to obtain drilling authority on federal lands, it is necessary to conduct baseline research. AINA has undertaken the task of incorporating the massive oil industry research into the ASTIS database so it is available to engineers and scientists. It is called the Arctic Technology Preservation Project (ATTP).

AINA has been successful in being a not-for-profit institution. There is never enough money for research. It is very important to work together collaborating and cooperating to leverage the scarce dollars and to pool the intellectual input.

Commissioner Roderick asked how government was able to help with the oil industry research. Todd said that they were the first to drill offshore in the Beaufort Sea and worked hand-in-hand with the government in trying to establish a regulatory regime. Anything that has to do with the Arctic attracts a great deal of public attention from the southerners and anything that attracts public attention stimulates government interest. The first three years were spent doing baseline research. The industry collaborative group, Arctic Petroleum Operators Association, collaboratively did about \$250 million worth of research. The ATTP ensured that the research and technology would be put in the public domain. There is also a tremendous amount of gray literature that is being found.

Commissioner Treadwell asked if American oil companies were invited to participate in the ATTP. Todd said no, but the American oil companies would be a good source of funding. It cost about \$50.00 to catalog and archive a title. Commissioner Hobbie remarked that the original funding he received at Point Barrow Naval Arctic Research Laboratory came from AINA through the Office of Naval Research (ONR) for \$4,000.00. Executive Director Brass also mentioned he was funded through AINA in the 1960s.

Chairman Newton asked about the origination of AINA. Dr. Carl Benson, Chair, US AINA said the United States body of the Arctic Institute and the Canadian organization became entities about 1977, but it was in the late 1940's and early 1950's that AINA became one Arctic institute.

One of the motivating forces was ignorance of the Arctic. When it is known that knowledge is needed in a certain area, research follows naturally. The need for research stimulated scientists from both the US and Canada in 1943. AINA was created before ONR. Dr. Lincoln Washburn and others with the Arctic Institute said Barrow was a good site for a laboratory. President Harding established the Naval Petroleum Number 4 in 1923. When the United States was pulled into World War II because of the bombing of Pearl Harbor, it became necessary to determine if there was any oil to use in the Alaskan Arctic. United State Geological Survey (USGS) conducted a massive exploration of the region. USGS also built three airstrips; one in Barrow and one at Barter Island. The airstrip at Barrow was one of the reasons to locate a lab in that community.

For years, Benson continued, AINA and ONR were close. The Arctic Institute helped to get money to researchers at a time when there were no other provisions for distributing funds through the government agencies or universities. The National Science Foundation (NSF) was created and other institutions were being formed such as the Geophysical Institute in Fairbanks. In the 1970's the AINA accounting was separated between the US and Canada which created two separate (but affiliated) Arctic institutions. The present effort in the US is to serve as the focal point for US members and collaborate with Native corporations. In 2000 a cooperative academic agreement was made between the UC and the University of Alaska. As can be seen, there is an attempt to keep the bi-national aspect going.

AINA is unique in two ways:

- it deals with individual members, not organizations
- it is the only Arctic organization that is international or bi-national. It has headquarters in both countries and there is a cooperative effort from each side trying to sustain one Arctic Institute. The UC and the University of Alaska are the two homes of AINA.

Arctic, AINA Journal

Dr. Karen McCullough then spoke about the status of the AINA journal, *Arctic*. In the mid 1940s the founders of AINA decided that the best way to fulfill the mandate of stimulating research was to start a scholarly journal and 56 years later the journal is distributed to over 1,460 members in 22 countries, both individual as well as subscribing organizations. The standard issue contains nine or ten original research papers, peer review papers, five or more reviews of books regarding northern interests, and occasionally has a commentary section. In volume 50 the newsletter was moved back into the journal. There are also special issues that are still peer reviewed on topics of interest to northerners. In 2000, an issue looked at climate change. In September 2001, the issue focused on pollutants and also satellite telemetry and how it can be used to look at dive behavior movements of animals. The most recent issue was 2002 *Circumpolar Ecosystems in Winter*, an outgrowth of a conference. AINA maintains a database of over 1,200 individuals who have assisted with the peer review. AINA uses a double blind process where all the names are off the copies that are sent for review and the authors also are not aware of the names of the reviewers.

Papers regarding biological sciences are strong, earth science papers are low, social sciences are on the rise and there is an increase in interdisciplinary papers. There is an increase of papers regarding traditional knowledge as well. Benson said that there is a strong drive to recruit United States members from Alaska although there are many members from Ohio and Washington. McCollough said there was a decline in the membership since 1989 with a small increase in 1990. This may mirror the fact that researchers (in Canada) have just about given up on expensive northern programs. Canadian professors may not be encouraging their students to work on research in the north because of the expense.

Treadwell asked if the journal was distributed electronically and if there were sets available to be published in a CD format. McCollough said that the last couple of issues were set up electronically. Brass said the decline in membership might represent a serious jeopardy for the institute. Building membership is important. Treadwell asked how the AINA journal compared to the *Polar Record* and McCullough said *Arctic* has higher participation. Benson said the unique thing about the *Polar Record* and the *Arctic* is that they deal with a region and not a discipline. Most of the young scientists are under pressure to publish in the journal that matches the study area of their research. These two publications reach a broader audience. McCollough said it is also difficult to get young people, students, to subscribe to the journals.

Commissioner Grebmeier asked what the average time frame was from submission of an article to publication. McCullough said it takes about a year to see the work in print. Grebmeier said that a year or so wait could play a part in the decline of submissions and membership. Robinson said that the trend for 30-year-old people is to get news from electronic media and therefore there is less demand for print. For the future, it may be prudent to look at getting Arctic information online for the coming decades. McCollough said there has also been a decline in libraries that subscribe to the journal.

Newton asked what the cost would be to publish a special issue. McCollough said the cost is \$30,000 in Canadian dollars. This covers everything including mailing. Brass asked if McCollough considered what the effect would be if the production costs were changed, for instance by changing from gloss to regular stock. McCollough said that may change the price somewhat, but the biggest expenditure of the journal is the salaries. She said the most likely answer is to move to making the journal available by subscription on-line. She encourages everyone to look at the new website with the added features that allow members to renew on-line. Submissions have increased this year. Roderick said he saw a lot of Arctic research students at Hanover during the last meeting and believes there is a market for the journal. Newton stated that the Commission could help by stimulating interest in Arctic Research that will have a natural feedback to the Arctic journal and AINA.

Arctic Science and Technology Information System (ASTIS)

Ross Goodwin, manager, spoke about the Arctic Science and Technology Information System (ASTIS), Canada's northern abstracting and indexing service, which is maintained by AINA. ASTIS began operations in 1978 with the mandate to make information about northern Canada more accessible to all who need it: government, industry, universities, and the general public.

The scope of ASTIS is defined geographically rather than by subject. ASTIS includes all subjects and covers northern Canada and adjacent waters. The southern boundary is the southern limit of the discontinuous permafrost and includes the northern parts of seven provinces as well as the three territories. Unlike most other abstracting and indexing services, much of the literature cited in ASTIS is gray literature, reports and other publications from governments, industry, aboriginal organizations, etc. However, peer-reviewed journal literature, conference papers, theses, and books are also included. Due to limited funding, the coverage of publications is not comprehensive. In addition to publications, ASTIS describes research projects using information gathered by agencies that license all field research in the three territories. ASTIS contains more than 12,000 research projects from 1974 to the present. ASTIS is funded through contract work and corporate donations and the database is available on the AINA website for free. The database currently contains 51,500 records. It is interesting to note that three of the six ASTIS websites are bi-lingual, French and English.

Newton asked if the ASTIS website was linked to other sites. Ross said it is linked to a few major Arctic sites and is also a part of the Arctic and Antarctic Regions Database. Is there duplication of efforts? Ross said that the data was very complementary because most of the ASTIS information is based on Canadian literature. The process that the National Information Services Corporation uses to produce this aggregate database provides a lot of opportunity to easily look at overlap between Polar databases. They have software that tries to identify duplicate records and creates composite records. A person can request composite records from ASTIS and the Cold Regions Research and Engineering Laboratory (CRREL).

Treadwell asked where the gaps are in producing a cohesive international database. Ross responded by saying that the gaps are in the Arctic data rather than in the Antarctic data. This is in large part due to the fact that the National Science Foundation funded the Antarctic

Bibliography that is now being done by the American Geological Institute with help from Scott Polar Research Institute in England. Another concern is the lack of information from the Russian literature. He is also aware that there is a Swedish database that is starting to provide Swedish Arctic citations for the Arctic and Antarctic regions. Treadwell suggested that there might be an interest group who would support filling these gaps at the Polar Library Colloquium. Brass said one of the high costs of obtaining Russian literature is the translation of the information.

