United States Arctic Research Commission

-Draft-

Minutes from the 96th Meeting

October 2011
Durham and Hanover, New Hampshire

University of New Hampshire (Durham, NH), October 5th
US Army Corps of Engineers Cold Regions Research and Engineering Laboratory (Hanover, NH), Oct. 6th
Dartmouth College (Hanover, NH), October 7th

Commissioners

Ms. Fran Ulmer (Chair)
Ms. Michele Longo Eder
Ms. Mary Pete
Ms. Helvi Sandvik (regrets)
Dr. Charles Vörösmarty
Dr. Warren Zapol, MD

Staff

Dr. John Farrell, Executive Director
Dr. Cheryl Rosa, Deputy Director
Ms. Kathy Farrow, Communications

Invited Participants

October 5 (Center for Coastal & Ocean Mapping and the Joint Hydrographic Center, University of New Hampshire, Durham, NH)

Dr. Jan Nisbet, Senior Vice Provost for Research, University of New Hampshire
Dr. Larry Mayer, Director, Center for Coastal & Ocean Mapping and the Joint Hydrographic Center
Dr. Nancy Kinner, Professor of Engineering, Environmental Research Group, University of New Hampshire and Co-Director, Coastal Response and Restoration Center (partnership between NOAA/ORR & UNH)
Dr. Larry Hamilton, Professor of Sociology, University of New Hampshire
Dr. Marc Lessard, Research Associate Professor, Magnetosphere Ionosphere Research Lab, UNH
Dr. Jack Dibb, Research Associate Professor, Institute for the Study of Earth, Oceans, and Space, UNH

October 6 (US Army Corps of Engineers Cold Regions Research and Engineering Laboratory)

Dr. Bert Davis, Director, USACE/CRREL
Dr. Don Perovitch, Research Geophysicist, USACE/CRREL
Dr. Margaret Knuth, Civil Engineer, USACE/CRREL
Dr. Matthew Sturm, Research Geophysicist, USACE/CRREL

October 7 (Dartmouth College, Dickey School)

Dr. Carol Folt, Provost, Dartmouth College
Dr. Ross Virginia, Professor of Environmental Science and Director of the Institute of Arctic Studies
Ambassador Ken Yalowitz, Director of the Dickey Center, Dartmouth College
Dr. Lee McDavid, IGERT program manager, Dartmouth College
Dr. Barry Scherr, Mandel Family Professor of Russian, Dartmouth College
Mr. Christopher Polshenski, IGERT student, Dartmouth College
Ms. Lauren Culler, IGERT student, Dartmouth College
Dr. Mary Albert, Professor of Engineering, Thayer School of Engineering, Dartmouth College
Dr. Laura Ray, Professor of Engineering, Thayer School of Engineering, Dartmouth College
Dr. Xiahong Fang, Assistant Professor, Department of Earth Sciences, Dartmouth College
Dr. Meredith Kelly, Assistant Professor, Department of Earth Sciences, Dartmouth College

Action Item Summary

ACTION 1: Kathy **Farrow** will arrange travel for Commissioner **Pete** to be an indigenous representative to the Alaska Climate Change Executive Roundtable. Their next meeting is November 1, 2011.

ACTION 2: **Rosa** will engage with representatives from ARCUS and/or with UAF, as a potential partner, to help advance plans for the NW Arctic Borough science/research workshop.

ACTION 3: Commissioner **Pete** will speak with a local legislator on the water and sanitation effort presented by **Rosa**.

ACTION 4:Rosa will rewrite the white paper to separate the logistical challenges of conducting research in the Russian Arctic from the policy challenges. She will then send it to the appropriate contact in the State Department for consideration and will look for other opportunities to promote US-Russia coordination.

ACTION 5: Farrell will further vet the draft Arctic research policy with IARPC, NSF, and with other stakeholders, as appropriate.

ACTION 6: Farrell will further vet the draft policy with the Office of Personnel Management, and then, if and as appropriate, with legal counsel.

ACTION 7: Farrell will investigate and report back to the Commissioners on the matter, raised by Strum, of a "level playing field" with Arctic research sponsors.

ACTION 8: The letter USARC staff send to invited speakers should include "What are the three most important research issues of which the commission should be aware?" Recipients should be told that they could respond either in writing, or in the course of their verbal presentation to the commission. Kathy **Farrow** will add this item to the meeting checklist.

ACTION9: Staff (**Farrell**) will draft a white paper that summarizes the state of oil spill response research in the Arctic. The paper will list the entities doing the research, the nature of the research, the sponsors of it, and other affiliated topics.

ACTION 10: Revise Commission policy by including requirement of USARC advisors to adhere to the Commission's conflict of interest policy.

ACTION 11: Complete the Goals report and distribute it in January 2012.

ACTION 12: The USARC approved the draft USARC budget for Fiscal Year 2012.

ACTION 13: The Commissioners approved the minutes from the 95th meeting.

