VOLUME 4 FALL 1990

ARCTIC RESEARCH

OF THE UNITED STATES

INTERAGENCY ARCTIC RESEARCH POLICY COMMITTEE

About the Journal

The journal *Arctic Research of the United States* is for people and organizations interested in learning about U.S. Government-financed Arctic research activities. It is published by the National Science Foundation on behalf of the Interagency Arctic Research Policy Committee and the Arctic Research Commission. Both the Interagency Committee and the Commission were authorized under the Arctic Research and Policy Act of 1984 (PL 98-373) and established by Executive Order 12501 (January 28, 1985). Publication of the journal has been approved by the Office of Management and Budget.

Arctic Research contains

- Reports on current and planned U.S. Government-sponsored research in the Arctic;
- Reports of ARC and IARPC meetings;
- Summaries of other current and planned Arctic research, including that of the State of Alaska, local governments, the private sector and other nations; and
- A calendar of forthcoming local, national and international meetings.

Arctic Research is aimed at national and international audiences of government officials, scientists, engineers, educators, private and public groups, and residents of the Arctic. The emphasis is on summary and survey articles covering U.S. Government-sponsored or -funded research rather than on technical reports, and the articles are intended to be comprehensible to a nontechnical audience. Although the articles go through the normal editorial process, manuscripts are not refereed for scientific content or merit since the journal is not intended as a means of reporting scientific research. Articles are generally invited and are reviewed by agency staffs and others as appropriate.

As indicated in the United States Arctic Research Plan, research is defined differently by different agencies. It may include basic and applied research, monitoring efforts, and other information-gathering activities. The definition of Arctic according to the ARPA is "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." However, areas outside of the boundary are discussed in the journal when considered relevant to the broader scope of Arctic research.

Issues of the journal will report on Arctic topics and activities. Included will be reports of conferences and workshops, university-based research and activities of state and local governments and public, private and resident organizations. Unsolicited nontechnical reports on research and related activities are welcome.

Prior issues:

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Front Cover

American surveyors, under the authority of the 1906 U.S.–Canadian Boundary Convention, begin marking the 141st meridian to the Arctic Ocean and the Alaska Panhandle border with British Columbia (see p. 34). Photograph courtesy of the National Archives, G. Clyde Baldwin Collection, RG 401(125).

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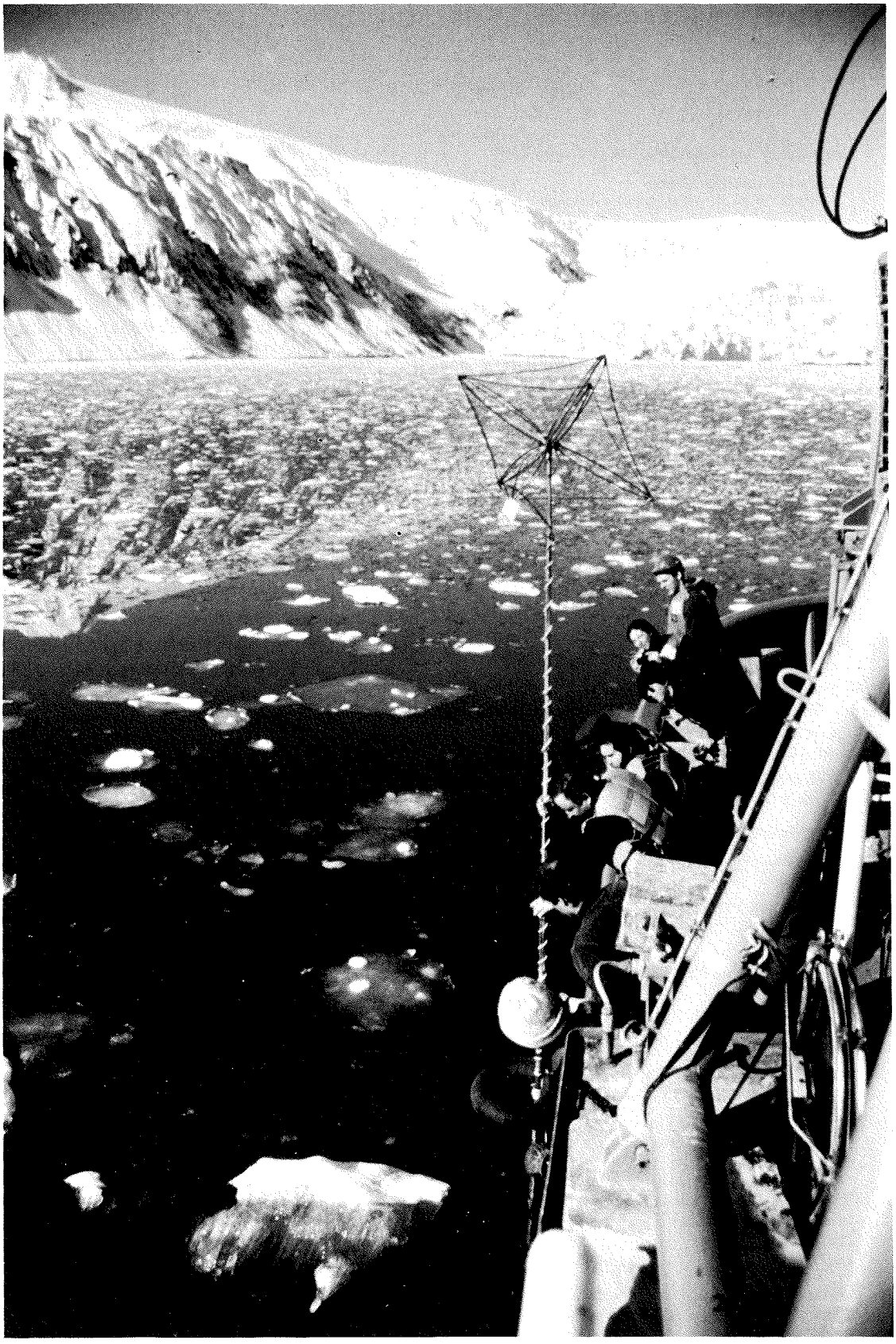


Students learn about the deployment of a radar-tracked surface drifter being launched from the IMS research vessel Alpha Helix.

An Arctic Nation Without an Arctic Research Ship

ROBERT ELSNER AND E.R. DIETER

If this country is to play a leadership role in understanding Arctic issues concerning the environment, natural resources, and climate, it needs a suitable logistic capability in the form of an icebreaking research vessel. The prolonged decline in logistic support capability for Arctic marine sciences has discouraged U.S. oceanographers from proposing much-needed research. A renewal of appropriate support through funding for science and the construction of an Arctic research vessel with icebreaking capability would abruptly change that situation and allow the United States to develop and pursue clearly defined commitments in the Arctic as it has in the Antarctic. The development and construction of a U.S. Arctic research vessel should proceed without delay.

Introduction

Robert Elsner is Professor Emeritus, Institute of Marine Science, University of Alaska–Fairbanks, and Chairman of the U.S. Marine Mammal Commission. His first working experience in sea ice took place in 1953 in the Beaufort Sea and he has been interested in ice operations since that time. He has done research in the sea ice of both the Western and Eastern Arctic as well as the Antarctic. He was the Principal Investigator of the earlier NSF-sponsored polar research ship design study.

E.R. (Dolly) Dieter has been Assistant Director for Coastal and Marine Operations at the University of Alaska since 1982 and has managed University of Alaska ship operations in the North Pacific and Bering Sea for the past 15 years. She is currently Program Manager for Ship Operations in the Ocean Sciences Division at the National Science Foundation. She is past Chairman of the Research Vessel Operators Council and is currently Chairman of the Federal Oceanographic Fleet Coordination Council Board.

Almost a century ago the polar ship *Fram* made her maiden voyage. During the next two decades, this ship—probably the strongest wooden ship ever built—carried Norwegian explorers and scientists on voyages of discovery in the Arctic and Antarctic. These accomplishments set the stage for new appreciation of the importance of polar science and for the logistics required to support it.

Nearly 100 years later, there is much to learn about the Arctic marine regions of the world. Our need to acquire this knowledge has grown at an accelerating rate. This is true for two reasons: scientific demand and resource exploitation. The Arctic Ocean and its adjacent seas play a key role in controlling climate and in determining its fluctuations. This region will provide prominent and early indicators of global climate change. The pragmatic requirement for food and energy resources, with which this region is so richly endowed, is inseparably related to concerns for protection of the global environment from misuse and pollution.

The United States' commitment to Arctic marine science has been variable and inconsistent. Immediately following World War II, the U.S. Navy and Coast Guard operated the world's premier icebreaking fleet. But that logistic capability was not matched by a commitment to Arctic marine research, and during the intervening years the logistic support for science in that region has steadily declined. Our national oceanographic fleet's ability to operate in ice-covered waters is notably deficient, especially when compared with those of countries having similar Arctic interests.

Present and future research activities require long-term commitments to scientific programs supported by new Arctic marine research facilities. Modern solutions to the logistic problems involved include use of satellite imagery, long-range aircraft, submersibles, drifting ice stations, and remote sensing. However, the most important facility is a stable research platform that can be provided only by an adequate icebreaking research vessel.

In recent years U.S. marine scientists have depended on other nations with superior ice-worthy research ships to provide logistic support. International scientific cooperation is commendable and useful, but it can no longer remain one-sided.

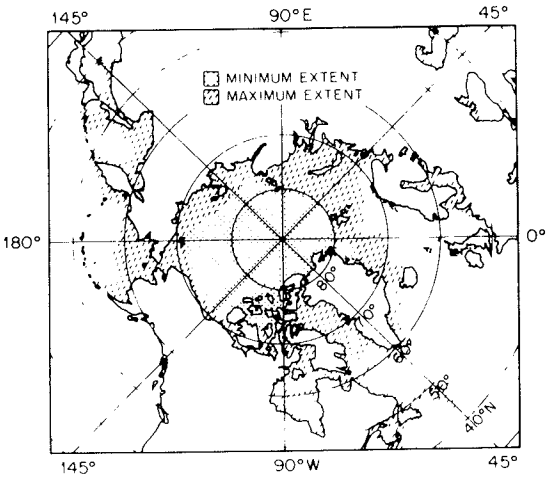
The U.S. oceanographic fleet has only modestly ice-strengthened research vessels that are incapable of sustained and unescorted sea ice operations. Ships such as the University of Alaska's *Alpha Helix* and the NOAA ship *Surveyor* have been employed in cruises to the ice edge of the Bering Sea, but they are severely limited in what they can do by reasons of safety and performance.

Despite the influence of sea ice in physical, biological, and climatological processes that have both regional and global influence, as well as its likely role as an indicator of global climate change, the nature of the interaction of ice with its environment and with living marine resources is poorly understood. This lack of knowledge in a region of such major importance demands attention

and correction if we are to better comprehend and deal with the Arctic and its influences on global systems.

Arctic Marine Environment

Sea ice dominates the environmental and navigational characteristics of the polar seas. It is also one of the more variable physical features of the Earth's surface. At its maximum extent, it accounts for approximately 7% of the Earth's surface. Its average thickness and appearance differ throughout the Arctic. The annual cycle of advance and retreat lags about three months behind the solar extremes. Thus, maximum southern extent of ice in the Northern Hemisphere is reached in March; its retreat to minimum size occurs by September. The winter change represents an approximate doubling of overall ice area from 8 to 15 million square kilometers. During the transition between winter and summer extremes, the total area of open water, consisting of leads and polynyas (areas of open water within the pack ice) increases roughly from less than 5% to sometimes more than 20%. However, its annual and regional extent is highly variable.



Maximum and minimum extent of sea ice cover in the Arctic.

In the Arctic Ocean, sea ice is primarily of multiyear origin. It averages 5 to 10 feet thick and is often rafted higher into pressure ridges and hummocks with greater keel depths. Navigation within this basin is a daunting prospect for even the strongest ships. The summer season offers the best opportunities, as demonstrated by Soviet nuclear icebreaker cruises to the North Pole in 1977 and 1987. Extensive sea ice forms seasonally along the boundaries of the Arctic Basin and extends into the Chukchi and Bering Seas, the Canadian Archipelago, and the Barents and Greenland Seas. The characteristics of this peripheral ice vary among the many geographical regions. Bering Sea ice is seasonal and generally not more than 3 feet thick except where it is subjected to pressure and becomes ridged. Greenland Sea ice originates in the Arctic Ocean and is 3 to 12 feet thick.

In contrast, Antarctic sea ice differs from that of the Arctic. Ice which forms in the Southern Ocean is predominantly seasonal, diverges from the continent, and is subjected to vigorous circulation. It seldom exceeds 3 to 6 feet in thickness. Thicker multiyear ice is confined to continental embayments. Because of these patterns of ice type and distribution in the two polar regions, it would be a mistake to assume that Antarctic operations require ships with greater ice capability than those operating in the Arctic.

Science Needs and Priorities

The history of United States oceanographic achievement has been one of pioneering and imaginative research directed principally to understanding temperate and tropical regions of the world's oceans. Our efforts in the Southern Ocean, supported by the scientific and logistic capabilities of the ships *Eltanin* and *Hero* and the Coast Guard *Wind* Class and *Glacier* icebreakers, have contributed significantly to knowledge of the seas around Antarctica. By contrast, relatively little attention has been devoted to the Arctic Ocean, the least explored of the world's oceans.