Dewline/Sealane Projects

Dr. Robert Williamson, research associate, AINA, said that industrialization had a very strong impact on a culture that for hundreds of years consisted of hunters and trappers. The construction of the Dewline and the impact on northern people is still being studied. One event from the Dewline project is that it advanced frontier aviation from south of the tree lines to north of the Arctic Circle.

The studies being conducted and proposed are in partnership with Calgary University, The Center for Military and Strategic Studies, and the Inuit of Canada. The partnership with the indigenous peoples who will always be here will be an important component of the partnership. People who had never before worked according to clock time, were drawn into industrial work during construction of the Dewline. The development of new communities brought forth teachers, nurses, and administrators and changed the face of the Arctic from a scattered population commuting to a highly urbanized population. This led to the creation of the self-determining, bi-lingual, bi-cultural form of governance. The work being done is multi-disciplinary with contributions from oceanographic, glaciological and planetological studies, as well as studies in biology and other fields.

With the physical changes occurring in recent years, answers are needed. Some of the things not known are contained in Soviet information not only in regard to the Dewline Project, but also in regards to Russian aviation, Arctic logistics and any archival information that may exist. Representatives in the Inuit Circumpolar Conference showed an interest in projects of this type.

Williamson said that it is necessary to provide guidance to this complex and ambitious undertaking.

Dr. Robert Huebert, Center for Military & Strategic Studies, UC, continued by explaining that the second major component addresses the international shipping aspect of the project. In a nutshell, the Canadian North experienced exponential growth from the historic emergence of the Dewline Project. Subsequently, the Cold War brought out needs to develop a security infrastructure. Canada worked with its American allies in protection of the North American continent. The changes in the Canadian Arctic were to a large degree ad hoc, piecemeal, and reactive. Therefore, it is necessary to take stock of the changes in a holistic perspective.

The Sealane Initiative is a second part of the Dewline project. Sealane will provide an examination of the many changes that we are expecting to occur as climate changes increases and the sea level decreases. There may be an increase in international shipping, ecotourism, transportation, etc. An increase is expected in resource development in a region that will provide opportunities and potential for conflict. In summary, we will not only be looking at history that has been neglected as far as the overall impact, but also at resources, shipping, sovereignty, and security with the idea that studies will be multi-disciplinary. Robert Williamson said that he sees the Arctic Institute of the North on both sides of the border as being important. Karla Williamson, Executive Director, AINA, said that the studies would also be multi-cultural. Circumpolar nations have a lot of information to share that will help all.

Commissioner Fate commented about her personal memories of the open door policy between the U.S and Canada and how that has become more formalized.

Huebert said that the interface between American-Canadian, indigenous-southern, technology-economics is one that has not been documented, at least on the Canadian side, and is what they want to address. Newton asked if the project is described on the AINA website. Karla Williamson said there is one page on their (AINA) website. Benson said Greenland went through the DEW line trauma as did Alaska, and Russia. Karla Williamson said the Dewline to Sealane project involves several nations & regions: the U.S. (Alaska), Canada, Greenland and Newfoundland. They are looking for funding aggressively every year.

Huebert said that 50 percent of the sites handled by the Canadian Department of Defense are underway, but that 50 percent of the sites that are the responsibility of the Department of Indian and Northern Affairs are not.

Arctic Programs and Accomplishments

Karla Williamson elaborated about the Arctic Collections. The library holds a special collection estimated to be valued at \$3-4 million. There is also artwork valued at about \$300,000 Canadian dollars. There is a core of volunteers who work on committees for funding for AINA and who also edit and perform other services for AINA. Recently the volunteers, with the help of staff, were able to obtain funding for a Northern Studies Training Program through the Canadian Department of Northern Affairs. AINA has two research stations: one is on Devon Island and the other is at Kluane Lake in the Yukon. Researchers from Canada, United States, Japan, and elsewhere come to Kluane Lake to spend their summers on research projects.

AINA is also providing eight scholarships to graduate and undergraduate students. The student competition for scholarships bring applications from all over the world and Canada. Since its inception, AINA alliances have been created nationally and internationally; partnerships for research mirror these alliances.

She continued to say that AINA's plan to align with the UC academic plan is one of the results of the influence of Dr. Harry Weingarten, president, UC. On the list of priorities is:

- energy and environment
- human behavior, institutions, and cultures
- health and wellness
- technology and managing information.

AINA has many ongoing programs and accomplishments. It has been successful in attracting younger researchers. It is also addressing the need to be useful to residents of the Arctic.

Commissioner Lewellyn asked about what Williamson meant as to the native way of knowing and asked if she could contrast that with the Danish system of knowing. Williamson said that life among indigenous peoples date back 5,000 years ago and earlier in Alaska. There is a very specific knowledge that has accumulated over the years that allowed the indigenous peoples to survive. 'Ways of knowing' are culturally bound and even geographically bound. Western academia is based on a lineal system, very progressive system, very often related to measurable time, days, weeks, and years. Other cultures do not use time as a basis for measurement. Linguistic studies are also needed because not all the languages are understood.

One third of the budget, the core budget, comes from the UC. The remainder is generated through outside funding.

Weingarten said feels encouraged by the collection of people at this meeting at the UC. Recently the University received national funding for Arctic research. The ability to be successful with such research lies in having available scholars, multi-disciplined participation, and an interdisciplinary perspective. Success will be realized as UC develops partnerships with other research centers. Genuine collaboration has to occur across nations for significant research in the Arctic. Newton said that the Commission has had a great deal of interest in visiting AINA and the UC. This was because AINA is a unique organization since it is located in two countries and has a sole focus on the Arctic.

Open Discussion

Brass asked if the Canadian internal focus on membership would be compatible with the external direction that the sister organization is taking in the States. Williamson said that since two-thirds of the funding came from external sources that both tasks are compatible. Brass asked if oceanography, geology, or atmospheric science would be part of the interdisciplinary research. Dr. John Yackle, UC, responded that AINA is cooperating with other scientists from outside the university who are experts in those fields. Brass asked how researchers were recruited. AINA recruits in a very similar way, there is some luck in having a researcher move into the area; other times they do external recruitments, and sometimes a researcher asks to be a part of AINA.

Funding sources for AINA Newton asked what the USARC could do for AINA. Benson said that he was very interested in funding sources. Concepts that have been successful are the American Geophysical Union (AGU) 'national reception' each December in San Francisco and the Arctic Roundtable at Arctic American Association for the Advancement of Science (AAAS) meetings each September. Researchers get together and it helps to stimulate ideas and membership. Such meetings involve the Institute of Marine Science, Geophysical Institute, Alaska biological research, and federal agencies such as the USGS. People like to meet in order to share information with their colleagues.

Hobbie said that one item AINA may be interested in knowing is that the *Arctic* journal has not changed in 30 or 40 years since he first started reading it, while he **has** changed. It was a very interesting journal to publish Arctic research. In his own work, Hobbie does intensive modeling, but does that fit in with what is published in *Arctic*? Some of the research contains several chapters of information. Is there space in *Arctic* to publish a large report. Brass suggested that rather than printing all the chapters in one journal issue, the chapters could be spread out over time. Brass suggested that the Commissioners could help the *Arctic* journal by talking about it, referring to it, reading it, and just try to network to build up the AINA membership.

Treadwell said that in the checklist of items that AINA and USARC can do together, it would make sense to pay attention to the grant and aid program as a possible way to get into some government funding. It is the unique, bi-national nature of AINA that presents an opportunity. There are many items where the US and Canada agree bi-nationally for needs and doing things in the Arctic. Brass added that it is important to look at possible funding, but students in a research area need to know that there will be money for continued research as a profession. Parliament may need to look at the long-term projects and invest in funding them.

Canadian Polar Commission (CPC)

Steven Bigras, Executive Director, Canadian Polar Commission (CPC), provided some background information about the CPC board members. They are nominated for a period of three years and can serve up to two terms. This helps to encourage the change of focus, priorities, and direction of the CPC. The Polar research discussions are based on both the Arctic and Antarctic. The CPC does not fund research unless specifically asked by a ministry of the

federal government. One of the major projects is to publish the CPC special and annual reports. ASTIS is one of the major sources of information for our reports.

Figures and numbers are needed for analysis of the progress of research in both Polar regions. Mike Robinson (former Chairman of CPC) had decided to use indicators including the number of Ph.D.'s and M.A. produced each year, the number of articles about the Polar regions, and how many questions were asked about the regions. There is also a lot of energy expended on the Polar Information Network. The commission has also been trying to coordinate Canada's activities for the International Polar Year. CPC is looking at creating a directory of Polar researchers. There are at least 2,600 people working on Arctic issues in Canada.