Day 1: October 5th

Center for Coastal & Ocean Mapping and the Joint Hydrographic Center, University of New Hampshire, Durham, NH

8:30 am. USARC Chair Fran **Ulmer** called the meeting to order. She welcomed Commissioners, staff, and representatives from the University of New Hampshire. She called upon Commissioners and staff to make self-introductions.

8:40 am. Senior Vice Provost for Research, Jan **Nisbet**, welcomed the Commission to UNH, and gave a general overview of the University. She focused on the Institute of Earth, Oceans and Space, and on other institutes in the social and material sciences as being particularly relevant to the interests of the USARC. She explained that UNH was a Land Grant and that it receives more federal research dollars than any other land grant college in New England. There are 15,000 students at UNH, 12,000 undergraduates (and thus 3,000 graduate students). There are about 680 tenured faculty members and another 90 research faculty members, as well as many lecturers, clinical faculty members, and adjuncts. The research portfolio is about $160M/yr.

8:45 am. Dr. Larry **Mayer** gave a PowerPoint presentation about the Center for Coastal & Ocean Mapping and the Joint Hydrographic Center (CCOM/JHC), and he emphasized the role of Arctic research. The CCOM/JHC was created in 2000 with an earmark from NH Senator Judd Gregg. By 2003, it became a line item in the President's budget (in NOAA). By 2009, the JHC became authorized under PL111-11, through a competitive process. Currently there are over 80 people associated with the center, including faculty, students, and staff. The goals of the center are to:

> • Be a world leader in the development of hydrographic and ocean mapping technologies and approaches.
> • Expand the scope of ocean mapping clients and constituencies through the development of innovative applications and collaborative work with both the private sector and government labs.
> • Educate a new generation of hydrographers and ocean mappers that can meet the growing needs of both government agencies and the private sector.

Mayer discussed the CCOM, specifically, which provides for participation of private sector and other government agencies, and he also mentioned the many industrial associates affiliated with JHC/CCOM.

Mayer gave an overview of the telepresence system, the acoustic test tank, and the research vessels and systems used by the Center. He described four priorities of the Center, which are:

- To improve the sensors used for hydrographic, ocean and coastal mapping (sonar, LIDAR, AUVs) with an emphasis on increasing accuracy, resolution and efficiency, especially in shallow water.

- To improve and develop new approaches to hydrographic, ocean and coastal mapping data processing with emphasis on increasing efficiency while understanding, quantifying, and reducing uncertainty.

- To develop tools and approaches to adapt hydrographic, coastal and ocean mapping technologies to mapping the benthic habitat and exploring the broad potential of mapping features in the water column.

- To develop new and innovative approaches for the 3- and 4-D visualization of hydrographic and ocean mapping data sets, including better representation of uncertainty, and complex time- and space-varying oceanographic, biological and geological components.

Mayer said that a new proposal was being developed to focus on developing innovative approaches and concepts for the electronic chart of the future and e-navigation. They also plan to develop tools, protocols, non-standard products, and approaches that support the concept of "map once – use many times," i.e., integrated coastal and ocean mapping.

Mayer then shifted topics to focus on his efforts associated with the UN Convention on the Law of the Sea Treaty (UNCLOS), and how he collects bathymetric data associated with the US efforts to delimit our Extended Continental Shelf (ECS). As a nation, the US has not acceded to the UNCLOS treaty. **Mayer** hoped that we would, as soon as possible. The Commissions concurred.

In 2002, **Mayer** completed an initial "table top" exercise of compiling and analyzing the data relevant to a US claim under Article 76 of UNCLOS. He identified 8 regions of the US where there was a potential claim for an ECS. The largest of these regions are adjacent to Alaska. This report was well received, and served as a starting point for further data collection supported by NOAA.

Mayer then described his work in the Arctic (Chukchi and Beaufort Seas, Barrow Margin, and elsewhere) aboard the USCG Cutter *Healy*, an icebreaker outfitted with a multibeam system. He spoke of the many cruises, some joint with the Canadian government. He showed many maps and charts of the data collected, and how it could be used to help delimit the US's ECS. He spoke too of ancillary projects, conducted during his cruises on *Healy*, such as studies involving AUVs, meteorology, oceanography, geo-cameras, ice buoys, ocean acidification, and observations of birds and mammals.

At the end of his presentation, **Mayer** stressed the importance of access to the Commission, and by this he meant access to infrastructure (vessels), access to geographic regions (permits and authorization). He encouraged the USARC to increase access.

9:45 am. Dr. Nancy **Kinner** gave a PowerPoint presentation and handed out copies of it, as well as a report from a workshop in 2008, and a set of one-pagers about the Coastal Response and Restoration Center (CRRC).

The CRRC has been a partnership between NOAA's Office of Response and Restoration and the University of New Hampshire since 2004. The mission of the CRRC is to:

- Conduct and oversee basic and applied research and outreach on spill response and restoration
- Transform research results into practice
- Serve as hub for oil spill R&D
- Educate/train students who will pursue careers in spill response and restoration

Kinner spoke about CRRC's work on the following topics: uncontrolled oil releases, the human dimensions of spills, Arctic spill response (the human dimension), Arctic communities working groups, meetings and workshops, and spill response information management.