National security concerns formerly dominated scientific interest in the Arctic. However, recent compelling developments suggest a high priority for more broadly based Arctic marine research. This increased importance is related to new concerns for global climate change, a relentless demand for energy resources, and increasing pressures on the world's fisheries. One-fourth of our domestic petroleum production comes from Arctic Alaska. Offshore exploration is being pursued in a challenging and vulnerable marine environment. Fisheries in the peripheral Arctic seas are among the most productive in the world, but current rates of harvest in those regions raise legitimate concerns about over-exploitation. In addition, serious environmental threats need to be addressed, as indicated by the presence of man-generated pollutants and the potential for devastating oil spills. Meanwhile, indigenous Arctic coastal native people continue to depend upon marine resources to support their subsistence lifestyle.

These issues, and others which similarly attract world attention to the Arctic regions, need to be

Ice cover in the Bering Sea.

more fully understood so that associated problems can be more effectively addressed. The United States must be prepared through scientific involvement and logistic capability to initiate and undertake the studies required to understand and control the developing course of events. In this way we can participate in the necessary scientific contributions and obtain the knowledge required for political decisions concerning the inevitable problems and developments of the Arctic. Several national bodies, some organized by the National Academy of Science and representing U.S. research interests, have identified topics of Arctic marine research that deserve special attention. The U.S. Arctic Research and Policy Act of 1984 established the Arctic Research Commission, and charged that body with identifying scientific goals and methods for improving logistic support.

Considering the range of responsibilities of the Arctic Research Commission, it is especially noteworthy that, in its recommendations of 1986 and 1988, the Commission assigned the highest research priority to a national program on understanding the Arctic Ocean, its marginal seas, and their interaction with the atmosphere. Because of the importance placed on ocean research, the Commission also recommended that high priority be assigned to the procurement of a suitable Arctic research vessel to satisfy the needs for present and future research. The U.S. Arctic Research Commission has assembled the results of earlier and current deliberations and has recommended:

> Research to understand the Arctic Ocean (including the Bering and marginal seas, sea ice, and seabed) and how the ocean and the Arctic atmosphere operate as coupled components of the Arctic system. In accordance with national needs, emphasis should be on gaining knowledge to advance:
> (a) discovery of nonrenewable resources, especially offshore oil and gas, and their development with minimal adverse impact on the environment;
> (b) prediction of ecosystem reactions to natural (e.g., climatic) and human-induced disturbances, including those affecting renewable resources of the Arctic continental shelves, particularly Alaskan Bering Sea fisheries and the species on which the subsistence lifestyles of indigenous peoples depend;
> (c) forecasting of Arctic weather and its impacts on global weather patterns;
> (d) prediction of climate change resulting from changing concentrations of atmospheric gases such as carbon dioxide and other greenhouse gases, or from other causes as revealed by proxy information in marine sediments and fossils; and
> (e) prediction of sea ice and other conditions that affect maritime transportation and submarine operations.
>
> *U.S. Arctic Research Commission Reports: May 1986, July 1988*

The Arctic Research and Policy Act of 1984 mandated a systematic approach to this process by requiring the Interagency Arctic Research Policy Committee to establish a five-year plan for the na-

tional Arctic research effort. That body produced a document, the *United States Arctic Research Plan*, in 1987 which responds in detail to the marine issues identified by the Commission. Further treatment is included in the Polar Research Board publications *National Issues and Research Priorities in the Arctic* (1985) and *Priorities in Arctic Marine Science* (1988). Most recently, the Interagency Arctic Research Policy Committee reported on recommendations for a national program in the publication *Arctic Oceans Research: Strategy for an FY 1991 U.S. Program.*

All of these reports include in their recommendations the urgent need for an Arctic research vessel, without which the proposed studies will be severely constrained, if not rendered impossible. The recommendations and appeals of the scientific community have gone unheeded for decades, while the United States continues to fall further behind in commitment, ability and technology on its vital Arctic marine frontier. The 1987 National Science Foundation report to the National Science Board, *The Role of the National Science Foundation in the Polar Regions*, provided support for these recommendations. The study points out the untapped potential for useful science which could be derived from comparisons and contrasts of bipolar studies that should be fully exploited—in the Arctic, a land-bound ocean, and in the Antarctic, an ocean-bound continent.

Global Climate Change

Several important Arctic marine science questions have assumed new importance in recent years, giving impetus to the need for an Arctic research ship. There is substantial concern, if not universal agreement, that a considerable change in global climate and weather patterns is now occurring and is likely to accelerate within the next century. This change would be the consequence, in large part, of the emission of the so-called "greenhouse" gases (carbon dioxide, methane and chlorofluorocarbons) which alter global heat exchange. The initial effects may be experienced in 50 years or less. Our inability to predict its extent and timing, and therefore our inability to adequately prepare for whatever adverse or positive consequences may arise, is the most disturbing immediate aspect of this potential change in our global environment.

It is generally acknowledged that the Arctic Ocean and its adjacent seas will provide the earliest clear indication of climate change.

It is generally acknowledged that the Arctic Ocean and its adjacent seas will provide the earliest clear indication of climate change. There are several reasons for this. The sea ice mantle of the Arctic is extremely sensitive to changes in heat flux across its boundary. Its presence, as well as its snow cover and the layer of low-salinity water derived from it and underlying it, acts as insulation, restricting the flow of heat from the deeper, relatively warm water to the cold atmosphere above. To illustrate, the heat flow through leads and polynyas is an order of magnitude or more greater than the flow through typical ice cover of similar area. Arctic warming leading to reductions in ice area and concentration, as well as later freeze-up and earlier break-up, would drastically affect heat flow, probably with attendant profound effects on climate. Intense seasonal feedback interactions could be expected. For example, a decrease in ice thickness or coverage would result in winter cooling of the water column and summer warming. Increased cloud formation throughout the year will tend to depress overall heat exchange. Projections of the net effects of these and other responses are uncertain at best because of the paucity of observations for construction of models.

Sea Ice Ecosystems

Arctic marine ecosystems, especially those of the regional seas that are seasonally ice-covered, are enormously productive, supporting some of the world's most important fisheries. Fish harvests in these regions have become increasingly important over the years, but harvests of some species may be exceeding the productive capacity of the ecosystems. Biologically acceptable exploitation of the habitat requires careful management based on presently incomplete information.

We know that sea ice edges influence biological productivity, but the mechanisms of this action and the overall contribution of sea ice to the nature and timing of that productivity need to be better understood. Recurring polynyas are thought to be sites of intense biological activity. They occur throughout the polar oceans, most frequently deep within the marginal seas. Their biological significance appears to be greater than their small total area would suggest. However, it is currently impossible to undertake systematic, long-term sampling programs and studies for lack of a suitable research ship.

Bering Sea walrus.

The increasing circumpolar indications of adverse interactions between marine mammals and fisheries constitute evidence that all is not well in these highly productive Arctic marine systems. Populations of sea birds and northern fur seals, sea lions and harbor seals are declining in the North Pacific and the Bering Sea, although the reasons are not clear. These adverse conditions are also occurring in the Norwegian and Barents Seas.

Marine mammals are prime indicators of the health of marine ecosystems. They are also vitally important in meeting the subsistence needs of indigenous peoples. The efforts of U.S. scientists to study their distribution, abundance and ecology require a research capability for multidisciplinary sea ice operations. Although the recent need for studies in the Bering Sea has been partly satisfied by U.S. scientists participating in cruises aboard Soviet ice-strengthened stern trawlers, our primary research interests have necessarily had to take second place to those of our hosts. For lack of a suitable U.S. ship, we have willingly gone to the U.S.S.R. for research ship time.

Interrelated Arctic Topics

Several lines of evidence suggest that the Arctic Ocean contributes significantly to the circulation in the North Atlantic and thereby to the World Ocean. Appreciation of the important role played by water mass transport originating in the Arctic Ocean is relatively recent and has revealed an unexplored area for research. Current understanding of the circulation of Arctic Ocean water is based on fragmentary information derived from satellite observations of ice drift, some data from floating buoys, and rare water sampling. Given our inability to conduct systematic oceanographic studies of the Arctic Ocean and its adjoining seas, it is not surprising that our knowledge is limited. There is still no substitute for ship-based determinations in space and time of water currents, temperature, salinity, nutrients, and sea ice characteristics of the Arctic Ocean and of waters entering through Bering Strait and flowing into the Atlantic through Fram Strait.

To better understand global tectonics, the geological history of the Arctic Ocean must be studied. Complex and poorly understood tectonic movements have occurred in this region, and they can not be adequately extrapolated from land-based investigations. The geological architecture and sedimentary history of the Arctic Basin must be better understood to evaluate the occurrence and abundance of hydrocarbon resources. The borders of the Arctic Ocean contain some of the largest reserves of fossil fuels known in North America. Deep drilling will require preliminary exploration to assist in determining drill sites.

Historical Perspective

The history of American oceanographic efforts in the Arctic has been one of variable commitment. The U.S. Coast Guard has traditionally provided occasional ship support for academic scientists aboard its icebreakers and continues to respond to requests from the oceanographic community when not otherwise committed. However, CG capabilities are drastically limited: there are only two icebreakers, the CG has significant non-research responsibilities for other operations in the Arctic and Antarctic, and these ships are not designed for research but rather for breaking ice. Past CG involvement in national Arctic research endeavors lacked long-term commitment and primary dedication to science. This condition was primarily due to the large operating expense and relatively low scientific capability of these ships. These conditions are described in the 1984 Interagency Report, *United States Polar Icebreaker Requirements Study, U.S. Coast Guard.* Research deep within the Arctic Basin will require support of current and planned CG icebreakers. Such cooperative ventures should be encouraged. Clearly, there is an important national role for CG icebreakers, some of it related to scientific operations. However, it would be unrealistic to assume that they can play the dominant role in U.S. Arctic marine research. The U.S. oceanographic community has repeatedly emphasized that its Arctic research programs will not flourish until operated from its own fully dedicated research vessels. This lack of U.S. vessels capable of supporting marine

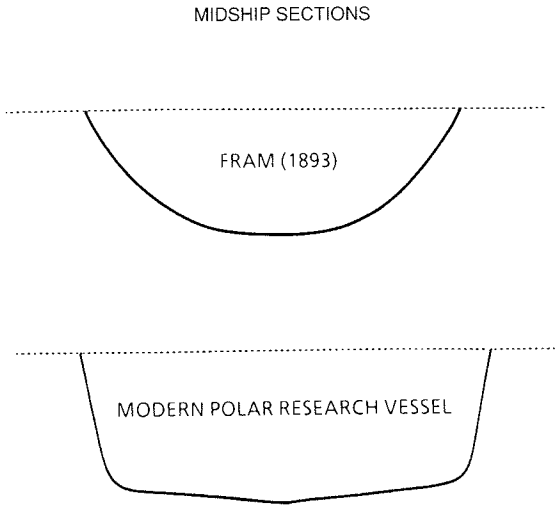
research in ice-covered areas was emphasized in the recent study by the Federal Oceanographic Fleet Coordination Council (FOFCC).

Other circumpolar nations have long recognized the importance of Arctic marine investigations and the need to design, construct and operate Arctic vessels for research. The Soviet Union is in the forefront of Arctic logistic capability in icebreakers of all classes, including polar research vessels. Canada, West Germany, Norway and the Soviet Union have all played important roles in the development of logistics for Arctic marine science. Finland has been a leader in the design and construction of modern icebreakers and polar research vessels. American scientists have participated as visitors aboard the research vessels of these and other nations. U.S. Arctic programs have depended upon these arrangements. However, as guests, U.S. scientists are not in charge. The host country strongly influences the science program, and the visitors must undertake research that can be accommodated.

The importance of an Arctic research vessel to the vitalization of a national Arctic marine science program can be demonstrated by the historical importance of the R/V *Eltanin* in the early years of the U.S. Antarctic Program. The Eltanin became fully committed to Antarctic marine research in 1962. More than a decade of vigorous NSF-supported research followed, made possible by the presence of a dedicated Antarctic oceanographic research platform. During that period the United States achieved and maintained a lead position among nations participating in Antarctic marine research. In fact, scientists from many of those nations participated in programs aboard *Eltanin*. The ship's ability to simultaneously support a range of multidisciplinary research activities, its ice-strengthened hull which provided safety and mobility, its single-minded dedication to research, and the strong funding support provided by the NSF combined to yield a productive and successful U.S. Antarctic marine research program. That position of strength had profound effects upon U.S. scientific and diplomatic influence across the entire range of Antarctic activities. This position was weakened with the transfer of *Eltanin* to Argentina in 1974. Some research momentum has been regained through chartering of the *Polar Duke* since 1984, but the program is not likely to fully recover until the new U.S. Antarctic Research Vessel *Nathaniel B. Palmer* becomes available in 1992. With a dedicated Arctic research vessel, similar results can be realized in the U.S. Arctic marine program.