CPC has been working with the Arctic Council, global monitoring of environment programs, and others. CPC is also involved with the University of the Arctic. The council of governors basically selects some of the courses that are taught within universities and colleges that could be related to an exchange program. As to what role the CPC would have in working with AINA on related projects, Bigras reminded the group that CPC was not a source of funding since most of its money was spent on staff and salaries. The best use of CPC would be in marketing AINA. The CPC newsletter goes out to 1,300 people nationally, and 800 internationally.

Newton said that one organization was not going to make the entire difference, but rather a lot of work is required within our legislators, and members in Parliament, and all of agencies in the two countries. Money will get that ball rolling. Bigras said the CPC might need to be more proactive in this area. The Antarctic was a smaller area and easier to reach a consensus among politicians, but the Arctic has so many issues and a consensus is difficult to build. The areas of focus are climate change, governance, education, energy and health.

Treadwell asked if economic issues in the Arctic are being considered. Bigras said that climate change related to transportation, sovereignty issues, and security issues are all related to economic issues.

Grebmeier asked about the CPC and logistics, since Canada and the US are looking at sharing icebreakers for research. Huebert said that the Canadian Coast Guard may want to help with research, but that security issues could pull them to other duties on a moment's notice and that does not help research.

Treadwell asked what amount of money Bigras saw as being directed to Arctic research. Bigras responded that the budget was about \$68 million. Canadians are very concerned about their tax dollars being directed into health and education first.

Bigras discussed the Northwest Passage regulations stating that Russia had adapted some of the Canadian regulations. The Japanese will probably be the most active in potential Arctic navigation issues in the beginning. Newton said the Chinese are also readying to use the Northwest Passage. It will make for interesting security issues.

Newton said that there are some issues that cannot be agreed upon. Treadwell said that in the last meeting of the Arctic Council that sovereign issues are being left aside while the focus goes to how the sea-lanes impact economics. Bigras said that this is a productive course of action.

Canadian Arctic Shelf Exchange Study (CASES)

Dr. Yackle, Department of Geography of the UC,. Yackle spoke about the Canadian Arctic Shelf Exchange Study (CASES), funded by the Canadian Foundation for Innovation, to boost Canada's role in international science. CASES are part of larger international Arctic shelf studies

ongoing around the circumpolar North. The focus of these studies is to examine the relationship between the physical system, the physical environment (atmosphere of the ocean and the sea ice) and then couple the biological systems that result from the physical environment. This is an integrative, interdisciplinary study. There are about 20 post docs for two years, 22 Ph.D. students, seven masters, and other affiliated with this project. Of note is that CASES is very much a biological oceanography program. One central hypothesis of the study is that it is the atmosphere-ocean-hydrology forcing impacts on sea ice variability that dictates the nature and magnitude of biogeochemical carbon fluxes on and at the edge of the McKenzie Shelf. The magnitude and rate of biological activity affects life from phytoplankton and zooplankton including cod, seals, marine mammals, and Polar bears.

The team in Calgary will organize an ice camp and the icebreaker will be frozen in the ice. The ship acts as the platform for conducting science and will stay fast until the end of March or so. A series of transits are planned in April along the McKenzie Shelf. Because of climate changes, this is a unique opportunity to look at the freshwater outflow of the McKenzie River and how it affects biological production in the Arctic. This program is a great opportunity to use an icebreaker for long-term Arctic Ocean investigations in Canada.

Yackle said that students, their teacher (one teacher for every four students), and a science mentor have been included in the research studies.

Canadian Arctic Shelf Exchange Study (CASES)

Constance Martin, AINA research associate (art history) and curator spoke about the AINA photographic collection project. Martin said that she is in charge of cataloguing photographs. The project has great value for its historic components. There are 4,000 photographs; many photos will be of interest to researchers interested in culture and scientific information. She said they have had some success in identifying the indigenous people as well as others in the photos. Scientists are finding out that these records are a great resource.

May 15, 2003

The meeting opened with a presentation by Dr. Dennis Salahub, Vice President of Research, UC. Salahub said that UC was founded in 1966 and is a young university with about 30,000 students. He reviewed the four items on UC's list of priorities adding that the university is looking forward to advancing research relationships with Americans. Brass noted that there is close collaboration between the U.S. and Canada with projects such as CASES and Shelf Basin Interaction (SBI).

Open Discussion

The Commission conducted a lengthy discussion on the use of icebreakers for research in the Arctic Ocean. There was also discussion of the needs for replacing the icebreaker fleets of the U.S. and Canada.

Grebmeier said that the SBI program has been assigned the *USCGC Healy*, the US Coast Guard's Arctic science icebreaker. While *Healy* is a Polar class icebreaker, it has been sent to the Antarctic this season to assist with icebreaking in the US Antarctic Program. The *Nathaniel Palmer* is being sent north to work other SBI program for one of the cruises that is normally assigned to the *Healy*. This was done by NSF since the primary ship, the Canadian Coast Guard icebreaker, the *Louis S. St-Laurent* had cracked a block in one engine and had to be taken out of service in for repairs. Increased collaboration between Canada and the U.S. would be very helpful for science. The *Palmer* is not as ice-capable as either the *Louis S. St-Laurent* or the *USCGC Healy*. There is a

need for replacements for both countries icebreakers. The science programs between the U.S. and Canada have been very successful, particularly those aboard icebreakers.

Age of Icebreakers/Replacement Needs

A discussion ensued between Newton, Huebert, Brass, Deputy Director Brigham, USARC, Robinson, Murray and Bigras about the two nation's icebreaker fleets. Brigham, Bigras and Murray stated that the traditional role of the Canadian Coast Guard icebreaker fleet was ice escort of ships in the Arctic and Gulf of St. Lawrence & Great Lakes in winter. Support to science by icebreakers has only come very recently, during the past 8-10 years. Murray mentioned the commercial icebreakers that supported the offshore development in the Beaufort Sea in the late 1970's and 1980's. Huebert and Brigham mentioned that US and Canadian fleets, as well as the Russian fleet, are in need of replacement. Brass mentioned that the Commission has heard from the U.S. Coast Guard that it has plans to refurbish the two *Polar* class icebreakers, *Polar Sea* and *Polar Star*, during the upcoming decade. Both ships are approaching 30 years in operation. He said the Commission and the scientific community needed to have more input to this plan so that the scientific suite of both ships can be upgraded significantly.

Brigham explained that the U.S. is facing a similar problem faced by the Canadians 10 years ago when the Canadian Coast Guard decided to refurbish the icebreaker *Louis S. St-Laurent*. The ship was out of service for at least 6 years and the costs escalated to approximately \$400 million Canadian. Today the ship is approaching 40 years old. The US is about to refurbish two *Polar* class icebreakers that would have at least 50 years of operation or more when retired. One sensible option is to 'honorably' retire both ships at 30 years, but this may not happen. Huebert and Brigham stated that modern (new) icebreakers for the U.S. & Canada would be more advantageous for future Arctic operations, and that refurbishing older ships may not be the right strategy for providing an adequate enhancement of their scientific capabilities.

Treadwell suggested that an independent report on the nation's icebreaker capacity is probably needed especially in light of the potential near-term development of northern sea routes.

Commission Wrap-Up

A discussion took place as to when the next meeting should be held. The Commissioners decided that the next meeting would be in Unalaska/Dutch Harbor on August 4th and 5th. An opening reception for the new office at 420 L Street in Anchorage, Alaska will be on the August 6th following a open session in Anchorage.

Fate made a motion for the USARC to proceed with steps in making high-resolution topographical mapping of the State of Alaska a priority. Treadwell seconded the motion.

Newton took the opportunity to thank Commissioner Grebmeier for her service to the Commission, as this was her last meeting as a Commissioner. Grebmeier said that it has been a pleasure serving on the Commission. She will be on now be a member of the Polar Research Board of the National Academy of Sciences and will remain in close communication with USARC.

Hobbie announced that on the 7th of July in Fairbanks the US Postal Service will have a first day issue of the *Arctic Tundra*: a 10-stamp panel of a beautiful watercolor painting of the foothills of the Brooks Range. The image is in the fall with caribou, wolves, musk ox; flora and fauna. Hobbie served as one of the advisors to the design committee.

See pages 31 and 32 for Chairman George Newton's activities during this period.

