

**Testimony of**  
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**to the**  
**U.S. Commission on Ocean Policy**

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Admiral Watkins, Commissioners, welcome to Alaska and thank you for asking me to testify as part of your panel on Arctic issues. My remarks will focus on Arctic and Alaska research needs, and ways that the Commission can help us build capacity to meet them.

The National Science Foundation's "Principles for the Conduct of Research in the Arctic" start by stating that "All scientific investigations in the Arctic should be assessed in terms of potential human impact and interest". This is important guidance that I commend equally to your Commission, since those of us who make our homes in the far north, live very close to our beautiful but at times harsh environment. Our cultural, spiritual, physical, and economic livelihood is very directly and immediately dependent upon that environment; and, in a land with well over 40,000 miles of coastline, bordered by the sea on three sides, and with many islands and rivers, the ocean dominates our environment. Thus, my main message to you is that in Alaska and the Arctic, when we think of ocean research or ocean policy, human dimensions are central to all our deliberations, and our objectives must be to protect and sustain economy and culture as well as the ocean environment itself. Some examples:

You have heard today from experts in fisheries and marine mammals. We are witnessing changes in stock characteristics and size that we do not understand and can not predict. Some of these appear related to changes in the ecosystem, others perhaps to human activities, yet others to market forces. The economic effects of these changes have been immense, and we have no ready answers. But in addition to the impact on commercial fishermen and processors, and on all the associated elements of marine business, in Alaska and the Arctic there is an additional human factor, namely subsistence. One statistic that I recall hearing recently is that the average annual consumption of subsistence foods by rural Native Alaskans is 400 pounds. Much of that is seafood -- fish, seal, whales, walrus, and sea birds. Even in the interior, a significant portion of the subsistence diet is salmon, so that the effects of the ocean and its resources are pervasive throughout our land. And I would remind you that subsistence is more than just food - it is also a way of life, a central aspect of what and who our Native people are.

An issue intimately related to living marine resources and their impact on people, is anthropogenic contamination. There are over 60 former military sites in the Aleutians and Pribilofs alone. While many of these, like bases and facilities in other parts of the Arctic and throughout the US -- not the least being the ex-ONR Navy Arctic Research Lab -- are believed to mostly have relatively low grade residues (plus unexploded ordnance in places), there is also Amchitka, site of the US's largest underground nuclear weapon tests. One pressing issue to be addressed by science is whether or not the radioactivity from those tests is contained in the explosion cavity, or has found or may find, pathways to the sea.

Persistent organic pollutants -- POPs -- are another major concern. Although the Arctic is not a source for POPs, it is a major sink, for both oceanic and atmospheric deposition of these bio-accumulating contaminants. As I was reminded the other day by a pediatrician with long experience in the rural parts of this state, the top of the predator chain in the Arctic -- the animal most impacted

through POPs accumulation up through the various trophic levels -- is not the polar bear. Rather it is the human infant, feeding on its mother's milk. At issue for research and policy here are not just sources, fates, and effects of contaminants, but also the perceptions of those who rely upon a subsistence diet, a diet which in spite of concerns about POPs remains much healthier, physically as well as culturally, than 'western foods'. We very badly need to get this story right, and soon.

You have heard much about climate change. Virtually all of the global climate models seem to indicate that the magnitude and effects of warming and other changes will be largest in the Arctic. The International Arctic Research Center at UA Fairbanks has a program to compare and improve those models. But while people in the lower 48 may be concerned about eventual impacts of the thinning ice sheet on naval operations or commercial transshipment or temperate zone rainfall and temperature, or even abrupt climatic shifts due to turning off the "ocean conveyor" which is driven by Arctic processes, our people TODAY find their access to hunting and fishing grounds disrupted, their prey displaced, or their homes endangered -- and I repeat today, not in 2050. Ask the citizens of Shishmaref, who have to move their village because of erosion due to shifts in the ice field, about global change. Or ask even us city folk from Fairbanks or Anchorage who have to face the impacts on our infrastructure -- our buildings and roads and maybe even our new missile silos -- from melting permafrost.