Designing an Arctic Research Ship

The Norwegian ship *Fram* was the forerunner of Arctic research ships. Because of its rounded hull design, severe ice pressure upon the hull sides forced the vessel to rise instead of crushing it. However, its motion characteristics in active open seas were thereby less than optimum. The *Fram* design was the forerunner of later 20th century



FOFCC

The Federal Oceanographic Fleet Coordination Council was established in 1980 by the interagency Committee on Atmosphere and Oceans to improve the overall efficiency and effectiveness of the use of Federal oceanographic vessels in support of the marine science programs of Federal agencies. FOFCC is tasked to review the operations, management methods and capabilities of federal oceanographic vessels and to provide a forum for the exchange of information on long-range plans regarding construction, deactivation or chartering of oceanographic vessels.

A recent FOFCC report (August 1990) recommends that the National Science Foundation construct an oceanographic vessel capable of operating in ice-covered areas in support of Arctic oceanographic research. The study reviews the oceanographic programs of Federal agencies involved with research in atmospheric and marine sciences to determine the requirements for ships and special platforms. The FOFCC report emphasizes that with only two Coast Guard icebreakers and no dedicated research vessels capable of working in the ice, U.S. scientists are placed at a serious disadvantage in Arctic research and technology development. U.S. oceanographers must sail on foreign ships of opportunity or Coast Guard icebreakers. On the former, U.S. scientists participate as visitors and are not in charge of the research program; on the latter, it is difficult for scientists to obtain support for high-ticket shiptime.

Bering Sea.

icebreaker hull forms. More recently, designers have created icebreakers having both excellent ice characteristics and seakeeping capabilities without sacrificing safety and integrity of the hull.

Responding to the interest of the national oceanographic community, the University–National Oceanographic Laboratory System (UNOLS) initiated a design study in 1975 for polar research ships. The study was directed by the Institute of Marine Science, University of Alaska, advised by a panel of active scientists, and was funded by the National Science Foundation and the Alaska Council on Science and Technology. Attention at that time was directed to the area of most research interest, seasonal ice regions as revealed by responses to a questionnaire circulated among oceanographic institutions. The resulting design called for a ship capable of performing oceanographic research in first-year ice, 247 feet overall and accommodating 26 scientists..

While much was learned from this study, it is necessary to reexamine the conceptual design in light of changing scientific missions, operational requirements, and new advances in ship design. Through a grant from the National Science Foundation the University of Alaska is currently developing a conceptual design for a modern Arctic research vessel in collaboration with a marine architectural firm. The science requirements and geographic areas of operation for such a vessel were defined by the UNOLS Fleet Improvement Committee (*Scientific Mission of an Intermediate Size Arctic Research Vessel*, 1989).

Clearly, safety is the primary consideration. That requirement can be met by insuring that the ship be designed and built to sustain extended cruises far from harbors and supply resources. It also would be required to operate successfully in both sea ice and high latitude open seas. Since the earlier design study, the scientific mission has expanded due to increased interest in the central Arctic Basin. While interest in seasonal sea ice of the peripheral seas continues, interest in regions of Arctic Ocean multiyear ice is increasing. Appropriately enhanced ice capability will be expected of the ship, thereby requiring that it be more powerful and perhaps larger. It must be able to tolerate occasional besetting in ice.

The Arctic research vessel is anticipated to be a general purpose, multidisciplinary oceanographic research ship with icebreaking capability. This ship would be recognized as a national research facility, available to institutional participation from throughout the country. Areas of present and anticipated scientific interest are the Western Arctic, that is, the Bering, Chukchi and Beaufort Seas, and the Eastern Arctic including Fram Strait and the Greenland Sea. Endurance should accommodate independent operations and reserves for three months. This does not imply continuous travel throughout that time, since there would be extended periods when it occupied stations in ice. Perhaps most important of all, hull design and strength and the propulsion system should be reliable and require minimum maintenance. The actual size of the vessel would logically be determined by anticipated geographic and scientific operations. Full complement could include 30 scientists and 20 crew. Sufficient interest and support might require two vessels operating separately in the Eastern and Western Arctic.

UNOLS

The University–National Oceanographic Laboratory System is an association of academic ocean science research institutions that operate shared-use academic research ships. The UNOLS fleet includes ships owned by the National Science Foundation, the Navy, and private academic institutions, and is recognized as a national asset vital to U.S. oceanographic research. UNOLS is charged with scheduling and coordination of ships and equipment for efficient utilization of resources. It is further tasked with advising Federal funding agencies on future facility requirements for ocean science research and the most appropriate mix and balance of facilities, both geographically and with regard to capabilities.

The current UNOLS fleet does not include a vessel capable of working in ice-covered polar regions. The UNOLS Fleet Improvement Committee established a subcommittee to define the science requirements and geographic regions of operation for an Arctic research vessel. Recognizing the need for ice-worthy vessels in the Arctic, FIC recommended the conceptual design for an Arctic vessel be undertaken and included in the UNOLS Fleet Profile. An Arctic research vessel design study supported by NSF is currently being undertaken by the University of Alaska.

Greenland Sea from the Norwegian ship Polarsyssel.

The ship should be capable of making continuous progress through 3 feet of level ice at 3 knots. There should be approximately 3000 square feet of laboratory space to accommodate the disciplines of physical, chemical, biological and geological oceanography and upper atmosphere physics. The ship's facilities should include climate control rooms, electronic and computer spaces, shops, a darkroom, a global positioning system, and dynamic positioning. The customary suite of deep sea and hydrographic winches, over-the-side cranes, A-frames and work boats would be installed. Such a ship would be able to operate in seasonal sea ice and in the peripheral areas of the Arctic Ocean multiyear ice. It should meet the appropriate Canadian Arctic regulations in order to permit cruises in Canadian waters and transit of the Northwest Passage in the summer season.

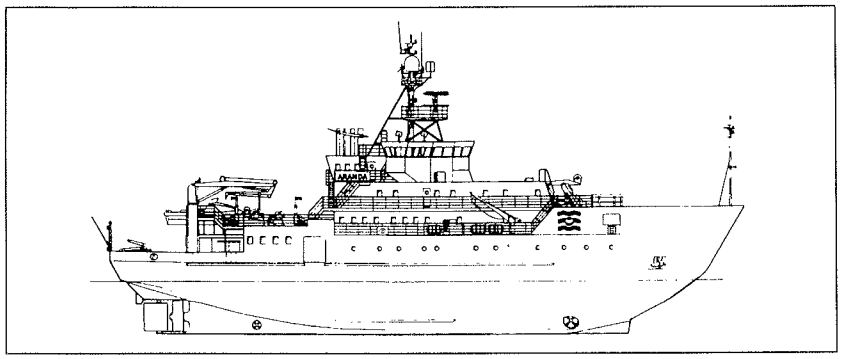
Vessels designed for ice operations have requirements not common to other ships. These include structural features such as bow shape, hull steel and frame specifications, propulsive power requirements, and rudder and propeller protection. Ships operating in ice are classified by rules of the classification organizations, such as the American Bureau of Shipping, Canadian Arctic Shipping and Pollution Prevention Regulations, and Det Norske Veritas. The class designations are not readily interchangeable, since ice classes are not always defined by the same standards in each system. Perhaps the simplest classification to understand is the Canadian system, which is based on the thickness of level sea ice the ship is intended to penetrate at a steady speed of 3 knots. For example, Canadian Arctic Class 3 indicates ability to break ice 3 feet thick at a steady rate of progress of 3 knots. By contrast, the most powerful icebreakers in the world, the five *Arktika* Class Soviet nuclear icebreakers, are rated for 7.5 feet of ice at 3 knots. The classifications serve to roughly identify a ship's ice worthiness and safety, but sea ice varies considerably in regard to the difficulty encountered in traversing it.

When an icebreaker encounters ice that prevents forward progress, the bow shape allows it to ride up on the ice, which may then break under the sheer mass of the ship. Sometimes repeated ramming of this kind may be required. An icebreaker's hull is formed to present convex surfaces to the ice, thus assuring greater ability to tolerate ice pressure. Strengthening with extra frames and thicker steel plate are required near the waterline and especially in bow and stern. Propeller and rudder are vulnerable and require rugged construction and protection. Protective mounting of the propeller in a nozzle has been widely used in recent years. This propulsive system provides about 20 percent more thrust and gives better protection for the screw by reducing ice collisions. It also allows more effective installation of ice fins for preventing ice intrusion into the propeller. Maneuverability in narrow leads and station-keeping requirements in open water may require bow and stern steering thrusters. Greater-than-normal main engine power is required, but nothing will substitute for the protection provided by an adequately reinforced hull.

There has been some discussion about the desirability of having a new U.S. Arctic research ship constructed in another country where such shipbuilding technology is well advanced. However, such a procurement procedure is both politically unwise and technically unnecessary. American shipyards can build ships of the kind that is needed. U.S. shipbuilders should be encouraged to develop and to exploit the capability for ice-worthy ship construction. The future need for such ships in commerce, exploration, science, and environmental monitoring is expected to increase.

Recent Polar Research Vessels

New polar research ships have been constructed for use by marine scientists of other countries and for scientific operations in both polar regions in recent years. Their new ships put them in a substantially more advanced position for marine research and development than U.S. scientists. For comparative purposes, it is useful to review these recent ships. The accompanying table lists recently constructed ships and their principal characteristics: length overall and shaft power. Where such information is available, their icebreaking capabilities in level, continuous ice are shown. The specified ice capabilities, indicated in the table as they are classed by each country, must be regarded as no more than rough indications, since relevant ice characteristics such as salinity, temperature, and snow cover are highly variable. In addition to these listings, Argentina, Japan and Sweden have new icebreakers with limited research capabilities.



Aranda—*1989 Finnish polar research vessel.*

The current trend in oceanographic vessels is toward larger ships. The size and form of the proposed new Arctic research vessel are still undecided. Those decisions will depend upon the anticipated scientific programs. Some compromises are likely to influence the design. Considerations of funding for operations and research will impact that process. There will be a continuing need for cooperation among the various participants in the Arctic marine research enterprise—scientific community, funding agencies, and the U.S. Coast Guard—to achieve national research goals. But the cornerstone of a realistic and cost-effective endeavor will be a modern, state-of-the-art, ice-worthy vessel dedicated to Arctic research.

Recent Polar Research Vessels

Country	*Year*	*Name*	*LOA**	*HP*	*Icebreaking*	*Notes*
Australia	1990	*Aurora Australis*	310	13,400	1A Super, 4 ft at 2.6 kt	Research and resupply
China	1988	*J101*			Seasonal ice less than 3 ft	Research and resupply 15,000 tons
Finland	1989	*Aranda*	192	4,021	1A Super, 3 ft at 3 kt	12–24 scientists Single screw in nozzle
Germany	1982	*Polarstern*	384	20,000	4 ft at 5.5 kt	40 scientists Twin screws in nozzles
Norway	1975	*Polarbjorn*	162	2,200	DNV† +1A1 Icebreaker–sealer	20 scientists Single screw in nozzle
Norway	1981	*Polar Queen*	213	4,500	DNV +1A1	
Norway	1983	*Polar Duke*	213	4,500	DNV +1A1 Sealer	27 scientists Chartered to U.S. Antarctic Program
Norway	1991	*Polar Circle*	296		DNV +1A1-EO–icebreaker Est. 3 ft at 3 kt	
U.K.	1991	*James Clark Ross*	322	8,500	2.5 ft at 2 kt	32–48 scientists
U.S.A.	1992	*Nathaniel B. Palmer*	308	12,720	ABS A2, est. 3 ft at 3 kt	37 scientists Antarctic research
U.S.S.R.	1975	*Mikhael Somov*	437			
U.S.S.R.	1978	*Otto Schmidt*	240	3,500	2.5 ft at 2 kt	
U.S.S.R.	1984	*Arnold Veimer*	235	3,085		
U.S.S.R.	1988	*Akademik Federov*	456	19,000	3.5 ft at 2 kt	

* Length overall (ft).
† Det Norske Veritas, Norwegian vessel classification.

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Beringian Heritage

A Reconnaissance Study of Sites and Recommendations

The article that follows is the full text of a study recommending an international protected area in the Bering Straits region. The recommendation was approved at a January 1990 meeting of the Joint Soviet–American Committee on Cooperation in the Field of Environmental Protection. Presidents Bush and Gorbachev endorsed the creation of an international park in a joint statement at their June 1990 summit meeting. Of particular interest to journal readers is the call for a broad-based, multilateral program of research into the cultural and natural heritage of the area. Government-to-government agreements are called for that would facilitate individual projects carried out by universities, academies, foundations, government agencies and ministries, native groups, and individuals. The Interagency Arctic Research Policy Committee is discussing implementation steps with the National Park Service.

Submitted by Denis P. Galvin, Associate Director, Planning and Development, National Park Service, on behalf of a joint U.S.–U.S.S.R. study team

Introduction

On a clear day, from the high ground of Big Diomede Island, one can see, with a turn of the head, the remnants of a great land bridge that once existed between the Asian and North American continents.

Those land remnants and the people who inhabit them, though separated by the sea, have retained much of their common heritage. The animals and fish on which they subsist, the storms, ice, and great migrations of birds and wildlife that dictate the rhythms of their lives, and the traditions and language used by indigenous people on both sides of the Bering Strait are tangible examples of Beringia's common bonds.