US Arctic Research Commission

Draft Minutes 69th Meeting

Monday, August 4, 2003

Unalaska, Alaska

In attendance:

a) Commissioners and staff: Mr. George Newton, Chairman; Mrs. Mary Jane Fate, Commissioner; Dr. John Hobbie, Commissioner; Mr. Jim Llewellyn, Commissioner; Mr. Jack Roderick, Commissioner; Dr. Susan Sugai, Commissioner; Mr. Mead Treadwell, Commissioner; Dr. Garrett Brass, Executive Director; Dr. Lawson Brigham, Deputy Executive Director; Mrs. Kay Brown, Fiscal Officer;

b) Others: Emil Berikoff, Unalaska Native Fisherman Association; Ryan Burt, Observer Program Database Manager, Alaska Department of Fish and Game (ADFG); Sonja Hadfa Comb, Alluvuk Family and Health Services Clinic; Tom Enlow, Manager, Unisea, Inc; Pam Fitch, Mayor, City of Unalaska; Carla Granath, Assistant Manager Area Biologist, Bering Sea-Aleutian Islands, Alaska Department of Fish and Game (ADFG); Greg Hanson, Councilman, Unalaska; Wendy Savory Hawthorne, CEO, Ounalashka Corporation; Chris Hladick, City Manager, Unalaska; Dr. Don Hudson, Alluvuk Family and Health Services Clinic; Frank Kelty, Resource Analyst, Unalaska; Rick Kniaziowski, Unalaska School Board and V.P of Alaska Association of School Boards; Gene Makarin, American President Lines; Shirley Marquardt, At-Sea Processors Association; Carl Moses, Alaska State Representative; Alvin Osterback, Port Director, Unalaska; Mya Renken, Director, Unalaska Convention and Visitors Bureau; Mary Schwenzfeier, Shellfish Observer Program Coordinator, ADFG; Julio Soares, American President Lines; Bob Storrs, V.P. Unalaska Native Fisherman's Association; John Voss, Finance Director, Unalaska; and Bill Woolf, staff, U.S. Senator Murkowski's office.

USARC Office Opens

Chairman George Newton introduced the new Commissioner, Dr. Susan Sugai. Over the past 25 years, she has been in Unalaska about every five years working on a research project. Sugai is a research scientist from the University of Alaska at Fairbanks and the Associate Director of the Alaska Sea Grant Program (ASGCP). The ASGCP is one of 30 programs involved in the National Sea Grant Program. It is part of federally-based programs for research, outreach, communication, and education. All four components must be in the program.

Newton then announced that the United States Arctic Research Commission, (USARC), opened a new office on August 6, 2003 at 420 L Street in Anchorage, staffed by Dr. Lawson Brigham, deputy director of the Commission and assistant, Amanda Saxton. Chairman Newton held a ribbon cutting ceremony with Senator Lisa Murkowski and both gave welcoming speeches to the group. Approximately 120 community leaders and Arctic researchers attended. This office provides a local presence for the organization in supporting the objectives and goals of the USARC and the national office located in Arlington, Virginia.

The new USARC website is also up and running and can be reached at www.arctic.gov

Introducing Unalaska

Mayor Pam Fitch from Unalaska, Alaska. Mayor Fitch welcomed the Commission and gave a history of the town. Unalaska's name derived from a native Aleut or Unagan word 200 years ago. Agunaloch is a Russian spelling from the original Unagan word. The present day spelling

was established between 1890 and 1899 by the US Board on Geographical Names. Unalaska does not mean 'not Alaska.' The history of the town was influenced by the Unangan peoples, the Russian commerce and religion, the impact of World War II, and by trading and commerce as a result of being located near the resources of the Bering Sea.

Mayor Fitch stressed the importance of looking at the whole ecosystem when viewing biological resource management in order to understand Unalaska. Unalaska is at the crossroads in a complex global network. It has been inhabited for over 3000 years. There are multiple archeological sites within the city limits. One site was recently uncovered during a road improvement project. Artifacts have been uncovered with a relative age of 4000 years near the Amaknak Island Bridge.

Unalaska has been the number one fishing port in the nation for poundage; only New Bedford surpasses Unalaska in the value of its fisheries. The prosperous resources are managed through the North Pacific Fisheries Management Council and Unalaska understands well the need to protect the resources through good science and management.

Several foreign investments have been made in the community and international film crews are interested in the community's unique natural history. The local economy is being diversified. However, Unalaska still relies heavily on commercial fishing. The idea of opening a Northern Sea Route has fascinated shippers though the centuries. Unalaska is a key logistical link if the route ever becomes a reality.

Understanding Unalaska's Infrastructure Needs

Newton remarked that one of the reasons the Commission chose to visit Unalaska is because of the potential opening of the Northern Sea Route and the Northwest Passage through the Canadian Archipelago. This community stands to be a major link in the transportation routes. As a result, the Commission wants to understand more about the port of Dutch Harbor and the surrounding infrastructure of the islands and deep-water channels in order to articulate the needs for future research in the United States.

Chris Hladick, city manager of Unalaska, then described several of the capital projects in the community of 4300. The town has a museum, library, parks, and a recreation facility. Capital improvements are needed at the airport, the court facilities, and maintenance of all facilities.

Airport—Considering that Unalaska experiences a huge influx of people during fishing seasons, the local airport requires modification. The current runway is surrounded by difficult terrain and is periodically impacted by weather. The safety areas are too small and the sides of the runway are too short. The distances of buildings to the centerline to the runway are also too close. Currently, the Department of Transportation (DOT) is working on alternate routes. The cost could be \$400 million. Applying FAA standards to the existing runway would cost \$140 million. Also, at this time the Aleutians East Borough has significant problems with air travel. They are considering making Cold Bay a hub and flying propeller aircraft to Unalaska.

Boat Harbor—A boat harbor project has been started and Unalaska is seeking funding through the US Corps of Civil Engineers. Their contribution would be to build the breakwaters. This \$23 million dollar project would create space to moor 70 boats, 120 feet and under. Currently, 1300 boats are registered to fish in this area and lack of moorage has been identified as a problem since 1990. The new Coast Guard and cargo docks are not large enough for this harbor. Unalaska is confounded by federal agencies that do not believe a big boat harbor is necessary. There have been two environmental assessments completed and the project is now undergoing

an EIS evaluation. Once the EIS report is completed, the community will need to make a recommendation to Congress. Hopefully, there will be recommendations for funding in 2004.

Power resources—There has been concern about fuel that was dumped during World War II. There is also need to increase the capacity of the powerhouse. The town also has a problem with the air permits because the emissions exceed the amount allowed for a town this size. Senator Stevens has assisted Unalaska with funding for wind power. There are also geothermal resources that could be tapped over on McKushan. The total need for the city is 16 mega watts. A \$100 million price tag is quite a big capital investment to pay off, plus there may be environmental issues concerning crossing the bay with cables. There is also an ongoing discussion regarding a fiber optic cable would be laid under the ice. It would be placed from Scandinavian countries to Russia and it would come ashore at Unalaska, split, and one trunk would go to Japan with the other directed to Oregon. Were this to take place, Unalaska would have to double its power plant capacity.

Sewer System—Hladick went on to address the current sewer system that may need to be upgraded. Basically, the wastewater coming into the plant is treated with ultra violet light. New regulations may force Unalaska to build a new sewer system that will cost between \$6-8 million.

Security—Another interesting project is the X-band radar barge project. A group from Mid-Course Ground-based Missile Defense System out of Atlanta visited Unalaska last year. This project would assist the Kodiak Launch Complex to triangulate on missiles going overhead to send information to Greeley. The proposed barge is 240 feet wide, drafts 50 feet, and is 20 stories off the water. It would come with a radar ship and there would be high security. Unalaska is a possible site for crew changes, repairs, etc. The environmental impact statement (EIS) will reflect this proposal.

Hladick added that an upcoming issue is Bristol Bay drilling in the North Aleutian Basin. This will certainly affect Unalaska and create a need for additional infrastructure.

Weather Impact

Commissioner John Roderick asked how long it would take a propeller plane to get to Cold Bay and if this type of plane would solve the weather problem. Hladick answered that in theory the propeller planes would solve the weather problem. Also, Hladick said the person who actually decides whether the plane will go or not is located in Seattle. It happens that Seattle will make a determination based on a forecast that was made 12 or 20 hours ago. Then, the weather changes 15 minutes after they cancel the flight.

One major complication for flying into Cold Bay is that there are no facilities. On-the-other-hand, a major advantage to Cold Bay is that jets can travel directly to Seattle and this would improve the travel time needed to transport fresh fish in processing plants to the market.

Financial Resources

John Voss, Financial Director for Unalaska, spoke next concerning the city's financial situation. Voss said that in 1974, revenues were \$300,000. This coming year, in 2004, the projected revenues are over \$36 million. Two significant growth periods occurred over the last 30 years: the 1970s when King Crab was dominant and the 1980s and 1990s when the ground fisheries were developed.