Such real human concerns of course are not just about 'climate' but also about other elements of environmental change -- I've already alluded to the ecosystem changes in the Gulf and the Bering, Beaufort and Chukchi seas -- most notably weather. Scientists can argue about the Arctic oscillation, albedo and heat exchange modifications from soot on the ice or from more open leads; but people here every day already sense the effects of change via weather that is perceived to be more variable, less predictable. Many times I have heard that the elders' traditional knowledge about weather no longer works; and we scientists with our fancy numerical weather prediction models aren't much help, witness last winter's surprise major snowstorm here in Anchorage. The title of a new book about indigenous observations of Arctic environmental change tells the story well: *The Earth is Faster Now*<sup>1</sup>. Aviators, ocean fishermen, construction workers, field researchers, and road maintenance crews as well as subsistence hunters are all severely impacted by these changes, every day; these issues are not esoteric or long range, rather they determine safety and sustenance while engaged in daily occupations. And I needn't remind this Commission of the degree to which the ocean -- open and ice covered -- influences weather and climate.

One more example, to stress my point about people being the central concern: even ocean research itself has an immediate human impact in the Arctic. Consider the recent Shelf-Basin Interaction Cruise on the Coast Guard icebreaker HEALY. The originally planned cruise track would have brought the ship into nearshore waters of the Beaufort Sea during the eastward bowhead whale migration, possibly disrupting the spring hunt. Irrespective of how and why the appropriate clearances were not arranged long in advance, the threats of law suits and last minute changes of cruise track, accompanied by much concern and anger plus follow-up actions by NSF, simply point out the immediacy and directness of the ocean's impact on people in the Arctic, and reinforce the importance of the NSF principles of research: human impact and interest are paramount.

So to summarize, what are our biggest issues for ocean research in this area? Changes in the ecosystem, and their impact on living resources at all trophic levels; weather and climate and the role of the oceans on their characteristics and dynamics; contaminants in the environment and the food web; and the impact of all the above on people. Especially people. And, though I have failed to mention them so far, tectonics, seismics and volcanism -- marine as well as terrestrial. I would remind you that you are almost on top of the epicenter of the second largest recorded earthquake; that marine geology and geophysics are essential contributors to our understanding of both process and

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<sup>1</sup> Copy provided for the record during oral testimony on 22 August

risk assessment; and that the estimated potential for future earthquakes right where you are sitting, is 9.5. Simply put, California construction codes don't cut it here.

Where do we stand in addressing these issues, and what do we need? What changes, if any, are appropriate? What should the Commission consider?

First, I would argue, we have to stop treating the Arctic as a 1-State issue. Our congressional delegation of 3, excellent as they are, should not be asked to shoulder the brunt of the load. One could even argue that our delegation's very success in meeting state -- and thus Arctic -- needs has enabled many federal agencies to minimize their own attention to Arctic issues. Many of the research issues I've highlighted are circumpolar, so that solutions developed in Alaska are extensible to populations around the globe. Perhaps more importantly to the US administration, the issues we face in the Arctic are fundamental to the changes that the rest of our nation will have to face. I'll note at this point that so far I haven't even mentioned oil and gas, ANWR, or the gas pipeline and its potential impact on the transition to a less carbon-intensive US economy. Those resources are on the coast, and increasingly off the coast; and they come to the lower 48 in large part by water. Our fisheries, the most productive and sustainable in the nation, are a major national resource. North American and thus US climate and weather are driven to a large degree by poorly understood Arctic processes...it isn't all El Nino.

Even if you can't get excited about the immediacy of the impact of ocean issues upon the relatively small, and significantly Native Alaska American population that lives in and adjacent to the Arctic, I urge you to consider the teleconnections, and our issues' impact on the rest of the country and the world. Don't let Alaska and the Arctic remain the provincial concern of a few.

There do exist connectivity's upon which we can build - I noticed for example from recent ARCUS publications that even Louisiana State University has significant Arctic research programs, and I personally know scientists from over 40 states who work here or in other Arctic areas. The problem thus is not with scientific interest and ability. Rather, I contend, it is that there remains an incorrect perception that the problems are ours in Alaska alone, compounded by the fact that we're perceived in government circles as well able, at least for now, to look after our own. Please look beyond this perception.