Thousands of years ago the Bering land bridge emerged, forming a flat, treeless plain—not a finger of land, but the stocky shoulders of two continents stretching hundreds of kilometers from north to south. Across this land moved the people who became the first North Americans, following the earlier movements of land mammals and plants. Unlike later migrations from Europe to North America, these migrations were not a conscious effort to populate a new continent, but rather a simple pursuit of food and shelter—the basic necessities of life.

That pursuit continued as glaciers melted and a shallow sea took the place of the land bridge. But the sea did little to stem the exchange of ideas, people, and items of trade. The great migrations of fish and wildlife continued, and the lands that were once joined retained a common character. The people of Beringia were united by language, tradition, and environment.

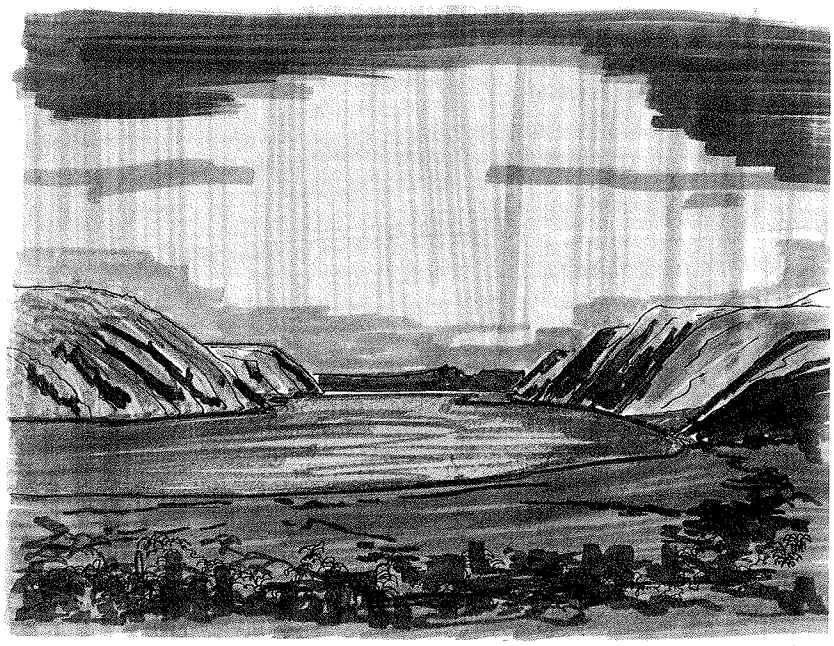
This common life in Beringia continued without interruption for thousands of years. Even under the flag of the Russian empire—and during the later American and Russian commercial whaling periods—people, ideas, and goods moved across the sea. However, the flow of culture and ideas, which could not be stemmed by the submergence of the land bridge, was disrupted by the tide of politics.

Still, the recent hardness of the political reality has not changed the fundamental interrelatedness of the Beringian region. Resources, and the threats to them, do not respect the boundaries made by man. Indigenous culture, with roots going back thousands of years, is not quickly moved by political winds.

While communications between the Soviet Union and the United States are often strained, natives of Beringia continue to share common Yupik and Inupiat languages. Walruses and whales remain a vital part of the diet and social fabric of the native people. Archeological sites in both countries show dramatic similarity, silent witnesses to the common struggle of a hundred generations to carve a life on the demanding shores of the Bering Sea.

For years the common heritage of Beringia has been recognized, and many proposals have been made for the two countries to take steps to protect important sites that attest to this heritage. However, until recently, the general political climate between the two countries did not lend itself to in-depth discussions about cooperative international designation of protected areas.

Recent political changes have been significant, though, and the trust, cooperation, and agreement



among the inhabitants of Beringia have been improved by several developments. These include exchanges of native residents from coastal communities; the proposal to create a joint science center on the Chukotskiy Peninsula under an agreement between the Institute of Biological Problems of the North, Far East Branch, U.S.S.R. Academy of Sciences in Magadan and the University of Alaska in Anchorage; the resumption of airline flights across the Bering Strait; and trade missions from each nation striving to renew commercial ties. These improved political relations, and the focus of activities between Alaska and Chukotka, have provided the right atmosphere for joint discussions of an internationally recognized Beringian heritage site.

In 1986, under the authority of the 1972 U.S.–U.S.S.R. Agreement on Cooperation in the Field of Environmental Protection, Working Group 02.04-20 was established to address "Conservation and Management of Natural and Cultural Heritage." Specific activities, characterized as themes, were developed by the working group in protocols of June and October 1987. Theme 2 is "Research, Conservation and Management of the Beringian Heritage."

In September 1989 a joint Soviet and American planning team implemented theme 2 with a 10-day assessment of park or protected sites on the Chukotskiy Peninsula (see map of sites visited). The group, which included expert planners and scientists from the Soviet Union and the United States National Park Service, continued its work in northwest Alaska, with an eight-day assessment of existing park units and native coastal communities.

This report, cooperatively developed by the joint team, identifies key areas that show the common heritage of Beringia. It covers the natural resources, the migration of man over the land bridge and archeological evidence of that crossing, the influences of more recent developments, and the common traditions that endure—language, arts, traditions, and the subsistence use of resources.

The team has recommended to its respective governments that an international park, embodying an existing national park in the United States and a newly created preservation unit in the Soviet Union, be designated by the national legislatures. The principal goals of parks united across international borders would be to promote cooperation among nations, to preserve natural and cultural sites, and to provide opportunities for the coordinated administration of resources.

An international park spanning the Bering Strait would recognize this region's common heritage, it would constitute a joint effort to preserve the important natural elements of the land bridge and the cultural traditions that continue today, and it would create a dramatic symbol of cooperation between two world superpowers.

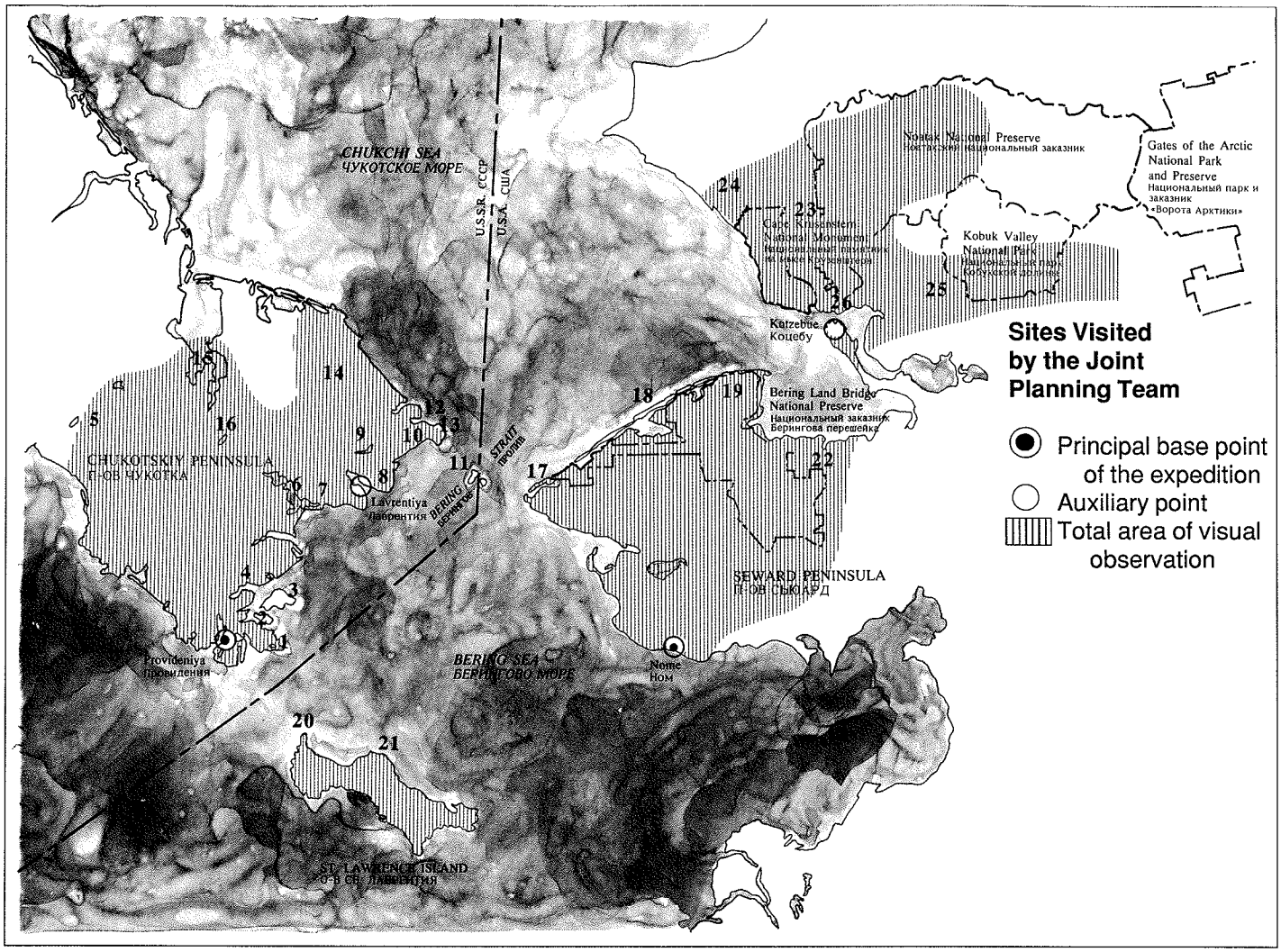
Common Beringian Heritage

Natural Elements and Systems

Geology

The most significant theme in the geological history of Beringia is the land bridge itself, which has intermittently been a dry land connection between Asia and North America. The land bridge was the result of lowered sea levels during the great ice ages, when vast amounts of water were stored in continental glaciers. The land bridge chronology is not well understood, and opinions differ as to the actual times and duration of the connections.

There was probably a very ancient connection, long before recorded glacial periods and before modern flora and fauna evolved. However, it was only during later connections in the past 30,000 years that humans and mammals migrated from Asia to North America, and some species migrated from North America to Asia. At times the land bridge may have lasted 5000 years or more and may have covered a very broad area. During the last ice age glaciers did not completely cover the Seward and Chukotskiy peninsulas, although small islands of glaciation occurred in both areas.



Sites on Chukotka—Area of Interest

1 Chaplino—Ethnography, Archeology
2 Whalebone Alley—Archeology
3 Arakamchechen Island—Archeology, Walrus Haulout Area
4 Korgan and Pestsovoi River Valleys—Hot Springs
5 Erguveyem River Valley—Hot Springs
6 Mechigmen Inlet—Archeology, Bird Nesting Area
7 Lorino—Hot Springs
8 Nunyamo—Archeology
9 Lake Koolen—Natural Phenomena, Fish, Migratory Bird Resting Area
10 Dezhnev—Archeology
11 Big Diomede Island—Archeology, Walrus Haulout Area
12 Cape Dezhnev, near Uelen—Archeology, Ethnography, Ivory Carving
13 Naukan—Archeology
14 Chegitun River Valley—Scenic Views, Rich Flora and Fauna
15 Kolyuchinskaya Inlet—Rare Fish Species, Migratory Bird Resting Area
16 Lake Ioni—Rare Fish Species, Migratory Bird Resting Area

Sites in Alaska—Area of Interest

17 Wales—Coastal Subsistence Lifestyle, Archeology, Ethnography, Reindeer Herding
18 Sishmaref—Coastal Subsistence Lifestyle, Archeology, Marine Mammals, Lagoons
19 White Fish Lake and Bering Land Bridge National Preserve—Archeology, Geology
20 Gambell—Island Subsistence Lifestyle, Ivory Carving, Archeology, Ethnography
21 Savoonga—Island Subsistence Lifestyle
22 Deering—Coastal Subsistence Lifestyle
23 Noatak—Interior Subsistence Lifestyle, Ethnography
24 Kivalina—Coastal Subsistence Lifestyle, Ethnography
25 Kiana—Interior Subsistence Lifestyle, Archeology, Ethnography
26 Kotzebue—Subsistence Lifestyle, Ethnography

Besides the land bridge, the landscape is also an element of the common heritage of ancient Beringia. The land is characterized by mountainous areas, large sounds and lagoons which cut deep into the land, hot springs, lakes, and rocks of volcanic origin. There are ancient broad valleys and tundra, numerous lakes, winding streams, permafrost features, and graben landscapes.

Ocean waves have formed sandspits and seacliffs along the coastline, although seacliffs are more common on the Chukotskiy Peninsula.

Mineral deposits on both the Chukotskiy and Seward peninsulas are rich and include anthracite and bituminous coal, tin, molybdenum, gold, and tungsten.

Paleoecology

Many questions remain concerning the paleoecology of Beringia during the last 40,000 years. Among the most important is the question of productivity: Was the area an Arctic steppe with richly productive grasslands supporting herds of ungulates like the present-day African Serengeti, or was it a landscape supporting only sparse, discontinuous vegetation with a small, widely dispersed ungulate population? One possible scenario for the evolution of Beringia's plant and animal life is presented below .