Kinner then spoke about NOAA's efforts on ERMA (environmental response management application), a web-based, data assimilation tool. NOAA is adapting ERMA for use in the Arctic.

Kinner said that she's seeking funding for workshops in Arctic communities (North Slope, NW Arctic, and Bering Strait region). Local travel is covered, but no other funding is yet available. She's seeking to educate people on the meaning of "incidence command system"(ICS), how to respond, and so on. She stressed that there is an absence of local knowledge in oil spill response preparation and that this is a critical gap that needs to be filled in the Arctic. Traditional and local knowledge needs to be incorporated into response plans. Rosa is participating on this Planning Committee on the part of the USARC.

Kinner concluded by stating that most funding for oil spill research is from (and within) industry, rather than from the federal government. She said that BOEMRE (DOI) has some, but it's not a particularly large amount, even after the Deep Water Horizon event. She estimated that about $20M has been spent, by all federal agencies, over the past 10 years.

10:30 am. Dr. Larry **Hamilton** gave a power point presentation about his work in Arctic social science, and specifically public perceptions about climate change. He focused in on Arctic ice and perceptions of change in the Arctic. His research is based on telephone-based surveys.

After presenting a series of scientific facts about Arctic climate change, **Hamilton** then discussed the survey questions posed to the general public. His results indicated a rather strong partisan (Democratic vs. Republican) pattern. In short, Republicans, both college educated and those who were not, and those from New Hampshire, as well as nation-wide, more often thought that the loss of Arctic sea ice was less than actual, or has "recovered," recently (2011), to the same areal extent of 30 years ago.

Hamilton said that public perceptions about Arctic science and physical realities are linked to pre-existing belief systems that shape views of credible information sources, and retention of the information encountered. He followed with, "This is the elephant in the room, when we discuss scientific communication." The traditional means of scientific communication are not enough in the new information environment. Survey research can help, by exploring what people know and how they know it.

Hamilton then spoke about polar-oriented questions in the "general social survey," that was conducted in 2006 and 2010. He found that there was a general improvement, from 2006 to 2010, in knowledge about the polar regions, but no change in the levels of concerns about polar problems. He also noted a widening in the partisan gap. In short, people gained knowledge in ways that supported their existing belief systems.

Hamilton then discussed regional differences in the perceptions of Arctic and climate change. He noted higher percentages of people thinking that climate change is at least partly due to humans in New England, the Pacific Northwest, and in some SE Alaska communities (e.g., Yakutat, AK).

Hamilton concluded with a discussion of his upcoming research. He wants to develop a wider set of knowledge questions that:

- have clear, factual answers which contrarian and mainstream scientists both accept,
- have been widely publicized in general media,
- have central importance to ongoing Arctic change, but
- do not require agreement with particular policies, future scenarios or causal explanations.

He wants to compare responses to these questions as they:

- change over time,
- relate to information sources and individual characteristics, and
- differ across places, including Arctic and non-Arctic.

And finally, he wants to apply insights for better scientific communication.

Regarding scientific communication, **Hamilton** suggests that the blogosphere is leading the press; material comes out faster/sooner than in the media. He also said that a small, but organized, group of climate deniers are responding to newspaper articles. He encourages scientists to make their data and information available to others, who can help promote the message (and others will push back against misinformation).

11:00 am. Dr. Marc **Lessard** gave a PowerPoint presentation titled, "Observing Earth's Space Environment from Arctic Regions." **Lessard** is associated with the Space Science Center in the Department of Physics.

Lessard said that he studies the connection between the Sun and the Earth, via the solar wind. This is called, by NASA, "heliophysics" and/or "geospace." NSF, on the other hand, calls it "magnetospheric physics," "aeronomy," and "solar terrestrial" science. In short, he studies the Sun, solar wind, Earth's magnetosphere, Earth's ionosphere/aurora, and Earth's upper atmosphere.

His basic research seeks to understand how energy in the form of solar wind, develops, propagates and is transferred (or not) to Earth's upper atmosphere. In an applied sense, this becomes "space weather," that affects communications, and other activities, such as airline travel in polar regions (radiation and communication), the link between solar activity and climate change, spacecraft, power grids, and GPS signals.

Lessard describe his research on the aurora, based on work at Poke Flats, near Fairbanks. He described the various displays of energy transfer, and how rocket experiments have been conducted. He then described research on Earth's radiation belts, and this research too was conducted in Arctic regions.

He concluded his presentation by describing a significant decrease in the availability of funding for his work, and the challenges of coordinating it (from NASA and NSF). He also said it was his impression that funding for his type of research is no longer being support by NSF's Office of Polar Program, and specifically in the "Arctic Natural Sciences Program."

11:35 am. Dr. Jack **Dibb** gave a PowerPoint presentation via phone, as he was in Washington, DC. **Dibb** is the Director of the Earth Systems Research Center. He's been studying air snow exchange at Summit, Greenland since 1989. Since 1998, he's been focusing on snow photochemistry, which can be defined as a sub-discipline of chemistry. It's the study of chemical reactions that proceed with the absorption of light by atoms or molecules. Everyday examples include photosynthesis, the degradation of plastics and the formation of vitamin D with sunlight.