Seafood is the driving force behind the Unalaska economy and it is crucial to have successful fisheries management. This year, 27 percent of the projected budget will come from taxes and

the value of seafood. Ninety percent of the city water sales will be from use by the seafood processing plants. In order to manage the fisheries, it is pertinent to have good information that translates into having good research and data collection. Thus, it is essential to have funding for research in order to manage the fisheries.

Treadwell asked whether Voss noticed gaps in communications from major research groups operating in the area. Voss said that there seems to be a lot of disconnected studies being done. Frank Kelty, resource analyst, added that studies involving sea lion issues, birds, ecosystem research, etc. and need to be integrated. Executive Director Garrett Brass said that in the *Goals Report* on the USARC website, one of the major research recommendations is for a consolidated view of the Bering Sea. This may be work that can be done by the North Pacific Research Board.

Roderick asked if there might be a long-term problem with the use of the fresh water. Voss answered that the issue with the water may not be the use, but the treatment of the water after it has been used.

Brigham asked how climate change might impact the Bering Sea fisheries and Commissioner Mead Treadwell asked if salmon is processed in Unalaska. Frank Kelty, resource analyst, Unalaska, said that salmon had not been processed there for many years.

The Salmon Cycle

Alvin Osterback, port director for the City of Unalaska, serves on the Marine Fisheries Advisory Committee (MAFAC) as co-chair, and chairs the Aleut Corporation, noted that the changes in the fisheries have been extraordinary. In the 1960s, salmon stocks were low and king crab was becoming the fishery's cash crop. Shrimp became abundant and everyone, including the biologists, thought it would last forever. The shrimp's profusion only lasted a few, short years. Codfish, which had not been seen for many years, then grew plentiful.

Osterback related the tale of an old-time fisherman who said that when the cod returned, the crab would go away. He believed that the fishery works in a 50-year cycle. It was understood that when shellfish were readily available, the finfish were not. A commonality of cod and pollock is that they feed in the same waters that the salmon fishery uses. Osterback thinks that the cod and pollock are more aggressive feeders and that they were instrumental in the salmon moving off certain feeding areas. The salmon fisheries have been down for six to eight years. Osterback feels this is in part due to the fact they have to swim a long way to the spawning grounds from Bristol Bay. He also noted that the waters are warmer and that the winters are milder with inference that this may be affecting the fisheries.

Needed Harbor Changes

Osterback sees that there will be more fish allocated to fewer vessels to cut the cost of the harvest. Even so, Unalaska will need more dock space and moorage for larger vessels. The infrastructure in Dutch Harbor will have to be improved. Osterback said the city was in the middle of a ten-year plan. There is considerable work to be done.

Newton asked if there are any areas that offer good, safe refuge for long-term moorage and if there are places for ships even in the windiest periods. Osterback said that there are some places depending on the direction of the wind. Unalaska is investigating building a sheltered harbor.

Commissioner Mary Jane Fate asked if the city had the facilities to support repair needs for vessels. Osterback said that there is the ability for vessels to receive limited repairs and that is helped by the fact that Unalaska has jet service.

Ecosystem-Based Management

Treadwell asked what MAFAC contributes and how it can work towards consolidating Bering Sea research, climate change research, and other research in the area. Osterback said that MAFAC provides advice to the Secretary of Commerce on all living matters in the ocean. One of the issues being worked on is ecosystem-based management.

Currently fisheries work on single species management and everyone would like to see multi-species management. Osterback suggested that the science community also use the knowledge of the elders. In the past, the information the elders had to give was not used. Now Osterback believes that scientists are seeing the benefit of using and integrating the knowledge of the elders with scientific research. His father is in his eighties and is still available to give valuable information. However, the knowledge he has is not written down.

Brass said that there is not a sufficient monitoring base and not enough understanding on the interactions between species; there needs to be money put forth to work on modeling capacity.

Kelty, having worked for the Alaska Seafood Industry for 30 years, pointed out that Unalaska was number one in 2001 for pounds of seafood. Kodiak was approximately number six. The 2002 numbers are being developed. It appears that Unalaska has set a new national record, over the 840 million pounds set in Long Beach for tuna. Unalaska landed 908 million pounds of seafood. Alaska produces over 53 percent of the nation's seafood. Pollock is the main species in the area.

An issue of concern is that coral has been found near the Aleutian Islands. This is of major impact to the bottom trawl and long-line fishermen. There are MPAs, Alaska Seafood Industry or marine reserves in the region. A *Programmatic Supplement Environmental Impact Statement* is being worked on now and will influence the North Pacific ground fisheries in the future.

The Magnuson-Stevens Act is being worked on as well. Steller sea lion protection measures are still being worked out and also an endangered species act is being developed. It is worthy to note that in the Bering Sea alone there are 30,000 square miles of closure area, some are seasonal and some are annual closures. Included are: red king crab no trawl area, a near-shore Bristol Bay protection area, a herring savings area, Chinook salmon area, sea lion protection area, and so on. In the Gulf of Alaska there are 60,000 square miles of areas that are completely closed-off either annually or seasonally. Kelty has a map of this information. North Pacific pollock fisheries management has good fortune to have science-based decisions, conservation quotas limiting catches, non-target species management, monitoring, and enforcement with on-board observers. Pollock, halibut, sablefish, and Bering Sea crab fisheries are rationalized.

The Gulf of Alaska ground fisheries are being worked on and are probably a year away from being rationalized. There are many issues where science research is needed. Money for the National Polar Research Board (NPRB) is useful, but it hurts the whole system because the budget was cut for National Marine Fisheries Service (NMFS). Science is needed to determine the essential fish habitat program and the long-term view 5 or 10 years down the line.

Treadwell asked if there are any locally-based science researchers in Unalaska. Kelty said no. They rely on the local office of the National Marine Fisheries.

Regulating Wildlife

Carla Granath and Mary Schwenzfeiser from the Alaska Department of Fish and Game outlined the regulatory roles in the state. Granath said the Alaska Board of Fisheries is the regulatory

body that sets the fishing policy in Alaska. The Magnuson-Stevens Act sets the national standards for fishery conservation management.

The number one goal is to prevent over-fishing while achieving optimum yield. This is done with a precautionary approach where optimum yield is less than the maximum sustainable yield. *The Fisheries Management Plan* is what outlines the state's role in management. The state is responsible for all of the shellfish management with limited federal oversight. The Plan establishes the over-fishing rates and the minimum size stock threshold that defines when the fishery is over-fished.

Fate asked how a decision is made to close or re-open a fishery. Granath said that reporting is on a voluntary basis. About 50 percent of the fleets participate. Treadwell asked why reporting was not made mandatory. Granath said that the current system was working well because the fishermen realize it is in their best interest to keep an eye on the fishery.

Mary Schwentzfeier with the Fish and Shellfish Observer Program said that the program has existed since 1988. In 2002 there were 33 candidates who trained through the University of Alaska North Pacific Observer Training Program. 70 observers were deployed in 12 fisheries. The information the collected was then put into a database.

Ryan Burt, the program's database manager, discussed managing the data He takes the data that the observers collect and distributes it to state and federal agencies and scientists. He also uses the volunteer catch reports. All of this information is used to manage the fishery. These data play a crucial role in the rebuilding of a stock, bycatch control measures, mortality and habitat protection.

Two models have been developed: the Length-Based analysis model and the Catch Survey analysis model. Data from the observers are used to provide a scientific foundation for use in reviewing proposed regulation and management changes. In the past, data are used extensively at the Board of Fisheries meetings. Individual fishermen and stakeholders attend open meetings and the data are used to shape policies and regulations.

Concerning Regulations

Emil Berikoff, Unalaska Native Fisherman Association (UNFA), an organization formed in 1992, explained that his group has been very active by sending representatives to the Alaska Department of Fish and Game and North Pacific Fisheries Management Council meetings. They have also had representatives in Washington, D.C. to work on the Magnuson-Stevens Act to ensure that the entry level fishing language was included in the Act because this is important for small boat fishing and the community. The Association's efforts resulted in the opening of the Black Rockfish Fishery. Rockfish are very small which benefited smaller boats that could not target cod.

Five years ago UNFA received a gillnet quota for herring and in 2003 they caught 116 tons. A recent issue of concern is the processor quota shares being considered by the North Pacific Fisheries Management Council. UNFA thinks this is a backward move. How can the United States government give away a national resource to foreign owned companies?

Another important issue is the Steller sea lion protection that was responsible for closing of several fishing areas. The protection even covered jig boats. However, Berikoff said there has never been a record of a jig fisherman catching a sea lion or even a long-line fisherman catching a sea lion.

Berikoff continued to say that UNFA supports selected fisheries. The by-catch on some of the fisheries is larger than some of the quotas allowed to small boat fishermen. UNFA also invited two Russians to come and view how fish regulations are created under a democracy.