Examples of specific ocean policy related concerns in this regard? Well, NOAA's Arctic Program Office comprises (last time I looked) precisely one government employee and an IPA. They're stretched a bit thin, especially since they're trying to coordinate the principal national Arctic research initiative, SEARCH (Study of Environmental Arctic Change - more on this later) as well as play a significant role in AMAP and other Arctic Council projects. At NSF, Office of Polar Programs (OPP) for many years has been separated from Geosciences...so when for example ocean observations takes a front seat at GEO, the Arctic is nowhere to be seen. A petty example, perhaps, but I think many of you have spent enough time in federal bureaucracies to understand that intra-organizational boundaries are sometimes even more impenetrable than those that are inter-agency. Navy? Well, George Newton, chair of the Arctic Research Commission, has quoted some numbers from ONR; but he doesn't detail all the post-basic-research ASW programs in the Arctic for which I was responsible at SPAWAR in the late 80's, and which are all now terminated. Basically, enemy (temporarily?) gone, zero interest. I don't think RADM Jay Cohen, the current CNR, would at all mind my reiterating to you his explicit statement to me as I was leaving his command earlier this year, that Navy has absolutely no interest in the highest priority UNOLS replacement ship as agreed to by the NORLC's FOFC, the ARRV. Then there's NASA, that in spite of the frequency of polar satellite passes is decreasing its support of the Alaska SAR Facility; leaving, by the way -- last I heard, although things may have changed -- the US National Ice Center with a significant future decrement in its daily take of ice information. I could go on...hopefully this is enough to give you a taste of the picture.

Thus I urge you, to the degree that others at your previous visits, plus we today, have been able to convince you that Alaska and the Arctic should play a significant role in your deliberations, to pay some attention to how we are dealt with in policy and federal R&D management. We are of national and global interest, not a 1-state issue.

Next I'd like to talk to the science itself. These days, when environmental issues are involved, in addition to theory there typically are three primary elements to rigorous inquiry: observations (in space and time) that provide data for a wide range of studies (meaning that oceanographers now understand that no one should get to 'keep' their data just to themselves) and simultaneously contribute to the crucially important historical record; process studies that contribute to our basic understanding of physics, sociology, and all the other fundamental disciplines, while enlightening us about interdisciplinary interactions (interdisciplinary and integration from the atomic/molecular to policy levels are fundamental structural issues in the practice of science today); and 'synthesis', where possible through assimilative models, leading to policy recommendations, cross-cultural acceptance and appreciation, and eventually predictive capacity. What do we have going for us, and conversely going against us, in each of these areas for Arctic research?

First some of the good news. As I have already mentioned, we have a corpus of interested and capable research talent in the state and the nation to address the important issues. We in Alaska are committed to providing the infrastructure to support this science, and have several current initiatives -- notably the development of an overall State R&D Plan, and proposals for ocean and ecological observing systems -- needed to support the scientific enterprise. I can assure you that as a State University, we recognize our responsibility to first and foremost enhance the practice of the natural and social sciences and the humanities needed to address those issues for which our natural and human environment is most suited. Our commitment is to the science, our State, and then our own researchers, in that order. And, we and our close colleagues in the region already have many facilities and capabilities that can help. Examples include the Arctic Region Supercomputing Center, the Alaska SAR Facility, the International Arctic Research Center, the University of Washington's Polar Science Center, UA Anchorage's Institute for Social and Economic Research, the Alaska Native Languages Center, and many other Native Alaska programs throughout the state. We have LTER sites at Bonanza Creek and Toolik Lake, plus an extended network of hydrologic, weather, volcanic activity, and seismic monitoring sites. We have the Alaska Native Science Commission to help scientists coordinate and interface their research with those most impacted by it. We have the North Pacific Research Board and the Exxon-Valdez Oil Spill Trustee Council which manage independent funding to augment the programs of the federal agencies; and the Prince William Sound Science Center, the Seward Sealife Center and the Barrow Arctic Science Consortium with its planned magnificent new facility upgrade, that provide access as well as their own expertise at important ocean sites at opposite ends of the state. NOAA has its Alaska Fisheries Science Center in Seattle and Auke Bay, that works closely with the Pacific Marine Environmental Lab and university scientists in studies throughout the Gulf of Alaska and the Bering Sea. We have scientists from many branches of the Departments of the Interior and Agriculture active throughout the state, independently and in cooperative research units at our University campuses. And similarly we have researchers and their facilities from many State agencies. We have, therefore, the rudiments of a state and Arctic wide observing network, a large number of ongoing process studies, and both the computational facilities and the senior scientists needed for modeling and synthesis.