Dibb said that scientists have learned that the way impurities are incorporated into snow and ice (and thus ice cores) is a much more complex process than initially thought. He then described the complexities, involving deposition, advection, photochemical modeling, photolysis of nitrate in snow, bromine chemical cycles, the impacts of bromine chemistry on the isotopic composition of nitrate, and other research efforts.

Dibb concluded his presentation with a brief discussed the new "Summit Station" in Greenland.

Noon. Working lunch.

Dr. John **Farrell** gave his report as Executive Director of the USARC. His written report was provided to the Commissioners in advance of the meeting, in the briefing book. He used the time at the meeting to provide additional details on the following topics in his report: (a) supporting the Chair and other Commissioners; (b) Co-leading the federal team to write the strategic action plan for "Changing Conditions in the Arctic," part of the new National Ocean Policy; (c) IARPC efforts, including the 5-year Arctic Research Program Plan; (d) USARC representation on various committees, working groups, and organizations; (e) Engagement with Congress and the State of Alaska; (f) Outreach activities; (g) science meetings and conferences; and (h) USARC administration.

12:30 pm. Meeting recesses for a tour of the CCOM/JHC facility.

1:35 pm. USARC meeting reconvenes

Dr. Cheryl **Rosa** gave her report as Deputy Executive Director of the USARC, and Alaska Director. Her written report was provided to the Commissioners in advance of the meeting, in the briefing book. She used the time at the meeting to provide additional details on the following topics in her report: (a) North Pacific Research Board; (b) North Slope Science Initiative; (c) Alaska Climate Change Executive Roundtable; (d) Arctic Landscape Conservation Cooperative; (e) Alaska Ocean Observing System; (f) NW Arctic Borough Workshop; (g) Water and Sanitation; (h) Arctic Council; (i) Russian White Paper; and (j) the USARC Goals Report draft.

Commissioner **Eder** added comments on the NPRB and the Barrow meeting, indicating that it was a success. It was noted, by Rosa, that the NPRB RFP would not have a component for oil spill in ice research.

Based on Rosa's report the following Actions were agreed to:

ACTION 1: Kathy **Farrow** will arrange travel for Commissioner **Pete** to be an indigenous representative to the Alaska Climate Change Executive Roundtable. Their next meeting is November 1, 2011.

ACTION 2: **Rosa** will engage with representatives from ARCUS and/or with UAF, as a potential partner, to help advance plans for the NW Arctic Borough science/research workshop.

ACTION 3: Commissioner **Pete** will speak with a local legislator on the water and sanitation effort presented by **Rosa**.

2:30 pm. Break.

2:45 pm. Reconvene.

Commissioners discussed the "white paper" on scientific cooperation with Russia on Arctic research that was drafted by Cheryl **Rosa.** One topic of interest was the audience for the paper. Is it DOS, AAAS, NAS, OSTP, or others interested in bilateral efforts between the US and Russia? The consensus is that the paper should be drafted for a broad audience, but that it is primarily drafted for the Department of State's consideration.

Commissioner **Zapol** suggests narrowing the title to "access" not "scientific cooperation."

ACTION 4:Rosa will rewrite the white paper to separate the logistical challenges of conducting research in the Russian Arctic from the policy challenges. She will then send it to the appropriate contact in the State Department for consideration and will look for other opportunities to promote US-Russia coordination.

4:15 pm. Review actions from 95th USARC meeting. All actions were accepted and approved with one exception, and that was wording of one section of the draft Arctic Research Policy. Commissioners asked that the wording in section 7 of the draft policy be changed from:

"The U.S. Arctic Research Commission shall annually propose short- and long-term priorities for federally funded research, for the IARPC's use in coordinating the research programs of federal departments and agencies."

To:

"The U.S. Arctic Research Commission shall recommend important areas for federally funded research, for the IARPC's use in coordinating the research programs of federal departments and agencies."

ACTION 5: Farrell will further vet the draft Arctic research policy with IARPC, NSF, and with other stakeholders, as appropriate.

Commissioners then turned to the Conflict of Interest. After some discussion, Chair Ulmer said that when the policy was finally concluded, she'd like all commissioners and advisors to sign it. Before that, however, the following action was agreed to.

ACTION6: Farrell will further vet the draft policy with the Office of Personnel Management, and then, if and as appropriate, with legal counsel.

5:00 pm. Public session of the meeting opens. No additional participants other than those already present, came to the session.

5:30 pm. Meeting adjourns for the day.

Day 2: October 6th

US Army Cold Regions Research and Engineering Lab (CRREL), Hanover, NH

8:30 am. CRREL Director Bert **Davis** welcomed the USARC and made introductions. He spoke about CRREL's mission, purpose, history, and noted how the institution was celebrating its 50th anniversary.

CRREL's mission is to solve interdisciplinary, strategically important problems of the US Army Corps of Engineers, Army, DOD, and the Nation by advancing and applying science and engineering to complex environments, materials, and processes in all seasons and climates, with unique core competencies related to the Earth's cold regions.