One of the biggest problems for small boat fishermen is that there is no harbor for small boats. Many fishermen cannot participate in the openings because there is no place to moor a small boat. Another problem is that some of the processors do not deal with small boat fishing so there is no market readily available and finding a market is costly.

It is important for USARC to get more research that includes all fish species, mammals, and birds. One of the reasons the sea lion issue is being blown out of proportion is because they did not have research data available on sea lions. Small boat fishermen have been allocated seven percent of the Togiak biomass. The reason it is so low is because there is no research on herring. Management thinks that the herring only spawn in Togiak. However, Berikoff has seen herring spawn on the South Peninsula and on the North Peninsula. He contacted Fish and Game to take samples but was told that the observations of a fisherman were not enough. A biologist's data is required because it would be more reliable. The information he had collected could be flawed. These are some of the main concerns for small boat fishermen and research could make a difference.

Newton asked about the size of the Unalaska Native Fishing Association. Berikoff responded that membership has been as high as 50 and indicated there are associate members as well.

Unalaska's Unique Characteristics

Tom Enlow, manager at the shoreside processor Unisea Inc., sits on the advisory panel for the North Pacific Fisheries Management Council. He said that Unalaska was a unique fishing community compared to others in Alaska because most of the fisherman who harvest fish in the Bering Sea are not residents of Unalaska and do not call Dutch Harbor their home port. In fact, people in Unalaska make their living from supporting the fishing fleets, large off-shore fleets, shoreside processors, and from processing the fish.

The mainstay of the community formally was crab, but for the past 15 years it has been pollock and cod. A recent report by the Department of Labor indicated that if combined, the shore-based processing companies would be the eighth largest private employer in Alaska behind Alaska Airlines and British Petroleum.

He continued to say that the newly formed Marine Conservation Alliance (MCA) is engaging in developing an ecosystem-based approach to fisheries management that will include marine reserves for essential fish habitats. MCA membership includes Unalaska shoreside processors.

Fishing Equality

Shirley Marquadt, At-Sea Processors Association, spoke about the importance of off-shore fleets. In the late 1980s, trawlers appeared in Unalaska waters. Trawlers were not regulated at the time. Trawlers are very efficient fish catching machines. In 1990 one vessel stopped in the Gulf and caught the entire pollock quota for Alaska. There are many competing businesses with an interest in the same stock and it was in the best interest for all to create a sustainable fishery.

In 1998 the American Fisheries Act was passed and in 1999 it went into effect. Factory trawlers were reduced from about 35 to 19 vessels, several being tied up year-round in Seattle. The fishermen were asked to keep the bycatch levels down. If they could not do that, they would have to retain and utilize everything that was brought onboard. In other words, every fish that

was brought onboard would come off their allotted quota—about 40 percent of the total pollock allocation to that fishery. The bycatch would have to be accounted in some way.

The vessels came together and formed an association. They worked to make fishing more efficient and more conservation based. The idea of sustainable use and management became main goals. The MCA was formed to promote base fisheries management on sound science and prudent management through an open, transparent process. By-catch has been reduced to incredibly low levels—0.04 percent in some cases. Marquardt said that when onboard one of the largest vessels, The American Triumph, they were noting a 0.04 percent bycatch level of jelly fish. Marquardt praised the importance of the offshore fleets and their determination to create sustainable fisheries.

Treadwell asked if At-Sea Processors make research contributions to universities and the State through the Marine Conservation Alliance. Marquardt said that some contributions are made directly and others indirectly. At-Sea-Processors donated 120,000 pounds of fish over three years to assist with a feeding habits of juvenile Steller sea lions study conducted by the Seward Sealife Center. Many other people donated transportation and storage facilities as a community project to answer the questions. For the past seven years, At-Sea-Processor vessels have voluntarily donated high sea salmon to Northwest Food Strategies in Seattle for distribution to food banks throughout the State of Washington.

Commissioner John Hobbie said he was interested in hearing that this group conducts evaluations of the scientific reports. Marquardt said that there is considerable information and data from different groups covering a variety of issues but no entity ties all the data together. It would be prudent to sort the information and bring interested people together. Hobbie asked if the At-Sea-Processors group has outside advisory group of experts. The director is Ron Clark from Juneau. All those who make the decisions are board members from the city, vessel owners, operators, skippers, mates, etc. Brass said that the North Pacific Research Board is an organization where At-Sea-Processors can submit items that need to be researched. Also, NPRB has considered forming a fisheries data archive where all the data could be pulled together so that it would be in a usable form.

Greg Hanson, Unalaska City Councilor said that in 1980 he worked in a field service department at a Seattle based company supplying machinery needed by the fleet up in Unalaska. In 1983 he moved to Unalaska to work with hydraulics for a small shipyard named Panama Marine. The operations were small with very little inventory and only one technician. Now there are four companies doing engine repair in various seasons, three companies who specialize in electronics, four hydraulic shops, four machine shops, three net companies, a handful of diving, welding, and logistical support companies in Unalaska. As a result, Unalaska now has superior inventory and technical expertise. The businesses provide the Unalaska with over \$3 million per year in taxes, primarily from fuel tax.

Hanson said that a consistent problem is the lack of research information in order to find out which fisheries could be struggling. It is going to take research dollars to get the base information in order to make knowledgeable decisions.

Business-to-Business Shortfalls

Gene Makarin, American President Lines (APL) addressed Dutch Harbor issues. APL has been in Unalaska since 1979 providing the first container ice carrier. There are now domestic and foreign competitors in Unalaska. APL primarily exports and serves all of Alaska. Japan has a potentially growing market for Alaska product. Makarin showed a map of Dutch Harbor in

relation to Asia, one of the markets. Also, he said that their freezer containers travel to Europe. American President Lines is owned by National Orient Line, based in Singapore. APL can get the goods to Australia or to Norway.

Captain Julio E. Soares, APL, emphasized that Dutch Harbor plays an important role in the relay of seafood containers. If one of the ships is out of sequence, it will have a ripple effect on the other cargo transportation ships. Dutch Harbor is a key harbor and the weather plays a critical role.

Makarin then noted that growth of his industry is limited in Dutch Harbor because of a lack of infrastructure, mainly a central sewer line. The capacity for growth needs to be provided by the Unalaska in order for the industry to grow.

Soares recited a list of growing concerns for APL that largely require additional money to upgrade the infrastructure.

- security demanded by the international community
- shipping and transit times for container vessels
- the harbor is not big enough to take in more ships
- not enough power to keep the refrigerators at the correct temperatures
- not enough electricity in Unalaska to support an increase in volume of traffic

In short, money needs to be spent to upgrade the infrastructure.

Makarin said the cost to put a ship in Dutch Harbor is twice that of putting a ship in Oakland or Los Angeles. Newton asked where a refrigerated container travels once it leaves Dutch Harbor. Soares said that the container travels to Japan. Treadwell commented that the ship goes through the Suez Canal because of the Jones Act.

Balancing Native Interests With Corporate Profits

Wendy Svarny Hawthorne, chief executive officer for Ounalashka Corporation (OC), the largest land-owner on Unalaska Island, briefly discussed the Alaska Native Claims Settlement Act (ANCSA). It is the main reason for the existence of the OC. Their business is based on leases to the companies that support the Bering Sea fleet. ANCSA conveyed 44 million acres of land to the Alaska native people and paid them a cash settlement of nearly \$1 billion. The catch was that both the conveyances and the cash were made to 'for profit' corporations formed in compliance with ANCSA to manage the proceeds and to be run by the Native people.

However, some of the requirements make it difficult to do business. ANCSA stock is restricted. Corporations and shareholders cannot sell shares. OC cannot have a public offering to raise capital projects. The purpose of the restrictions is to protect corporate assets and keep the assets in Native control.

Thirty years have passed and ANCSA is still a work in progress. Much of the land escaped that protective umbrella that was meant to protect the land. Subsistence rights for rural Natives remains unsettled and federal and state taxes consume the corporate profits. It is still necessary to return to the U.S. Congress to fine tune the original law.

Since the first meeting in July 1973, OC has increased its assets over the last 30 years from \$222,000 to \$53 million. OC has endeavored to aid its shareholders by paying dividends, funding higher education for shareholders and their descendents, and by being a fit corporate

citizen. OC looks forward to working with Unalaska, its people, and the Army Corps of Engineers to assist with a number of projects including:

- the small boat harbor
- clean-up of contaminants from WW II
- development of the shipping industry.

Research is needed to clean up the land for needed development, for understanding the complexities of the Arctic, sub-Arctic, and the Bering Sea ecosystem.