Some 40,000 years ago the sea level lay not far below its present position. The land bridge was a narrow isthmus and may have been briefly flooded. Thermokarst ponds and lakes were scattered in lowlands and major river valleys. Loess was accumulating slowly on vegetated lowland surfaces. The diverse fauna included the mammoth, horse, bison, caribou, mountain sheep, steppe antelope, moose, camel, and wooly rhinoceros.

About 30,000 years ago the sea level was lowered, and progressively more of the land bridge became exposed. Beringia was essentially treeless; many sand-dune areas had been activated, loess was accumulating, but there was little reduction in the diversity of the ungulate fauna. The climate was drier than it is today.

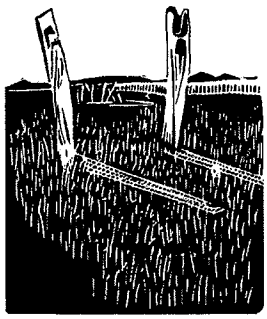
The sea fell to its lowest level about 18,000 years ago, and the land bridge was a plain more than 1000 km wide north to south and connecting North America and Asia. Unglaciated zones across Siberia, Alaska, and the Yukon formed a corridor with a high degree of biotic exchange. Extensive glaciers isolated the areas. Animals included the mammoth, bison, horse, caribou, mountain sheep, saiga, and musk ox. The land was almost treeless.

An abrupt climate change starting about 13,500 years ago resulted in a rapidly rising sea level that drowned the continental shelves of the Bering and Chukchi seas. Dwarf birch proliferated, cottonwood trees grew in areas where they no longer grow, and aquatic plants and animals extended their ranges. The climate was characterized by snowy winters, a rapid spring snowmelt with floods, mudrows, and gully washouts, and warm, dry summers. The mammoth, horse, and bison disappeared. Caribou, moose, beaver, and elk were present, but elk later disappeared. Grasses and herbs gave way to mosses and sedges, and the landscape assumed its present appearance.

In ancient times the lives of native people—Chukchis and Eskimos—were closely intertwined with the natural world, and they were dependent on it for their survival. Hunting, fishing, and gathering plants and berries provided for their subsistence, and a growing scarcity of these subsistence resources probably prompted the migration of people across the land bridge. Man has been in western Beringia for an estimated 30,000 years, but in eastern Beringia man has been present only about 12,000 years.

Paleontology

Sites on both the Chukotskiy and Seward peninsulas have been found containing pollens, wood and other plant parts, mammal bones, and animal parts ranging in age from Miocene (20 million years ago) up through the late Pleistocene (1 million years and later). Collectively, these records may prove to be of great significance in understanding climatic cycles and vegetation patterns, as well as the spread of life across the land bridge, even before the period of human migration.



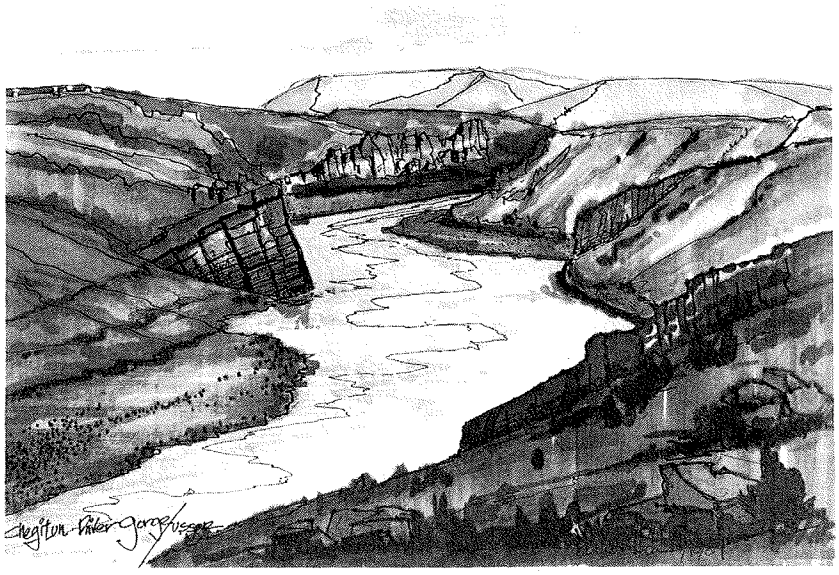
The presence of fossil pollen and wood indicates that the peninsulas at one time supported a temperate forest of hardwoods and conifers. Younger Pleistocene fossils include extinct mammoth, bison, and horse. These fossils indicate the former abundance and diversity of large, gregarious ungulates in a region that now supports few large mammals.

Today, prehistoric Eskimo pithouses often contain the heads and bones of gray, bowhead, and beluga whales, walruses, polar bears, reindeer, and mountain sheep. They are remnants of a utilitarian people. The heads and bones of the bowhead whales were used as a building material for houses. Walrus and seal oil were used as fuel. Walrus tusks were used for making tools, hunting implements, and artwork.

Marine Mammals and Resources

Throughout Beringia marine mammals have been the most important component of the subsistence lifestyle of villagers. Hunting camps and transportation routes on both coasts show evidence of the long history of marine mammal use.

The bowhead whale, a species found on the ice edge, has been central to native culture and subsistence lifestyles. It provides meat, skin, and blubber (rich in vitamins, protein, and fat), and baleen used in making tools and handicraft items. The



whale hunt is a major focus of the native community. The preparation, the hunt, and the sharing of the whale is the fabric that still binds the society, just as it has for thousands of years.

Yankee whalers began taking whales in the Bering and Chukchi Seas in 1848, and their activities laid the foundation for the U.S. purchase of Alaska in 1867. Over a period of time, however, those whales that summered in the Bering and Chukchi seas were almost exterminated by the commercial whalers. And today few bowheads are sighted in these waters.

The walrus, a Pleistocene relic mammal found on the ice edge, was regarded by Eskimos and other native people as having supernatural powers and human attributes. It was for them a resource of major importance, providing food and fuel, tools, shelters, boats, sleds, and clothing. Today, the walrus is harvested commercially by the Soviet Union, and Natives on both sides harvest walrus for traditional subsistence purposes. Ivory carvings from walrus tusks are made at a central factory in the Soviet Union and by individual Natives in the United States.

The depletion of walruses and whales in the region eventually alerted governments to the need for conservation. The North Pacific Sealing Convention of 1911 established the precedent of mutual cooperation in resource management. Treaty regulation of whaling dates back to 1937, and a major quota agreement was achieved in 1966. Both countries jointly conduct a walrus population count at five-year intervals. An international joint management program would help to maintain healthy walrus populations.

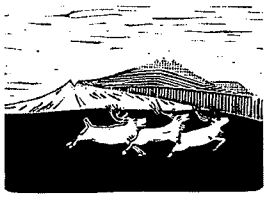
Polar bears move great distances and, as a consequence, are a shared international resource. Polar bears associate with the ice edge, and they move north to south or south to north with the movement of the ice. Satellite transmitters show animals captured in Alaska move to Chukotka, and Soviet-tagged polar bears have been shot in Alaska. Polar bears are legally taken by Alaska Natives. Restricted selective shooting and capture of cubs for zoos is allowed in both countries.

Other marine mammals important to the subsistence lifestyles of local villagers include seals (bearded, ringed, and spotted) and other whales (gray, beluga, humpback, fin, and orca). These animals are used for food, clothing, and handicraft items.

Salmon, grayling, char, and other fish species are locally important for subsistence. Whitefish and herring also occur, but they are less important to villagers. Shellfish are harvested by villagers.

Flora and Fauna

Scientists consider Chukotka and northwest Alaska to be a single botanical area. The intermittent emergence of the Bering land bridge favored an exchange between the two continents, predominantly the dispersal of plants from Asia to America. One difference between the vegetation of



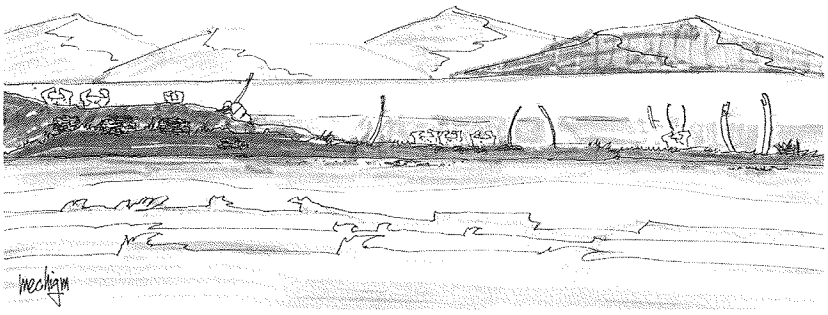
Chukotka and Alaska is that the polar forest limit is formed by different tree species. These differences are related to the history of the Bering land bridge (see the map of Beringian heritage sites).

The continuum in tundra types is based largely on soil moisture and degree of drainage. Tussocks and polygons are common. Sedges, peat mosses, lichens, a few grasses, heaths, and willows predominate. Plants grow low to take advantage of the ground temperature and to avoid harsh winds. Villagers on both coasts collect berries from several species of shrubs.

Tundra-steppe and steppe associations appear on the Chukotskiy Peninsula, apparently as relics from the cold and dry Pleistocene epoch. Similar vegetation has recently been discovered on steep, south-facing river bluffs in Alaska.

Throughout Beringia willow thickets and some alder have developed along floodplains on new alluvial soils. These thickets form the principal cover and food for moose in Alaska, but the animals are absent on the Chukotskiy Peninsula.

The Chukotskiy and Seward peninsulas are extremely rich areas for birds. At least 170 species are known on the Seward Peninsula. This diversity is related in part to the nearness to Asia and also to the occurrence of marine/estuarine, tundra, and nearby boreal forest habitats. The Asian birds include some species that regularly migrate across the Bering Strait to breed on the Seward Peninsula. Some North American species go to Chukotka or farther to breed. Only five or six species can be found throughout the winter season. Willow and rock ptarmigan are common throughout the year on both sides of the Bering Strait.



The marine/estuarine areas, together with extensive freshwater ponds and lakes, provide habitat for large populations of migratory geese, ducks, sandhill cranes, and shorebirds. The stickleback fish is sufficiently numerous to provide food for many species of aquatic birds.

Colonies of seabirds are found on both coasts. The extensive high rock cliffs on the Chukotskiy Peninsula provide habitat for one of the largest concentrations in the world of kittiwakes, puffins, and glaucous gulls.

The tundra habitat supports the majority of passerine birds, as well as hawks, gyrfalcons, snowy owls, Steller's sea eagles, and other predatory birds.

Wolverines are found throughout the Chukotskiy and Seward peninsulas, but they are scarce. Foxes, land otters, lynxes, Arctic ground squirrels, hares, and numerous small mammals are found throughout both peninsulas. Beaver are present in Alaska but are absent from Chukotka. Fox farms are an industry at several villages on the Chukotskiy Peninsula.

Grizzly bears and wolves occur on both sides of the Bering Strait, although populations are not large for either species. Moose are found only on the Alaskan side. Prior to the 1950s moose were generally absent from northwestern Alaska, but in the past 30 years moose range has extended considerably.

Caribou occur in large free-ranging herds to the north and east of the Seward Peninsula. These animals are a part of the western Arctic caribou herd, which comprises over 300,000 animals. As the herd has expanded dramatically during the past few years, animals have moved farther onto the Seward Peninsula. With this expansion comes potential for conflict with reindeer herding.

Reindeer range throughout the Seward and Chukotskiy peninsulas. Reindeer husbandry includes herding, protection from predators, corralling, antler removal, slaughtering, and transporting to market.

On the Seward Peninsula the reindeer industry was envisioned as a means to provide the Natives with a more dependable source of food. By law, only Natives can herd reindeer in Alaska, and 12 herds on the Seward Peninsula are owned and managed by local residents and native corporations. The total reindeer population, which is currently estimated at 24,000, has been declining, in part because animals are lost to the caribou herds.

On the Chukotskiy Peninsula reindeer herding takes place on state farms. There are an estimated 32,000 reindeer. Some 150 herders lead a nomadic way of life, carrying their food, fuel, and housing on all-terrain vehicles.

Climate and Air Quality

Beringia today is influenced by maritime and continental climates. When waters are ice-free, temperatures are moderate, humidity is high, and skies are typically cloudy, especially near the coast. Interior sections are somewhat drier and less cloudy. When offshore waters are frozen, both inland and coastal areas are drier and clearer. Winter temperatures do not reach the extreme lows encountered in interior areas. July mean temperatures of 9.7°C and 9.8°C have been recorded at Imuruk Lake in Alaska and at Perevalnaya on the Chukotskiy Peninsula, respectively. Annual precipitation is approximately 250 mm in both areas.

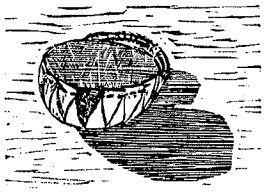
The 10°C isotherm, often correlated with the northern limit of the "tree line," is at the south and east edge of Bering Land Bridge National Preserve. This is several hundred kilometers north of where the isotherm is found on the Chukotskiy Peninsula.