CRREL's technical program areas include signature physics, terrain properties and processes, maneuver support and sustainment, cold regions infrastructure, biogeochemical processes in earth materials, environmental fate and transport (geochemistry), hydrology and hydraulics, and water resources (geospatial applications).

In mapping CRREL activities to USARC's priorities, **Davis** noted that CRREL has interests in 3 of the 5 major goals of the USARC, namely, (1) environmental change of the Arctic, Arctic Ocean and Bering Sea; (2) civil infrastructure, and (3) natural resources assessment and earth science.

Davis noted that CRREL is broad, in scope, but only one or two person deep in any one subdiscipline. He noted that 95% of the money needed to run CRREL is reimbursable. Sources of funding are industry, NSF, and other parts of DOD. Currently, the fastest developing business is testing and providing info to the Office of the Secretary of Defense level of interest.

Davis praised the USARC as an effective and useful organization, and said that it was not another 'tweener organization,' meaning an ineffective entity that exists between Congress and the Executive Branch.

8:50 am. Don **Perovitch** gave a PowerPoint presentation on Arctic research in which he is involved. He spoke of climate change, interdisciplinary and collaborative research, SEARCH, field campaigns and autonomous instruments used to observe climate change, and long-term observatories. He focused in on sea ice research, his specialty, and described sea ice mass balance buoys, atmospheric chemistry buoys, and the processes that are driving climate change. He said that solar heating of the upper ocean is playing a major role. He described the implications of these changes on biogeochemistry, and on the people that live in the Arctic. He concluded with a slide on "responding to change," in terms of climate, business, economics, and engineering.

He said that CRREL was one of the few groups in SEARCH that addresses the "responding to change" emphasis.

After he concluded his presentation, a general discussion occurred on the importance of long-term observing and which agencies are responsible for supporting such, either consistent with the goals of "mission agencies," or of "basic research" agencies.

9:17 am. Margaret **Knuth**, a civil engineer, who's been at CRREL for three years, spoke about her research via PowerPoint. She gave a general overview of how CRREL interacts with private industry, and noted that CRREL doesn't provide services to private industry if there is another private sector provider.

She described how her work "responds to climate change." **Knuth** described discrete element method modeling of floating ice in the Beaufort Sea, in Cook Inlet and in Buckland River, and showed short movie clips of each. She also described platform icing, vessel icing, aircraft icing, mobility, fuel and cargo sled technology, and infrastructure.

9:40 am. Matthew **Sturm** discussed his research at CRREL via movie and PowerPoint. He first went to Alaska in 1973, after he left the military. Sturm described the early days of the U.S. Army in Alaska, and then CRREL's long history in Alaska, starting with the Frost Effects lab in 1944. He mentioned the Permafrost Division, SIPRE, ACFCEL, and CRREL. He mentioned Farmer's Loop, the Fox permafrost tunnel, and the $6M renovation at Ft. Wainwright.

Sturm said that the CRREL staff in Alaska had expertise in the following areas: geology, geochemistry, environmental quality, snow ecology, geophysics, engineering (of many sorts, including hydraulics and mechanical), physical science, instrumentation, field technician, and management.

The specialized tools used by CRREL include snow modeling, ground-penetrating radar, core drilling finite-element modeling, EM-31 geophysics, FM-CW radar, LiDAR, resistivity and other geophysics, spectrometers and chromatographs.

Sturm summarize in these four points…CRREL has:

- A 50-year history of distinguished Arctic research.
- The intellectual and physical capital to continue high quality Arctic research.
- A level of dedication and expertise in working in the Arctic environment unrivaled in any other institution.
- An exceptionally good moment in time to continue building this national capacity.

Sturm concluded with the following.

The Arctic Research Commission can directly help CRREL in three areas:

1. A level playing field in competing for funding at NSF, NASA, NOAA etc.
2. Assistance in helping us bridge the "valley of death" between basic and applied research
3. Advocacy for CRREL as the lead in DoD Arctic research for a more coordinated DoD approach

With respect to the "level playing field," he meant with regard to program managers and with the broader scientific community. In other words, he would like to see CRREL proponents treated similarly to proponents from universities and other non-profit organizations. There's a misunderstanding of how CRREL is funded. It's largely a soft-money institution.

Knuth gave a specific example, saying that that the NSF Antarctic Division programs will not provide salary support to CRREL, whereas the Arctic Division will. Why the disparity?

ACTION 7: Farrell will investigate and report back to the Commissioners on the matter, raised by Strum, of a "level playing field" with Arctic research sponsors.

10:15 am. USARC toured the CRREL facilities, library, and laboratories. Visits included the oil-spill-in-ice test tanks, cryotanks, driving on dirt, driving simulator, and other facilities.

1:00 pm. Working lunch and general discussion with CRREL Director Bert **Davis**.

2:00 pm. USARC resumes its business meeting.

The commissioners discussed letters to be sent to speakers who are invited to address the commission. The resulting action follows.