Promoting Unalaska

Mya Renken, Director of the Unalaska Convention and Visitors Bureau, then explained some of the special characteristics of Unalaska. It is

- less than two hours by jet service from Anchorage, or a three-night ferry ride from Kodiak.
- closer to Japan than to Seattle
- oldest continually inhabited community in the world, tied with Old Damascus in Syria
- a former camp ground used by Captain Cook and other captains while charting the Aleutian Islands. (Dr. Rick Knik has an idea of where the site is and it will be a future archeological project.)
- arrival site for Russian fur traders and priests in the 1760s
- played a strategic role in World War II, but the Unangan people were interned away from the islands.

There are several events for tourists to enjoy including the Halibut Derby. The event has been somewhat controversial recently ever since Federal halibut subsistence regulations questioned whether a fish could be caught as the result of sports fishing as opposed to subsistence fishing. Thus another layer of criteria has been added to the event.

Much of the tourism is based on the resources of not only the island, but of the Bering Sea. Forty percent of all coastal birds are in the Bering Sea. One of the rare birds in the area is the whiskered auklet that breeds on the smaller islands. There are very few trees in the area, and some birds such as eagles, have built their nests in construction cranes. Unalaska boasts the Museum of the Aleutians housing thousands of artifacts recovered in local archeological digs. The archaeological study ongoing regards the human migration route.

Renken then talked about the Aleutian World War II National Historic Area and Visitors Center. It is affiliated with the National Park Service and was created to interpret, educate, and inspire present and future generations about the War of the Aleutians and the Unangan people.

Of the twelve cruise ships that were scheduled to come through Unalaska in 2003, three ships did not come because of SARS. Most of the ships that come through are repositioning trips between Asian and Alaska. Some ships have come through the Northwest Passage and visited the Pribilof Islands.

As for marketing efforts, the Alaska Travel Industry Association and the Alaska Seafood Marketing Institute are considering working together to promote both seafood and tourism since they share some common markets.

School Report Card

Rick Kniaziowski, Unalaska school board member and vice-president of the Alaska Association of School Boards, said the schools in Unalaska were recently re-accredited by Northwest Labs with a score of 84 over 87. This is the highest score ever achieved by a school district. For the past 15 years, the city and parents have funded a preschool program for three- and four-year-olds taught by a certified teacher. Unalaska has the third highest starting teacher salary in the state and ranks eighth overall in average salaries. The 405 students in kindergarten to grade 12 represent 16 countries. More than half of the preschool and kindergarten students use English as a second language. The ESL program here is strong, combining hard work from involved parents and student success.

There are a couple of challenges that Unalaska faces. One is to receive full and adequate funding from the state. The second is the 'No Child Left Behind' bill. Kniaziowski believed this bill was passed rather hastily in Washington, D. C. based on what worked in Texas. This mandate is perhaps one of the most intrusive, under-funded mandates in education history. While the concepts are commendable, putting it in practice is proving to be a severe challenge in Alaska.

Secretary of Education Paige visited Alaska last month and hopefully understands that the problems faced by rural Alaska are different than those of the lower 48 states.

- If a school were considered in crisis for three years in a row, parents would have the option of having that home school district transport the student to the next closest district on a daily basis. That would mean sending students to Anchorage every day at Unalaska's expense or replace the entire teacher staff.
- Teacher retention is one of the single biggest struggles in rural Alaska and it is counter productive to replace an entire staff.
- Regarding the required exit exam, Unalaska is in fair shape. However, there are some districts where no one has passed yet. That means schools will be adding a year or two of high school in order for these students to pass

Tackling State Issues

State Representative Carl Moses provided an overview of state issues related to Unalaska. The first item on agenda is that the state must raise money that can be accomplished by implementing a sales tax. However, this tax will hurt smaller communities particularly where their prices on many of the staple items are already two-to-three times the price of the same or comparable items in other parts of Alaska or the lower 48 states. Institution of an income tax may also be necessary. These measures may be necessary because of the size of the state. State Troopers, road maintenance, and many other items are expensive to fund in Alaska and there will be no easy answers.

Treadwell said that the Alaska Department of Fish and Game has shied away from longer-term research because of their concern that members of the legislature believe that it classifies as university-related research. The legislature could then cut the budget further limiting research dollars. Somehow the right thing is not being done.

It is hoped that there will be more integrated federal and state research programs falling under marine science in order to get the data needed to develop more fisheries. Moses said that there are a number of fisheries not fully developed because of a lack of funds to manage more fisheries.

The Federal Outlook on Oceans, Conservation and Infrastructure

Bill Woolf, U.S. Senator Lisa Murkowski's staff, said that there is a fair amount of interest in the

Magnuson-Stevens Act and whether to reauthorize it this year. There is a national debate over the quota system.

He then talked about the *Pew Oceans Commission Report* that calls for scrapping the entire current system and instituting a different one to restore ocean wildlife, protect ocean ecosystems, and preserve the ecological, economic, and social benefits the oceans provide. However, Woolf said he suspects this is not a good prospect. For one thing, Alaska already has thousands of square miles set aside in marine protected areas designated for specific conservation use. Apparently though, these areas are not what Pew calls fully protected. They may be looking for a marine wilderness area—one where there is absolutely no motorization permitted, including transit.

Pew also called for ecosystem management. There is not enough basic information to jump into ecosystem management and it would be a disaster from a conservation standpoint. Woolf believes that the northern Pacific region, led by the North Pacific Fishery Management Council, is as far ahead in moving towards ecosystem management as any organization in the country. Hopefully the *National Ocean Commission Report* will provide some counterbalance.

The salmon fishery has been hurt by a decline in prices. The resources are in Alaska, but the market is not. The federal government is purchasing a total of \$13 million canned and pouched pink salmon to help reduce the inventory so that processors can move new product. This is not helping to raise prices. Approximately 130 tons of salmon bought by a private organization is head for distribution in Laos where there is recognition of the value of the product.

There is a need for new technological developments for the industry. One particular technique that Washington State University will investigate is funded by the Department of Defense Natick Science Center.

Another challenge is what to do with the waste product. Some processors have a meal plant facility on board but smaller vessels do not. A small, very fast meal plant is needed to take care of the byproducts from these fleets.

Woolf talked about the tremendous wealth of information that is implied by the term traditional knowledge. Currently, the information is not well used and it would be useful for scientists to have full access to this information.

Another important issue is the Environment and Public Works Committee and the Federal Highway Bill. The Denali Access System is patterned after the work of the Appalachian Commission that built highways throughout the southeast's multi-state Appalachian region. Despite the variation in size of these two areas, since Alaska is only one state, it receives considerably less money than do the individual states that make up the Appalachian region. Alaska receives only \$450 million every year in federal highway dollars.

Native village roads also need to be upgraded. Woolf said they would like to see the Bureau of Indian Affairs give an accounting of the available roads in native communities in Alaska. He continued to say that his staff is also working closely with Congressman Young's office focusing on the Water Resources Development Act that provides for boat harbors, dredging projects and so on.

Currently there are debates about whether carbon dioxide should be listed as a pollutant. Mercury contamination is another issue that is gaining a lot of attention. Scientific studies are not yet conclusive and the issue may be decided politically rather than scientifically.

Other issues include the Endangered Species Act, a subject that is also extremely polarized. The Invasive Species Act will come up next year for reauthorization and is of interest to port communities in Alaska. Prince William Sound Port of Valdez has one of the largest exchanges of ballast water due to the oil tankers arriving to many ports in the country.

Other items of interest are the Senate's ratification of the Polar Bear Treaty with Russia and the fact that the United States may ratify the Law of the Sea Treaty.

Brass asked what happens to a bill like the Magnuson-Stevens Act if it is not reauthorized. Woolf said that the practice is simply to continue on as though it had been.

Open Public Comment Session

Sonja Hadfa Comb and Dr. Don Hudson from the Alluvuk Family and Health Services Clinic outlined their assistance to three populations in the community

- the processor population
- the fishery population
- the floating population, people who live on fishing vessels in the Bering Sea.

The clinic provides emergency and urgent care, but now there is a demand for preventive care for this relatively young population. A physician was hired for the first time in 11 years to augment as staff that now comprises two full-time physicians, two full-time mid-level clinicians, a physical therapist, and a dentist. Fishing fleet injuries have declined in recent months but heart attacks are on the increase.

Hudson remarked on the positive health-related changes he had seen in Unalaska over the past 20 years. Because people are working for the same companies for many years, there is a stable workforce. Industries are cleaner.

But since the population is so diverse—Hudson said that at one point he counted 10 different languages spoken in the area—it is sometimes necessary to have interpreters to determine the patient needs. Newton asked if either of them have seen chronic exposure to PCBs. Hudson said that he sees it when he goes to Bethel. He also sees evidence of it when he visits some of the old Army/Air Force sites.