Comprehensive data about air quality throughout Beringia are not available, but generally air quality is considered to be excellent. Arctic haze does occur in the region. Potential sources of air pollution include the Red Dog Mine road and port on the Alaska coast and coal-fired power plants in villages on the Chukotskiy Peninsula.

Common History of Development in the Bering Sea Region

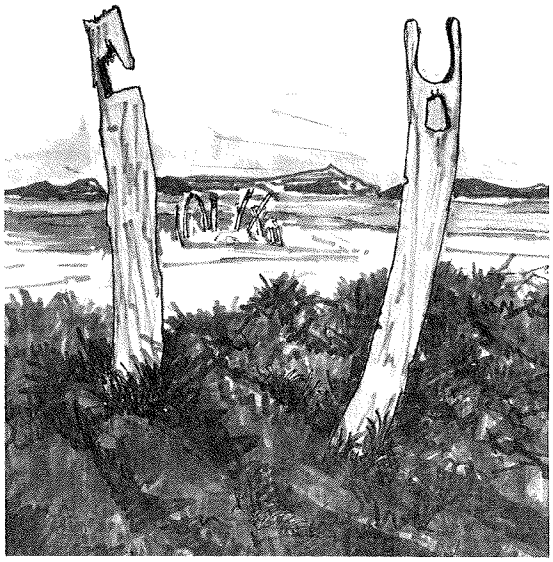
Beringian Cultural Migrations and Archeological Evidence

The first people to cross the Bering land bridge, at a time and place we can only guess at, caused a revolution in the cultural tapestry of the world. Who were these people? How and when did they travel? How did they survive in the harsh, late glacial climate? These are all questions that are basic to the understanding of our own origins, and the key lies somewhere in Beringia. As one of the world's great ancient crossroads and culture centers, Beringia is a critical focal point for research with global implications.



The problem of how people came to North America remains one of the most controversial, unsolved problems in archeology. Based on the interpretation of linguistic, genetic, dental, and archeological evidence, the earliest migrations have been summarized as occurring in three hypothetical waves (see the map of human migrations across the Bering land bridge).

The first migration, between 15,000 and 12,000 years ago, included Paleo-Indians, ancestors of all South American and most North American Indians. They were hunters of big game, such as the now extinct mammoth and bison, and they used characteristic fluted points. No analogous fluted-point artifacts have yet been found in northeastern Asia.



The second migration occurred about the same time as the first, but it took place along the southern coast of the Beringian land mass. These people were the ancestors of the Eskimos and Aleuts, whose material culture has been included in the Siberian-American Paleoarctic tradition. Components of the Ushki Lake sites in central Kamchatka, dated to 14,000 years ago, have analogous artifacts at maritime Alaskan sites, such as Anangula in the Aleutian chain and Ground Hog Bay on the northwest coast.

The third migration is thought to have occurred around 12,000 years ago and possibly included the ancestors of the interior Alaska Indians and the Pacific Northwest coast Indians. These people were nomadic gatherers and caribou hunters who used a microblade technology; their abandoned camps are scattered across eastern Siberia and interior Alaska.

The complex development of cultures on both sides of the Bering Strait is represented in the Beringian Cultural Sequence chart. Similarities in technologies and artforms indicate the continued exchange of ideas and material culture. Around 3500 years ago two atypical sites appeared on opposite sides of the strait (at Chertov Ovrag on Wrangel Island and at the Old Whaling site on

Cape Krusenstern); these sites share analogous artifacts not known to any other sites.

During the last 2000 years of prehistory the Bering Strait area was a flourishing culture center, characterized by stable, shared cultural development on both sides of the strait.

Historic Development and Lifestyles

In the 18th century Russian and English explorers mapped the Bering Strait and the area to the north. Russian expansion during the 18th century did not affect the Eskimos of the region to any great extent, nor did the maritime explorations of Captain James Cook of Britain.

In the early 19th century the flow of European trade goods increased and influenced Eskimo material culture to some extent. Goods were bartered in very limited quantities by the Natives of Chukotka, who traveled across the strait to annual fairs in Alaska.

The Russians did not establish colonies in the region, and as a result native contact with western people was quite limited until the great era of New England whaling commenced in the mid-19th century. Overall, the cultural impact was injurious to the native population because of the effects of liquor abuse and disease, but it did increase mobility and economic opportunities for the Eskimos. Some Natives shipped aboard whaling vessels,

and others worked for white traders and fur dealers, who began to establish stores and onshore whaling stations near the end of the century. Increasingly, as missionaries moved into the area and schools were established, the Eskimo culture gradually adapted to the new influences, yet managed to maintain a traditional subsistence way of life.

The gold rush to the Seward Peninsula in 1898-99 accelerated change in Alaska. Prospectors spread out all over the region, and communities were established.

Plans were made for an Alaska–Siberia railroad that would have joined Asia and North America with a rail bridge or tunnel across the Bering Strait, but the project faltered.

Miners and traders in Nome also developed an interest in the Chukotskiy Peninsula. They were not successful in finding goldfields like those on the Seward Peninsula. During this period the Russian navy was deployed along the Bering Strait coast to prevent incursions and foreign claims to its natural resources. Russian searches for gold on the Chukotskiy Peninsula were unsuccessful in the early 20th century, and gold was not found until the late 1940s, although other minerals were discovered.

Gold dredging near Nome and an important lead/zinc mine north of Kotzebue are among the mineral developments that continue to influence the social and economic structure of the Seward Peninsula.

Present Conditions

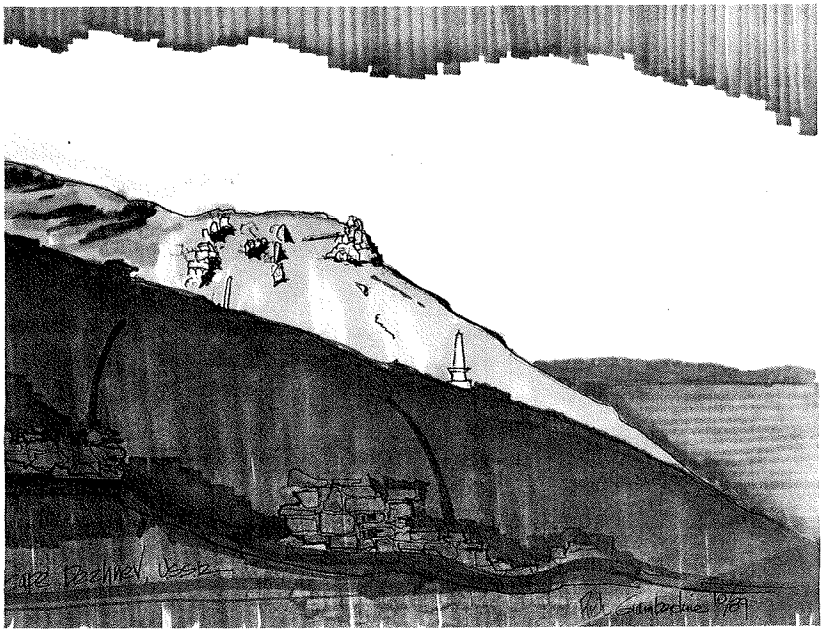
From the 1930s until the close of the 1980s, the development of Beringia has been characterized by the autonomous existence of the Chukotskiy Peninsula and Alaska, and these areas have developed quite differently. Family ties, trade, and cultural relations between the indigenous populations were interrupted on both sides. Only nature continued without change. Along the Chukotskiy and Seward peninsulas, the seasonal migrations of seals, whales, walruses, and waterfowl continued, as did the subsistence hunting of those resources by the people of Beringia.

However, even natural conditions are now undergoing change. Changes to the landscape can be seen on both the Chukotskiy and Seward peninsulas. The construction of roads and the use of tracked vehicles without consideration for the fragile nature of the tundra has, in places, left highly visible tracks across the land. In other areas, the effects of grazing reindeer are obvious. Many of these changes will have long-term effects on both the people and the land.

Today there is little industrial development in Chukotka, and very little tourism takes place. On the Seward Peninsula, development accelerated during World War II, when bases of operations were established to serve as transfer points for equipment being sent to the Soviet Union. Many non-Natives came to the area, a trend that has con-

tinued to the present with nearby oil and gas development and the extension of government services into most villages.

Tourism is increasing in northwest Alaska, and the improving relations between the Soviet Union and United States is bringing increased attention to the region.



Culture of Native Populations

Language

The ancient Eskimos had one common language, but the migration of native people—in search of land rich with marine animals, fish, and land animals—carried them over large regions and brought about the development of different groups, each with its own dialect.

Even though these groups speak different dialects, they have a common language and can be understood by many Eskimos living on both continents. Eskimos who speak Inupiat live on and to the north of the Seward Peninsula. Eskimos who speak Yupik live on the Asian coast, St. Lawrence Island, and south of the Seward Peninsula.

Traditions—Subsistence, Ceremonies, Cultural Traditions

Eskimos in historical times were hunters of marine mammals (such as whales, walruses, and polar bears) and land mammals (such as sheep and caribou). In the 18th and 19th centuries, when American and Russian fur traders came to the Chukotskiy and Seward peninsulas, the Natives trapped wolverines and foxes. Ivory carving and the creation of clothing was also traditional. Ceremonies that developed during the Old Bering Sea period (1500–2500 B.P.) included marking the taking of whales, the start of the hunting season, the ritual initiation of young hunters, and other personal family celebrations.

Dances and songs have also existed since the Old Bering Sea period, the primary musical instrument being a skin drum.

Traditional Trade

An important element of the common heritage of Beringia is the trade among communities along the Bering Strait. The hides, meat, and products of reindeer and other land animals, as well as marine mammals, wood, and tools, have traditionally been exchanged.

The Preservation of Natural and Cultural Resources

Goals for Preserving Our Common Natural and Cultural Heritage

Natural and cultural resources of international significance exist throughout the Beringian region. Across these lands walked the first people to inhabit North America. Today, this region holds great value to the descendants of those earliest people, and it continues to provide food for subsistence, raw materials for their economy, and great aesthetic enjoyment.

At the time of the land bridge an untouched continent lay before the people, but now pristine natural areas are slowly disappearing. Today there is a need to preserve land where man has caused little change. To do this, a variety of methods are available to each nation.

In the joint effort to preserve portions of the natural and cultural heritage of the Beringian region, several goals are shared by the Soviet Union and the United States.

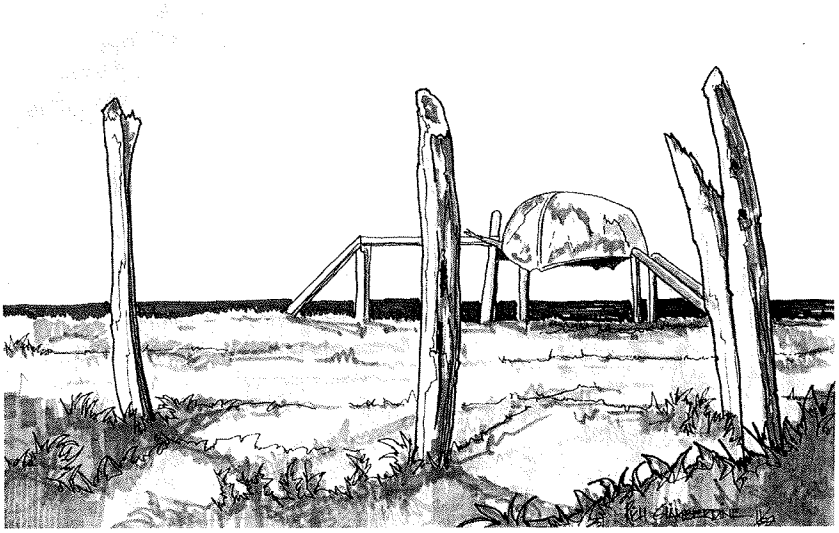
Preservation would allow the discovery of new information about the Earth's development, the evolution of flora and fauna, the genetic foundation of life that the region has supported, as well as insight into the culture of the native people.

Each nation also hopes to preserve some of the great aesthetic beauty of the region, as well as to restore the region's traditional cultural and economic links.

Finally, both nations view the result of the preservation effort as a means to introduce people of Beringia and other areas to the rich cultural and natural resources of the area.

These goals do not come without challenges.

There is a need to create joint data banks so information about the common resources can be shared. Each nation will also face the challenge of proposing and ratifying the legislation necessary to recognize this joint heritage and to permit greater cooperative efforts in the future.



Effective management structures and mandates that recognize this joint heritage must also be put in place, and a greater emphasis must be placed on the training of specialists who will study these common resources.

Protection Methods Available to Both the U.S. and the U.S.S.R.

Existing Protection Methods

Many types of conservation units were considered in the United States before the passage of the Alaska National Interest Lands Conservation Act in 1980. After intense debate, national parks, national preserves, national monuments, designated wilderness, national wildlife refuges, wild and scenic rivers, and other reserves were established for special purposes. Each designation has specific legal meanings. National parks, monuments, preserves, and designated wilderness generally carry the most preservation-oriented levels of resource protection available to the United States government.