ACTION8: The letter USARC staff send to invited speakers should include "What are the three most important research issues of which the commission should be aware?" Recipients should be told that they could respond either in writing, or in the course of their verbal presentation to the commission. Kathy **Farrow** will add this item to the meeting checklist.

Based on the oil spill research the commission learned about at UNH and at CRREL, Fran Ulmer proposed the creation of a summary document on oil spills in ice-covered waters. The following action evolved.

ACTION9: Staff (**Farrell**) will draft a white paper that summarizes the state of oil spill response research in the Arctic. The paper will list the entities doing the research, the nature of the research, the sponsors of it, and other affiliated topics.

2:37 pm. Commissioner **Zapol** gave a presentation on the recently completed Antarctic study of the National Academies' Polar Research Board titled, "Future Science Opportunities in Antarctica and the Southern Ocean." He mentioned the key findings, and how they will be used by the National Science Foundation in crafting future research opportunities in the Antarctic region.

3:10 pm. Commissioner **Vörösmarty** handed out two documents. One was his trip report to Iceland, for the Northern Research Forum science meeting. The second was on the topic of SBIR/STTR (Small Business Innovation Research / Small Business Technology Transfer program. This discussion stemmed from conversations Vörösmarty had at the Northern Research Forum in Hveragerdi, Iceland and at a post-conference meeting with Lois Wardell of Arapahoe SciTech, September 3-6, 2011.

Vörösmarty described the rationale for SBIR/STTR as an engine for US innovation in technology, and that about $2B is provided annually by about 11 federal agencies for such activities. He said that the innovations developed by SBIR/STTR are available for commercial use, but he argued that most are unknown to researchers and thus "un-harvested. They could have direct and important value to Arctic research and Arctic region applications.

Vörösmarty then provided two examples of un-harvested technologies of value to Arctic research. The first was a hand-held biosensor, which could help in the field of polar microbial ecology. The second was a guided dropsonde that could monitor weather events or atmospheric in-situ sensing, sampling, or profiling.

Vörösmarty suggested that a systematic assessment of what's available would be useful for Arctic research and could create new markets for these products. He recommended that USARC fund a workshop on this idea. USARC could assemble a team to assess the feasibility of developing a systematic harvesting mechanism for SBIR/STTR investments with the aim of carrying these technologies and innovations into the Arctic research realm. USARC would then prepare a report to be shared with IARPC and other agencies. The longer-term goal would be to advocate and/or create a process for technology transfer.

Commissioners considered the request and came up with the following Action for Vörösmarty.

Action 10: **Vörösmarty** will consider further the options to use SBIR to advance Arctic Research and will report back to the Commission when ready.

4:00 pm. Break

4:10 pm. Reconvene

The Commission discussed the joint meeting with the Canadian Polar Commission scheduled for 2012. The primary discussion point was how, together, we would engage with the scientific community in a more meaningful way and raise the visibility of Arctic research.

Farrell proposed that the USARC and the Canadian Polar Commission come up five or so common research topics or themes, agree on them, and then promote them as more of a top-down approach. These could be related to Arctic human health, the Chukchi-Beaufort Sea ecosystem, or other topics. There was general concurrence from the Commissioners, but not specific action.

The Commissioners next discussed Patrick Anderson's proposal on "Adverse Childhood Experiences." No actions were taken other than Commissioner **Zapol** encouraging Commissioner **Ulmer** to discuss the topic with USARC Advisor Debra **Caldera**.

Day 3: October 7th

8:05 am. USARC reconvenes in the Dickey Center, at Dartmouth College, to discuss the USARC advisor policy as described in the Commissioner briefing book. The only change to what was proposed in the briefing book, is to require the advisors, as well as the Commissioners, conform to the Commission's conflict of interest policy, as indicated by signing the form.

ACTION 10: Revise Commission policy by including requirement of USARC advisors to adhere to the Commission's conflict of interest policy.

The Commission then discussed the 2011-2012 Goals Report. Cheryl **Rosa** led the discussion and presented a PowerPoint indicating her vision of the report. **Ulmer** suggested a framing piece, up front, of trends in the Arctic that would link to research. Other discussion focused on how outmigration and resource development are occurring, Arctic wide, and thus the need for research in order to provide advice and guidance on these evolving trends. Rosa proposed a timeline to complete the report by January. The Commissioners concurred.

ACTION 11: Complete the Goals report and distribute it in January 2012.

8:30 am. Dartmouth College's Provost Carol **Folt**, and Ambassador Ken **Yalowitz** welcomed the Commission to Dartmouth. Others from Dartmouth included Drs. Mary **Albert**, Ross **Virginia**, Lee **McDavid**, Barry **Scherr**, and Mr. Christopher **Polshenski**.

Folt spoke of the pride that Dartmouth has for the Dickey Center, named after John Sloan Dickey, a former President of Dartmouth and a strong internationalist. The Institute of Arctic Studies is housed in the center. She discussed Vilhjalmur **Stefansson**, who built the northern studies program at Dartmouth, which, at the time, was the 3rd most popular major at the college. As a link to the USARC, **Folt** indicated that former USARC Commissioner, John **Hobbie**, was from the Dartmouth class of 1957, and that he had majored in northern studies.