We also have science plans. Two of these in particular deserve mention. The first is the SEARCH Science Plan. SEARCH -- Study of Environmental Arctic Change -- addresses the long term observations, analysis, modeling and application studies needed to understand environmental change in the Arctic and its connections to changes in the atmospheric and oceanic circulation in the northern hemisphere and thus global climate. The SEARCH Science Plan has been developed over the past several years with support from NSF. SEARCH has broad support from the scientific community, and is in the process of initial implementation under the guidance of a federal Interagency

Working Group, a Science Steering Committee, and a Project Office. I have brought copies of this Plan as an addendum to my testimony.

The second is the Federal Ocean Facility Committee's (FOFC) academic Fleet Replacement Plan, which was approved by the National Ocean Research Leadership Council (NORLC) last year. This plan calls for the replacement of a number of UNOLS vessels over the next decade. The first of these, scheduled in the FOFC plan for operations commencing in 2005, is an ice strengthened ship to replace the 36-year old R/V Alpha Helix, the oldest research vessel in the UNOLS fleet, which is operated by the University of Alaska. Under the guidance of a UNOLS design oversight committee, this ship -- the Alaska (or Arctic) Region Research Vessel (ARRV) -- has completed preliminary design and model testing. What is particularly interesting and important about this ship is that it is not simply a replacement in kind, but offers new and unique capabilities for research in the waters off Alaska. New features include ice strengthening (Ice Class A1) and a hull shape that enable it to work in first year ice, an acoustic suite designed for both fisheries and geophysics, fishing capabilities suited to the Alaska ecosystem, and most importantly the seaworthiness and endurance needed to work year round in the Gulf and the Bering Sea. Combined, these characteristics will open exciting new possibilities for research in Alaskan and Arctic waters.

I have brought as attachments to this testimony, a brief description of the types of science it is expected that this ship will pursue in the Gulf of Alaska and inland waters, and in the Bering, Beaufort and Chukchi Seas. I also have attached a one-sheet description of the vessel, and a figure that compares the ARRV both to the USCGC HEALY, the Coast Guard's new Ice Class 5 Arctic research and support icebreaker, and to an earlier proposed design for an A3 Class Arctic research vessel that proved too expensive, and excessively redundant to HEALY's high-Arctic capabilities. If the University of Alaska wins the expected competition for the ARRV, we would operate it out of Seward. In addition to academic research which is typically funded by NSF, NOAA will have significant needs for this vessel's services for fisheries oceanography, both independently and as a companion to its new Fisheries Research Vessel, which will be home ported in Kodiak. Together the FRV, the ARRV, and the HEALY will provide for the first time the type of modern, high technology research access to Arctic waters needed to address some of the pressing scientific issues associated with fisheries, climate, geophysics, and marine chemistry. When they are coupled to planned and proposed ocean observing systems and to facilities such as the new Barrow Arctic Research Center, we will have an unprecedented opportunity to perform some extremely important ocean science. I would be pleased to answer any of your questions about the important synergies among these vessels and coastal facilities. I would also note that there is significant interest in a near sister-ship to the ARRV for the US North East, giving us comparable access to the very important Arctic and sub-Arctic waters north of the Atlantic. It is because of this interest that our colleagues at WHOI have partnered with the University of Alaska to help design the ARRV.

From the Commission's policy perspective, perhaps the most important point about the SEARCH Science Plan and the FOFC Fleet Replacement Plan and the associated ARRV mission requirements and design, is that they are the consensus products of not just the research community, but also the Federal Agencies that have been involved closely in their development. They are excellent examples of the traditional community approach to defining and meeting major oceanographic programmatic and facility needs. So far, so good. There is, however, a major missing element: namely, a plan and commitment to fund and execute these plans in an orderly manner. Here is where I believe we really need the strong support of this Commission, both in these specific cases, and as a basis for addressing serious concerns about the future of ocean and Arctic research.

SEARCH has been several years in the planning. Its implementation is just beginning. What remains at issue is how the implementation will proceed. The agencies involved obviously have different missions, interests, and funding processes. As opposed to the US Global Change Research Program, however, there is no 'crosscut' where the agencies have developed definitive funding and implementation plans, and associated schedules. Therefore what began as a coherent entity may well

end up with piecemeal, inefficiently coordinated fielded projects. If this program was important enough to develop as an interagency effort, why is it not important enough to execute in the same manner? Where are NSTC and OMB in all of this?