Bering Land Bridge National Preserve was one of the areas established by the Alaska National Interest Lands Conservation Act. Its primary purpose is to protect and preserve for research and education a portion of the prehistoric land link with Asia. Its other management purposes include the following:

- Protect and interpret Arctic plant communities, volcanic lava flows and ash explosions, habitat for and populations of migratory birds, and fish and wildlife
- Provide for the archeological and paleontological study of plant, man, and animal migrations across the land bridge
- Protect subsistence resources

Bering Land Bridge is the principal area of the U.S. national park system that is related to the history of the Bering land bridge. Other areas managed by the National Park Service within the Beringian region are Cape Krusentern National Monument, Noatak National Preserve, and Kobuk Valley National Park. These areas have similar mandates for the preservation, protection, and understanding of natural and cultural resources.

The eastern Chukotskiy Peninsula also contains many natural and cultural resources, and many efforts are taking place to preserve important sites. Archeological sites are under government protection; however, no joint protection of cultural and natural resources exists. Conservation efforts are also hampered because various resources are managed by different ministries and agencies.

Separate National Site Designation

To preserve and protect natural and cultural resources of the Beringian region, one alternative is the continued management of existing U.S. national park system areas in Alaska and the establishment of complementary protected areas on the Chukotskiy Peninsula.

While this is a simple alternative for the United States and would protect sites, resources, and ways of life, it would not formally recognize the historic and prehistoric ties between the continents or between the Soviet and American people. It also lacks the symbolic joining of the two continents, governments, and people.

Like the United States, the Soviet Union has many categories of protected territory, and the goal of preserving the natural and cultural heritage of Beringia could be done by adding to one of these existing territories.

For example, this could include one or two *zapovedniki* (a strict reserve with closed access) located near major river estuaries. Another option is a system of seasonally closed preserves called *zakazniks*, which could be established to protect areas used by migrating waterfowl or wildlife.

These kinds of programs could be further improved by creating scientific centers to provide the research and support for meeting preservation goals.

Another solution would be to create a Chukotskiy National Park, which would consolidate responsibility for preserving natural and cultural resources. The boundary, internal organization, and management should be determined by the Soviet Union, with an example being the creation of the Perseslavsk Natural–Historical National Park.

International Park Site Designation

The designation of an international park, consisting of protected sites in both the United States and the Soviet Union, is another alternative. This could be achieved by designating one or more national park areas in Alaska and reserving comparable areas on the Chukotskiy Peninsula as an international park. This would give legal and management protection for natural and cultural resources, would protect local lifeways, and would allow complementary management of sites on both sides of the Bering Strait.

This alternative would recognize the natural and cultural links between the continents and their people. Cooperative activities could improve site management and research, provide for the restoration and continuation of cultural ties, and establish an important symbol of our shared Beringian heritage.

For the Soviet Union, this alternative would require the creation of a national park as described above, and for the United States, designation by the government of an existing park unit.

Recommendations

Overview

The recommendations which follow for an international park define *park* in the broadest sense. They include the idea that each country should set aside areas for the principal purpose of protecting our common Beringian heritage. They also recognize that heritage is not confined to protected areas. In its travels, the team looked at landscapes that embodied scenic, natural, cultural, and lifestyle characteristics.

The recommendations. . . include the idea that each country should set aside areas for the principal purpose of protecting our common Beringian heritage. They also recognize that heritage is not confined to protected areas.

The recommendations include areas and activities that would promote and protect:

- The culture of the indigenous people
- Information about the history of the Earth and the evolution of flora and fauna
- The kind and distribution of plants and animals, with particular interest in preserving species and the gene pools
- Areas of scenic appeal

The recommendations broadly define the term *culture* and suggest the device of cooperative agreements to promote current activities. These agreements would recognize the importance of existing lifestyles, including traditional subsistence, national holidays, ceremonies, handicrafts, and native art. The agreements would extend the park beyond its boundary without expanding Federal ownership on the American side or threatening existing patterns of local land use on the Soviet side.

This study does not define the boundary of the international park, but existing national park areas on the Alaska side would form the basis of the U.S. designation. On the Soviet side protected areas would be established according to their laws, policies, and regulations. Each side would organize and manage the park in accordance with the regulations and laws of each country.

Considering the exceptional political significance of this project, and its high potential for promoting international cooperation in circumpolar and Pacific regions, other organizations such as the United Nations would be logical partners in supporting its operation.

Creation and Management of the International Park

The United States and the Soviet Union would each recommend areas to promote the protection, understanding, and enjoyment of the common heritage of Beringia. The international designation would be accomplished when both sides have established a protected unit in Beringia.

Because of its international significance, after joint designation the United States and the Soviet Union should explore the establishment of a biosphere reserve or a world heritage site.

Park Management

Once the international park units were designated, regular meetings should be scheduled between the individual directors or superintendents to establish joint programs and to direct common activities that would be mutually beneficial. Such meetings should occur at least annually. The meet-

ings could design scientific and cultural programs to be undertaken by other organizations for the benefit of the international park and the preservation of Beringian heritage.

Cooperative Agreements

The managers of U.S. and U.S.S.R. park units that would be designated as part of the international park should be granted broad authority to pursue cooperative agreements. Such cooperative agreements could include provisions for mutual work in planning, design, and architecture, and research in linguistics, ethnology, archeology, native arts, history, and prehistory. Many opportunities for mutual work also are envisioned in natural resource research and management. The products of these agreements would increase the opportunities for education in Beringia and beyond.

To promote scientific and cultural research and to provide public information about Beringia, a joint center, or centers, should be established.

These cooperative agreements could include other governmental agencies or ministries, Alaska native corporations, state farms, ivory carvers, universities, and academies to carry out and support the terms of the agreements. The cooperative agreements would be one means to extend the preservation and understanding of the common heritage beyond the boundaries of the designated parks.

Upon successful negotiation of a cooperative agreement between the parties, barriers to transportation and communication should be reduced. Eased restrictions could include the right to movement between Chukotka and the Seward Peninsula without a visa. Scientists, Natives, and others involved in the protection and promotion of the Beringian heritage would be included, if covered by the terms of a cooperative agreement.

Establishment of a Joint Center for Research and Public Information

To promote scientific and cultural research and to provide public information about Beringia, a joint center, or centers, should be established. The center would work on projects relevant to resources of the common heritage and would provide scientific support for the international park. Information gained in doing the scientific work would be archived at the center and made available to the international scientific community. Cultural activities would also be studied and promoted, and information relating to these activities would be stored at the center. Such activities could include cultural festivals, exhibits, demonstrations of carving, seminars, and classes on issues affecting common resources.

The center could be established in cooperation with existing institutions already active in the research and public information fields. The program of the center would be determined by regular meetings of the director and superintendents of the international park.

Protocol

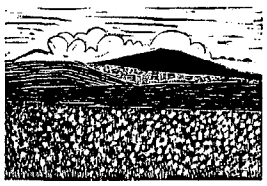
Protocol of the meeting of the Working Group 02.04-20, "Conservation and Management of Natural and Cultural Heritage," under the Joint Soviet-American Agreement on Cooperation in the Field of Environmental Protection, September 6–October 4, 1989, Provideniya, Magadan Region, U.S.S.R.–Anchorage, Alaska, U.S.A.

1. In accordance with the plan of the Working Group 02.04-20 and according to Theme 2, "Research, Conservation and Management of the Beringian Heritage," a group of American and Soviet specialists visited the Chukotskiy Peninsula in the U.S.S.R. (from September 7–18, 1989) and on the American side, the Seward Peninsula along with other regions in Alaska (from September 18–25, 1989). The group acquainted themselves with the natural and cultural richness of the regions, acquiring a great deal of scientific and practical knowledge. In addition, they consulted with local officials and the people regarding the development of an official proposal. This work was carried out pursuant to an agreement contained in proceedings dated July 1987, October 1987, and July 1989. For this reason the work represented an even greater priority for the working group in 1989.

The American delegation was led by Mr. D.P. Galvin, Associate Director, Planning and Development, National Park Service. The Soviet delegation was led by Mr. I.G. Ivanov, Chief Specialist of Goscomarchitecture under U.S.S.R. Gosstroy. The aforementioned had responsibility of co-chairing the working group.

2. As a result of these reciprocal visits and in accordance with former agreements, the Soviet–American group worked out a joint report. From September 26–October 4, in Anchorage, Alaska, the group prepared the text of the report which recommended the creation of an International Park in this region.

3. The American side agreed to publish 1000 copies of the report, half of which would be sent



to the Soviet side. In order that the report would be available and understood by a broad public, the text would be enhanced by the use of graphics. The American side also agreed to hand out the working group's (02.04-20) published report during the XIIth Session of the Joint Soviet–American Commission Collaborating on Environmental Protection, which will occur in January 1990 in Washington, D.C.

The American side also agreed to receive two representatives from the leadership of the U.S.S.R.'s Goscomarchitecture and Goscoprirodi for 5–7 days in November 1989 for joint participation with leaders of the National Park Service. They will finalize work on the report before its publication.

4. Both sides agree that after approval of the idea to create an international park in the Bering region at the XIIth Session of the Joint Soviet–American Commission, they will conduct a joint program. Within 6 months' time, this program will describe the respective steps each government will take to establish an international park. To this end, during the period of preparation, 2–3 specialists on each side would exchange visits for a period of 5–7 days.

5. Both the Soviets and the Americans expressed an interest in subsequent cooperation concerning the preservation of the natural and cultural heritage. Both sides expressed mutual agreement in the value of organizing and participating in joint research. The month of work by the group of experts in studying the natural wealth and cultural values of the Bering region and the work on the report provided both sides with an incomparable opportunity to evaluate the high quality of professionalism of their counterparts.

Both sides recognize that the joint execution of their work was fruitful and proceeded in a setting of cooperation, friendship and mutual understanding.

The Soviet and American delegations express their appreciation to the officials of Provideniya and Chukotka, administrative regions in the U.S.S.R., as well as to the public organizations, schools and leadership in the U.S.A. regions of Nome and Kotzebue for the excellent conditions in carrying out their field work. They also express their appreciation to all the Soviet and American participants involved in this working expedition.

Signed in Anchorage on October 4, 1989, in English and in Russian so that both texts would be equally authentic.

From the American side — From the Soviet Side

D.P.Galvin — I.G. Ivanov

The Alaska Marine Mammal Tissue Archival Project

M. JAWED HAMEEDI

The AMMTAP project is being conducted in cooperation with the National Institute of Standards and Technology, U.S. Department of Commerce. It is funded primarily by the Minerals Management Service, U.S. Department of the Interior, as part of the Outer Continental Shelf Environmental Assessment Program. The principal investigators of the project are Dr. Paul Becker (NOAA) and Dr. Steve Wise (NIST).

The Alaska Marine Mammal Tissue Archival Project was started in 1987 by the Alaska Office of Ocean Assessments Division, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, to collect representative marine mammal tissue samples and preserve them for chemical analyses in the future. The chemical analyses will permit documentation of long-term trends in the concentration of toxicants or their metabolites and may serve as an indicator of overall environmental quality. Availability of these samples would also permit the use of new analytical techniques that were not in use at the time the tissues were collected. Retrospective analysis, as intended for this project, would also permit comparison of present and past analytical techniques and their resulting data.

Although the project was initiated in the context of the outer Continental Shelf oil and gas leasing in the U.S. Arctic, it is also consistent with recommendations made by other agencies and resource management entities. For example, the Marine Mammal Commission in its 1988 report *Selected Marine Mammals of Alaska: Species Accounts with Research and Management Recommendations* states the following for priority consideration:

> Determine and monitor levels and sources of heavy metals and other contaminants present in Alaskan marine mammals, particularly those that may pose hazards to coastal residents who harvest the animals for food.

A similar recommendation was put forth at the 5th meeting of the U.S.–Canada Arctic Fisheries and Marine Mammals Coordination Workshop held in 1989.

Why Marine Mammals?

Marine mammals have been prominent in the human settlement and development of Alaska since prehistoric times. Many Alaska Natives, as well as those in other Arctic regions, for example the Eskimos in Greenland, have traditionally hunted small cetaceans, large baleen whales and other marine mammals for subsistence use. The hunting of the bowhead whale has long been a focal point of the Inupiat culture and is symbolic of the ethos and orientation of the people of the North Slope of Alaska.

Subsistence hunting in the Arctic remains an important and integral part of village life, including maintenance of traditional family organization, reinforcement of ties between generations, and religious ceremonies. In many communities, marine mammals are the principal source of meat in people's diets. This means greater exposure to naturally occurring and anthropogenic toxicants, such as mercury and organochlorides contained in marine mammal tissues. In the case of mercury, it has been reported that modern populations of Inuits have received much greater exposure than their forefathers did in earlier centuries. This could be due to global increase in mercury pollution.

Investigations over the last two decades have shown that many marine mammals can accumulate toxicants in their tissues to high levels. Toxicants are known to accumulate mainly in the liver, kidney and blubber (fat). Concentration of mercury as high as 1 mg/g (dry weight) has been reported in liver tissues of the California sea lion. The high levels of toxicants in marine mammals are often attributed to their high position in the marine food webs and their metabolic activity. Other factors may include their long life spans and a tendency to accumulate large amounts of fat as energy reserves and for insulation.