8:50 am. Ken **Yalowitz** described the Dickey Center, and noted that they are celebrating their 30th anniversary. The Center has three foci:

1. Global Health Initiative (Efforts in Africa and Asia)
2. War & Peace studies (A new postdoctoral program. Post-docs will work on international security and foreign policy. Modeled on the Harvard Olin program. Multidisciplinary).
3. Institute of Arctic Studies

8:55 am. Ross **Virginia** went into further detail about the Institute of Arctic Studies. He described the Institute's priorities, opportunities, and emerging issues.

The institute was created in 1989, and it focuses on the cultural, environmental, and political dimensions of the North and the critical impacts of climate change. Virginia described the Stefansson collection in polar exploration, that's maintained in the Rauner Library. He then described Dartmouth's IPY project #160 "Arctic Change: An Interdisciplinary Dialog Between the Academy, Northern Peoples, and Policy Makers." Dartmouth's Mary Albert was the chair of the US committee that organized the US IPY program, and Dartmouth also hosted the 2007 Arctic Science Summit Week.

Dartmouth also has strong links to Alaska, with a Native American Studies Program (with 160 native students on campus), Stefansson Fellows visiting Alaska, the UArctic Institute for Applied Circumpolar Policy, and in programming with UA Fairbanks and UA Juneau IGERTS. **Virginia** delved into links between Dartmouth and Greenland. Contributions to the US/Greenland/Denmark joint committee activities include:

1. Graduate Field Education Program (IGERT)
2. Univ. of Greenland Student Exchange
3. Visiting Fellows and Speakers
4. Outreach and instruction aimed at Greenlandic students (JSEP)

9:05 am. UArctic Chair of the Board, Dr. Barry **Scherr**, who's also the Mandel Family Professor of Russian at Dartmouth then spoke about the University of the Arctic, which had been founded by Oran **Young**, formerly of Dartmouth.

He said UArctic:

1. Is a cooperative network of universities, colleges, and other organizations committed to higher education and research in the North.
2. Members share resources, facilities, and expertise to provide relevant and accessible post-secondary education for the North.
3. Works in partnership with indigenous peoples, seeking to engage their perspectives and participation in all activities.
4. Promotes excellence in knowledge generation and application in areas relevant to the North.
5. Promotes cooperation in a context in which recognized degrees are granted by the members themselves.

UArctic is organized into strategic areas, each consisting of one or several programs, such as undergraduate studies, graduate studies, mobility programs, research and development, service to members, and UArctic Organization. Dartmouth and UAF are the two primary US entities in UArctic. Russia's level of participation has increased significantly in the past few years. Establishment of "federal universities" (8 of them) in Russia has made a different. Arkhangelsk and Yakutsk are the primary centers. Arkhangelsk is where UArctic has created a research office.

Scherr encouraged the commission to learn more about UArctic at the website, www.uartic.org.

After his presentation ended, **Ulmer** asked **Scherr** how we might improve US scientific access to the Russian Arctic. **Scherr** responded that by saying that it's a difficult subject and that the problems are not new. In fact, he said, it's gotten worse since the late 1990's when access was easier. It's now like the old Soviet times, but without the regularity.

One success that **Scherr** and UArctic have had is to work one level below the official government level, and to find organizations that can be helpful. An example is the new federal universities. The federal consolidation of universities was done to raise the profile of higher education. Moscow and St. Petersburg are two of the 8. They are setting up an organization that mirrors our AAU (American Association of Universities). If someone can align what the US scientists are doing with what some of these federal universities are doing, it might be a way to get around the roadblocks.

Scherr said that he was less optimistic about government-to-government agreements.

Yalowitz said that there's a westernizing impulse but also an internalizing. Russia seeks help with oil and gas development. Russia sees the Arctic as the key to their future. They will zealously protect their interests. The US needs to negotiate between those elements (that is, seeing the Arctic as Russia's future, and the desire to reach out to help develop Russia). The key is to find a subject which is neutral (politically) and that they have an interest in. **Yalowitz** recommended a trip to Russia, to establish person-to-person relationships. He concluded by saying that Russia likes science, but is suspicious of foreign governments, and especially NATO.

9:30 am. **Yalowitz** resumes his presentation to the Commission, addressing the topic of the "Institute for Applied Circumpolar Policy (IACP). It was established 4 years ago. Its purpose is to improve public and private understanding of the policy implications resulting from circumpolar climate change and its human dimensions through a series of meetings on aspects of climate change requiring policy attention. IACO also offers executive training and education to increase northern capacity to respond to the human dimensions of climate change.

4 Arctic Change Conferences have been held thus far, and a fifth is planned.

- Arctic Climate Change and Security Policy (Dartmouth, 2008)
- Considering a Roadmap Forward: The Arctic Marine Shipping Assessment (Fairbanks, 2009)
- Climate Change and Human Security (Rovaniemi, 2010)
- Arctic Health: Challenges and Responses to Rapid Environmental and Social Change (Dartmouth, 2011)
- Arctic Policy: A Focus on US and Russia Relations (in planning for Russia or Fairbanks, AK 2011-12)

Yalowitz then reviewed the recommendations from the 2008 report "The Arctic Climate Change and Security Policy Conference."