The UNOLS replacement ships are, if anything, in an even worse predicament. The FOFC Plan called for the ARRV to commence operations in 2005. We are now told that NSF has a particular interest in this ship, because of its role in the design, and that it will consider funding it -- pending the standard NSF review and approval procedure for major facility items -- "sometime after 2004". Given recent congressional concern over management of the MRE account, plus the (perhaps necessary from a bureaucratic perspective) vagueness of this commitment, this gives us little comfort. And, given time for the competition, construction, and outfitting, with a 2005 start at the very earliest, the ARRV will likely not be operating until Alpha Helix is some 42 years old; a bit scary when one considers the nature of the waters in which she sails.

Even if NSF does fund the ARRV in full accordance with this schedule, what about the others ships in the FOFC Plan? Navy is in the process of looking at design flexibilities (e.g., scale-able hulls) for the "Ocean Class" vessels; and I recently saw a draft of their revision to the FOFC Plan which significantly shuffled the order and location of those ships, and proposed an initial procurement in FY04. Is this in the POM? Where in the FYDP is the Navy commitment to fund any of these ships? And if it is not there, how will they be funded? By Congress, outside the President's Budget? Is it conceivable that NOPP and NORLC will tell us good luck, community, go pork our plan for us? And if so, why does anyone think that there will be anything other than a feeding frenzy by the various potential operators to see who can get their delegation to fund their own vessel? So much for the FOFC plan. I for one have no nice words for this process, as I perceive it unfolding. Why go to all the trouble of developing consensus through a deliberate mechanism like NOPP and NORLC if it will then be ignored, undercut, and not funded? What sort of a partnership is this anyway? I urge the Commission to take a very hard look at the Fleet Replacement Process, both on its own account -- I needn't emphasize, I believe, that ships are and will remain somewhat central to research at sea -- and as a test case for the nature of ocean partnership, both among federal agencies and between them and the research community.

Returning to the process of Arctic science, in addition to the capabilities and formal Plans I have described, I believe the scientific community also has some very positive ideas about what else we need. Ocean observing systems are of course essential, and we are in the process of forming the necessary committees and working groups to develop plans for such a system for the Arctic and Alaskan waters, that will include the requirements of SEARCH. Federal, state, and private entities are all involved in this process. We also are considering plans for terrestrial observing systems to complement and extend those of SEARCH and the various other, currently unconnected field programs. I for one envision outfitting Alaska as a macro-observatory, with intertwined environmental and human dimensions.

George Newton has stressed the importance of under-ice observations from submarines -- or, alternatively as the technology evolves -- large, long distance AUVs. There are geopolitical as well as geophysical and climate-related reasons for such a national effort, and I believe that the scientific community that participated in SCICEX would be very enthusiastic in their support. I have already mentioned the need for a skillful weather model for the Arctic and Alaskan waters and land areas; we have had initial working meetings with National Weather Service representatives and various scientific groups, and as this process unfolds I hope to bring it to the Arctic Council to promote circumpolar cooperation in this effort under IARC. I should also reiterate that at the behest of the Alaska Legislature, we are developing a State R&D Plan, with the cooperation of UA, the Alaska Science and Technology Foundation, the North Pacific Research Board, the Arctic Research Commission, and Interagency Arctic Research Policy Committee. As part of this effort we will be inventorying facilities, capabilities, and ongoing research projects in the region, to help us better plan and coordinate future activities.

These are just of a few examples of what we know we want to do. There are of course many more. Although in this talk I have stressed "large" science and the associated infrastructure, as you well know the unique American brilliance in research comes from the curiosity and drive of the individual scientists. My suggestions therefore, should be taken merely as examples of the hypotheses and studies our scientists would like to pursue.

In summary, then, I contend that we have quite a good idea of the sorts of Arctic issues we should be focusing on, and understand full well the immediacy of their human impact. The scientific community has to date done a commendable job in planning the requisite science and facilities. Your Commission can be comfortable with the ability of the researchers to hold up our end of any partnership -- in both planning and execution. Where I'm worried is precisely where you can do us the most good. There is no need in our exerting our utmost if the nation, through the state and in particular the Federal agencies charged with responding to national mission and research needs, fails to provide the coordination and resources needed to let us do our jobs in the way we are being asked to. I look forward to the results of your deliberations.