Fate asked if they saw a problem with drugs, inhalants, and alcohol. Hudson said there is as much problem with the legal drugs as the illegal drugs. There are a lot of children who have an addiction problem. However, there is also a large group of bright people who after receiving an education, either bachelors or masters degrees, who return to the village and abuse substances. There are a group of bright children who are bored and experiment as well. With the children, we have professionals in the school who have the ability to intervene early. Comb commented that there has been a rise in chronic diseases such as diabetes and heart disease. There have also been a couple of suicides that were not drug related.

Treadwell said that the Commission has done work promoting telemedicine for outlying communities such as Unalaska. Comb said that unfortunately they do not have the money to access telemedicine because they are a private clinic. Comb said that they do not have a professional to send requests for clarification or for outside expertise. They actually have to have the patient go to a major city center like Anchorage. Providence may have been the proposed provider for teleradiology, but the clinic needs real-time feedback; two weeks or even 24 hours is too long.

Then Bob Storrs, vice-president of the Unalaska Native Fisherman's Association, spoke about the need for more research money. Storrs said it is important to have more interaction between fishermen, scientists, and elders. This cooperation could come in the form of both voluntary and involuntary cooperation such as the Observer Program. Storrs said he believes a stumpage fee would benefit the Observer Program so that many vessels pay into a pool, and then National Marine Fisheries Service (NMFS) can assign observers where they may be needed. This may help depoliticize the placement of observers.

He also said that Unalaska needs a Sea Grant position. It is also important to stabilize small fisheries with fish available throughout the year. It may interest all to know that there is a hatchery program with the school that teaches children about the industry. Sugai said that the Alaska Marine Safety Education Association (AMSEA) has a phenomenal education program that has helped save many lives of people working in fisheries in Alaska. Storrs said that a new course needs to be tailored to a high school program. Sugai said that students could go to Sitka in the summer. The program has a boarding school there. High school students can receive credit for taking the courses within the school. The whole object is to take the training to the communities. Sugai said the Sea Grant program needs the full appropriation of \$3 million for the Fisheries Extension Enhancement, a national strategic investment. Also, Alaska has a demonstrated need for the program.

Kelty then spoke about the need to clean fishing gear and debris from the ocean. A small program was started in St. Paul to try and retrieve the trash from the fur seal rookeries. Almost 34,000 pounds of debris was collected and taken to Unalaska's landfill and another 80,000 pounds is stored at Rockport on St. Paul Island. In one cove, there are thousands of crab buoys. It looks as though someone has stored them there when in fact they have been washed into the cove. This is a concern for the North Pacific and Bering Sea communities.

Chairman George Newton, USARC

Activities May 19, 2003 through August 8th, 2003

- Researched funding resources to complete digitizing Arctic Ocean bathymetric data and old CTD/SVP data from the Arctic stored at the Arctic Submarine Laboratory in San Diego.
- Attended the Polar Research Board meeting on May 20 and noted that during the proceedings, the Scientific Committee on Antarctic Research (SCAR) spokesperson addressed his concern that the Antarctic was not nearly as organized as the Arctic research community. He specifically noted ARCUS as a good example on how to get information out (ArcticInfo), a system that has no duplicate in the Antarctic science world.
- On May 21 worked on the House side with the Chief Executive Officer of the Glacier Society regarding issues of transfer, control, etc.
- Visited Dave Garman to deliver some old pictures and brought him up to date about the Commission and its activities. Garman would like to attend the next USARC meeting in Washington, D.C.
- Continued working with NIMA on the Arctic Maritime Hazards Database system.
- Office of Naval Research has terminated an identifiable High Latitude Dynamics Program. (ONR is a mission agency and its pullback from the Arctic is of high concern.) Made several calls on individuals to assess the impact on the other Federal Agencies conducting research in the Arctic.
- He attended the hot wash-up for the Fiscal Year 2003 Navy ICEX. Science conducted at the ice camp received more time than originally planned.
- He wrote an article for *Sea Technology Magazine* during June which appeared in the July 2003 issue.
- Newton attended the conference on the 'Legal and Scientific Aspects on the Limits of the Continental Shelf.' During that meeting period also accomplished the following:
 - Met with the President of Iceland at his residence for one and a half hours. He spoke extensively about his concept of a 'North Research Forum.' The President indicated that he planned a trip to Washington, D.C. in September and asked for Commission support in setting up an agenda.
- On July 14, 2003, Newton met with Assistant Secretary of State, John Turner, to discuss Article 76 UNCLOS and urge administration action.
- On July 14, 2003, Newton and Commissioner Treadwell met with the Assistant Secretary of the Interior, Lynn Scarlott.
- On August 8, 2003, Newton met the Staff Director for Senator Lugar of the Senate Foreign Relations Committee regarding Article 76.
- Newton worked with Craig Dorman and Senator Murkowski's staff on changes to Arctic Research and Policy Act, 1984.

Appendix B

Meetings and Additional Activities In FY 2003

In addition to those meetings and other activities reported in the minutes, the Commission is represented, when possible, at the monthly meetings of the

- State Department's Arctic Policy Group
- Interagency Arctic Research Policy Committee's staff meetings
- *ad hoc* Alaska Arctic Council Working Group.

The Commission's staff attends all meetings of the National Research Council's Polar Research Board and Ocean Studies Board. The Commission continues to attend the annual (spring) Arctic Summit Week, an international gathering of Arctic scientists coordinated by the International Arctic Science Committee.

The Executive Director and Deputy Executive Director have participated, as the Commission's representative(s), at all meetings of the North Pacific Research Board. They have also participated in workshops for the development of a National Climate Change Program.

Several Commissioners and staff have attended meetings of the Arctic Council in Finland and Iceland, 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, they continue to attend meetings of the American Geophysical Union, and other science gatherings such as the

- Arctic Institute of North America
- The Oceanography Society
- U.S. Permafrost Association
- Alaska Marine Science Conference
- International Bering Sea Conference.

During FY 2003 the staff attended meetings of the Alaska Ocean Observing System, the Study for Environmental Arctic Change (SEARCH), and the 2005 US-Sweden International Arctic Ocean Expedition.

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 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 which 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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ARCTIC RESEARCH COMMISSION**

January 2003

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(serving during Fiscal Year 2003)

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Table 1

PUBLICATIONS OF THE US ARCTIC RESEARCH COMMISSION

Annual Reports to the President and the Congress

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- *The United States: An Arctic Nation.* 1987
- *Entering the Age of the Arctic.* 1988.
- *Arctic Research for an Arctic Nation.* 1989
- *Arctic Research: A Focus for International Cooperation.* 1990
- *Arctic Research in a Changing World.* 1991
- *An Arctic Obligation.* 1992
- *Arctic Research Priorities.* 1993
- *Annual Reports, Fiscal Years 1994 and 1995.* 1996
- *Annual Reports, Fiscal Year 1996.* 1997
- *Annual Reports, Fiscal Year 1997.* 1998
- *Annual Reports, Fiscal Year 1998.* 1999
- *Annual Reports, Fiscal Year 1999.* 2000
- *Annual Reports, Fiscal Year 2000.* 2001
- *Annual Reports, Fiscal Year 2001.* 2002
- *Annual Reports, Fiscal Year 2002.* 2003
- *Annual Reports, Fiscal Year 2003.* 2004

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- *National Needs and Arctic Research, a Framework for Action.* May, 1986
- *Logistics Recommendations for an Improved U.S. Arctic Research Capability.* June 1997
- *The Arctic Ocean and Climate Change: A Scenario for the U.S. Navy.* January, 2002

Findings and Recommendations

- *Logistic Support of Arctic Research.* July, 1988.
- *Statement of Goals and Objectives to Guide United States Arctic Research.* December, 1989.
- *Arctic Data and Information: Issues and Goals.* June, 1989.
- *Improvements to the Scientific Content of the Environmental Impact Statement Process.* December, 1989.
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- *Goals, Objectives, and Priorities to Guide United States Arctic Research.* January, 1991.
- *Research Needs to Respond to Oil Spills in Ice-Infested Waters.* May, 1992.
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- *Goals and Priorities to Guide United States Arctic Research.* January, 1997.
- *Goals and Priorities to Guide United States Arctic Research.* January, 1999.
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- *Corrosion of the Trans Alaska Pipeline Systems & Research Needs.* L.D. Perrigo. May, 1990.
- *Effects of Glasnost and perestroika on the Soviet Establishment: Relevance to Arctic Research.* J.G. Roederer. March, 1991.
- *The Increasing Importance of Arctic Research to the United States.* J.G. Roederer. May, 1991.