Ross **Virginia** then went to the podium and returned to his PowerPoint, to describe Stefansson Research Fellows, the Greenland Exchange program, and to introduce the Integrative Graduate Education and Research Traineeship (IGERT) Program titled, "Polar Environmental Change:

Graduate Education for Tomorrow's Leaders." The IGERT is funded by the NSF. IGERT goals are to:

- Train students in science and engineering with polar topics
- Provide a graduate experience that includes interdisciplinary, international, and intercultural, first-hand knowledge
- Gain understanding of relationships between science and policy
- Develop skills in communicating science to the public, policy makers, and across cultures

IGERT student research focuses on:

- sea ice change and albedo
- salmon restoration
- climate change and alpine and arctic plant communities
- soil carbon dioxide flux in tundra
- aquatic food webs and climate change
- Greenland ice sheet mass balance
- snow chemistry and melt dynamics
- glacier history and landscape change
- traditional uses of arctic plants
- hydrology and precipitation change

10:00 am. Chris **Polashenski**, the first graduate of the IGERT program, gave a presentation to the Commission about his research on sea ice melt ponds near Barrow. Specifically, he spoke about how meltwater ponds are important in the processes leading to the loss of Arctic sea ice. He noted that scientists don't really understand why sometimes there are lots of melt ponds, and sometimes there are many.

10:10 am. Another IGERT fellow, Lauren **Culler**, gave a presentation on "Implications of Changing Climate on Arctic Freshwater Ecology." She discussed hydrological alterations and direct temperature effects, as well as the impact of warming on Arctic mosquitoes.

10:20 am. Break

10:40 am. Reconvene

10:42 am. Professor Mary **Albert**, from the Thayer School of Engineering, spoke about the US Ice Coring Program. Dartmouth hosts the Ice Drilling Program Office. She delved into the science of ice cores, the paleoclimatic record they contain, and their value as perspective on climate processes and as an archive of climate change. She noted how rapid changes have been recorded in ice-core records, where abrupt transitions have occurred in less than 10 years. She spoke of bubbles in ice cores that trap samples of the ancient atmosphere, enabling reconstruction of atmospheric chemistry, carbon emissions, and other conditions.

Albert then described the Ice Drilling Program Office (IDPO) and the Ice Drilling Design & Operations (IDDO) concept, at the Univ. of Washington, both of which are funded by NSF. They are described, in detail, at www.icedrill.org. The vision of these programs is "to enable discoveries about changes in climate and the environment, using evidence from glaciers and ice sheets, to inform environmental policy." The mission is "to conduct integrated planning for the ice drilling science and technology communities and to provide drilling technology and operational support that will enable the community to advance the frontiers of climate and environmental science."

After providing additional detail on IDPO and IDDO, **Albert** summarized with the following:

- Polar regions are changing rapidly due to warming, with global impacts
- Arctic ice cores are crucial for evidence and patterns of anthropogenic influence, and arrays of ice cores are needed
- With our rapidly changing climate, need for new sustainable technologies, and crisis in public education, now is a critical time for science, education, and policy to work together toward a more sustainable future for all people.

11:20 am. Professor Laura **Ray**, from the Engineering College, spoke about robots she's creating that have applicability in polar regions, and specifically to support Greenland science campaigns. The "cool robot," designed in 2005 is solar-powered and serves as a roving instrument station. The "Yeti robot," created in 2007-8 is an all-electric model that supports logistics and glaciology research. "Cool Robot II," was created in 2010-2013, and also supports science campaigns. It measures air-snow chemistry and accumulation and surface roughness.

11:37 am. Professor Xiahong **Feng**, a geochemist, spoke about how changes in sea ice link to precipitation. Her project is aiming to quantify the sea-ice evaporation link using stable oxygen isotopic ratios in precipitation in inter-annual and decadal scales.

11:55 am. Professor Meredith **Kelly** researches climate and cryosphere changes in Greenland. She's trying to understand the causes of abrupt climate change, particularly during the last 12,000 years. She's also trying to understand if the Greenland Ice Sheet is more stable in climate periods that are warmer than present.

12:20 pm. Lunch

1:00 pm. Commissioners and staff tour the Dartmouth Rauner library and the Steffansson collection.

1:30 pm. Commission reconvenes to discuss commission business

The FY12 budget was distributed and discussed.

ACTION 12: The USARC approved the draft USARC budget for Fiscal Year 2012.

ACTION 13: The Commissioners approved the minutes from the 95th meeting.

2:00 pm. Kathy **Farrow** presented and led a discussion of the Commissions' communications strategy. It was well received and there was general consensus that the current strategy was successful.

2:15 pm. The final discussion was a return to the Goals report. In short, the Commission reaffirmed what they had discussed earlier in the day.

3:40 pm. Meeting adjourns.