Species of Interest

Thirty-four species of marine mammals live in Alaskan waters, nearly two-thirds of which are cetaceans. Some of Alaska's marine mammals, e.g. ringed seals, bearded seals, beluga whales, narwhals and polar bears, are characteristically Arctic species, circumpolar in distribution and fairly abundant throughout the high latitudes of Canada, Europe, and the Soviet Union.

The criteria used for selection of species to be sampled as part of AMMTAP are:

- *Geographic range*. A species of a broad geographic range (circumpolar) is more valuable for monitoring purposes than one of a restricted range because the former can offer some measure of comparability of data within and between regions.
- *Mode of potential contamination through the food chain*. Selected species should be representative of the range of feeding modes, and possibly also of bio-transfer of toxicants, which occurs in marine mammals such as pis-

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civorous and planktivorous species, other large carnivores, and those which feed on benthic fauna.

- *Subsistence use.* Selection of species which are regularly consumed by humans, or otherwise utilized in subsistence activities, provides information not only on environmental contaminant levels, but also on possible implications regarding human health.
- *Availability of scientific information.* Availability of information on the distribution and abundance, feeding modes and behavior, life history, and physiology of selected species is essential in determining the fate and effects of toxicants in the animal tissues. It can also provide useful insights into internal regulation, detoxification and biochemical by-products of toxicants that might affect the health of the individual animals or their populations.
- *Ease of collection.* The archiving of tissue samples and its contribution to the monitoring of contaminants require that samples be reliably and readily available on a long-term basis. The species selected should not be so rare (or unavailable from hunters) that continued sampling might be jeopardized.

Based on the above criteria, the following species were selected: polar bear (*Ursus maritimus*), bowhead whale (*Balaena mysticetus*), beluga whale (*Delphinapterus leucas*), Dall's porpoise (*Phocoenoides dalli*), Pacific walrus (*Odobenus rosmarus divergens*), northern (Steller) sea lion (*Eumetopia jubatus*), northern fur seal (*Callorhinus ursinus*), harbor seal (*Phoca vitulina*), ringed seal (*P. hispida*), spotted seal (*P. largha*), bearded seal (*Erignathus barbatus*), and sea otter (*Enhydra lutris*).

Level of Toxicants

Sources of toxicants are limited in the Arctic due to the relatively low degree of urbanization and industrialization. Although local sources are widely scattered, they contribute to some input of polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and related compounds, and organo-metallic compounds (e.g. organo-mercury, organo-tin) to the Arctic ecosystem.

In recent years, much attention has been directed to pollution in the Arctic from sources in lower latitudes and to the possibility of global pollution in the case of certain toxicants. Some halogenated hydrocarbons, although having no known local sources, have been reported as occurring in North American Arctic fauna. These halogenated hydrocarbons include dichloro-diphenyl-trichloroethane (DDT) and its breakdown products, dieldrin, chlorobenzenes, hexachlorocyclohexane, chlordane compounds and metabolites, polychlorinated camphenes (such as toxaphene), aldrin, endrin, and mirex. Mechanisms for introducing these contaminants from outside sources into the Arctic probably involve a combination of oceanic and atmospheric transport.

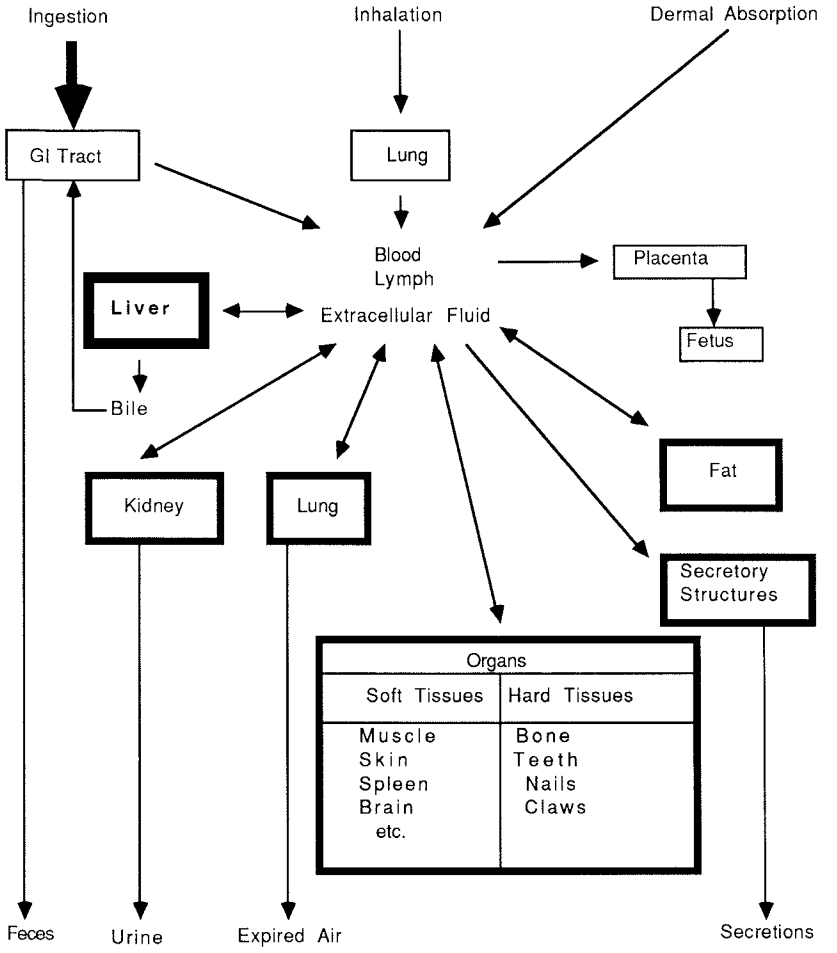
Data on toxicants accumulated in Arctic marine mammal tissues are scant; they are uneven in both geographic and species coverage. Some significant research has been conducted during the past decade by the Canadians on environmental contaminants in some species (for example beluga whale, polar bear and ringed seal), but data for most Arctic species and for marine mammals from Alaska remain very sparse.

Sampling Protocol

The two most important factors in the design of the AMMTAP field sampling strategy are: 1) the tissues are not contaminated during collection, fixation and preservation, and 2) the animals are not taken unnecessarily. To that end, it became essential to document procedures for field work and specimen preservation, and develop close coordination and understanding with Alaska Natives in order to obtain freshly killed animals taken during subsistence hunts.

The AMMTAP sampling procedures emphasize the use of standardized techniques and special equipment for tissue removal and handling, and freezing of tissue samples in the field as soon as practicable. Detailed documentation is provided of all sampling activities from the time of death of the animal until the samples arrive at the archive. Equipment specifically designed for this project includes titanium and Teflon tools (used to minimize extraneous contamination of samples). Samples are collected only from freshly killed animals taken by Alaskan Native subsistence hunters or those taken by field personnel of other ongoing programs. Standard measurements are made of the animals, including teeth and claw measurements for age determination, and stomach contents for food identification. A report describing the field sampling protocol was published in 1988 (NBSIR 88-3750). It is currently being revised for publication in March 1991.

The basic mammalian routes of absorption, distribution, and excretion of xenobiotics are conceptualized in the accompanying illustration. Blubber (fat) and liver samples are important because of the tendency for lipophilic toxicants, such as orga-



Metabolic pathways and sites of accumulation of toxicants.

no-chlorine pesticides, to concentrate in fatty tissues. Both are sources of large samples and both are also consumed by humans in large quantities. The liver, being a major detoxification site in the body, is a key organ where organic and inorganic toxicants, as well as their metabolites, are accumulated. Both liver and kidney are also known to accumulate heavy metals; in the case of cadmium, the monitoring of kidney tissue might be particularly important. Muscle, skin and other tissues are sometimes collected for special purposes. Bile samples from pinnipeds are routinely collected, frozen, and shipped to the NMFS Northwest Fisheries Center for PAH metabolite screening.

The tissue samples are stored at –150°C and archived in the National Biomonitoring Specimen Bank (NBSB) at NIST, Gaithersburg, Maryland. This facility, designed for long-term storage, was built after 10 years of cooperative efforts between NIST and the Environmental Protection Agency, and following several years of comparative studies with specimen archiving programs of Europe (particularly West Germany) and Canada. Other agencies using the NBSB include the U.S. Department of Agriculture, the Food and Drug Administration, the National Cancer Institute, and the National Status and Trends Program of NOAA.

One-half of each sample received by the NBSB is archived for long-term storage and future analysis and the other half is designated for immediate analysis if needed. The NBSB maintains all data and information associated with these samples (e.g. results of analyses, measurements made on the animals from which the samples were taken, etc.).

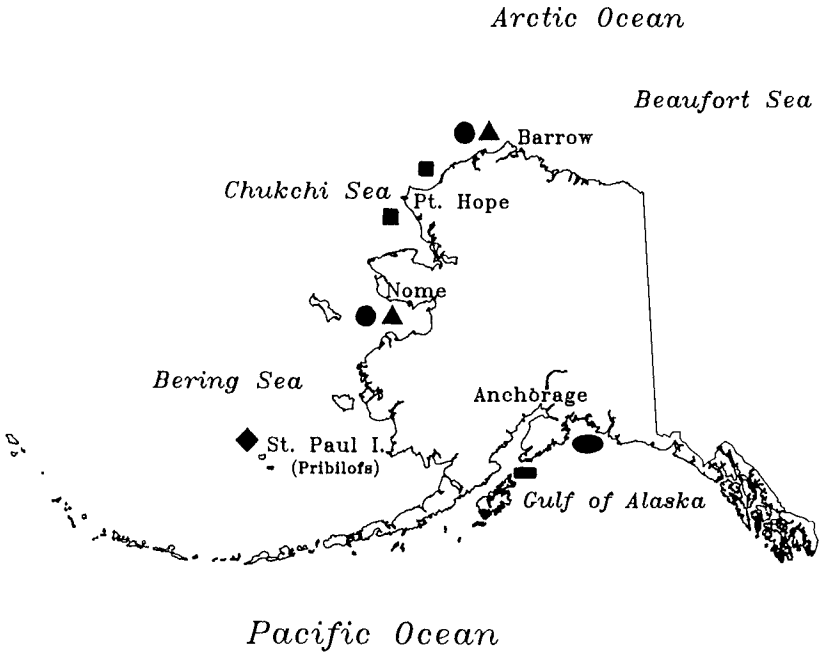
In order to evaluate the stability of the archived tissues, the concentrations of selected trace elements and organic contaminants are monitored in approximately 10% of the tissue specimens. Aliquots of those specimens are initially analyzed to establish the baseline levels. Reanalyses of aliquots of these tissues after a 3–5 year interval provide a measure of change from the initial values. Besides providing a measure of "quality control" on sample storage, these analyses also provide some real-time measure of toxicant concentrations for monitoring purposes and for planning future sampling.

Species Sampled as of August 1990

The first year of AMMTAP (1987) was devoted to the design and testing of field sampling protocols. These initial tests were conducted in July 1987 during the subsistence harvest of northern fur seals on St. Paul Island in the Bering Sea. This was done in close cooperation with NOAA/NMFS, TDX Corporation (the Pribilof Islands Native corporation), and the local Aleut residents of St. Paul. The original sampling protocol was evaluated as to its practicality and suitability for obtaining samples of four tissue types (liver, kidney, blubber and muscle) without contamination during collection and handling. Based on the results from the St. Paul work, the sampling protocol was revised.

So far, six species of marine mammals, five pinnipeds and one cetacean, have been sampled in different parts of Alaska (see map for locations). The species are:

Northern fur seal	St. Paul Island, Bering Sea (1987)
	St. Paul Island, Bering Sea (1990)
Ringed seal	Barrow, Chukchi Sea (1988)



Collection sites and species sampled by AMMTAP as of August 1990.

- ▲ *Ringed seal* (Phoca hispida)
- ● *Bearded seal* (Erignathus barbatus)
- ■ *Beluga whale* (Delphinapterus leucas)
- ◆ *Northern fur seal* (Callorhinus ursinus)
- ⬬ *Harbor seal* (P. vitulina)
- ▬ *Northern sea lion* (Eumetopias jubatus)

	Nome, Norton Sound (1989)
Bearded seal	Barrow, Chukchi Sea (1988)
	Nome, Norton Sound (1989)
Beluga whale	Point Hope, Chukchi Sea (1989)
	Point Lay, Chukchi Sea (1990)
Harbor seal	Prince William Sound (1990)
Northern sea lion	Cook Inlet (1990)

Although the AMMTAP has focused on Arctic fauna, harbor seals and northern sea lions were sampled in Prince William Sound and Cook Inlet in 1990 as part of a special effort to provide materials for investigators involved in the monitoring of subsistence resources that might have been affected by the *Exxon Valdez* oil spill.

Selected organic compounds and trace elements have been analyzed in a few of the archived ringed seal and northern fur seal tissues to monitor stability of preserved samples. Twenty-three trace elements as well as several organic compounds were included in the analyses: PCB and its congeners, DDT and its metabolites, some metabolic products of the chlordane group compounds, lindane, dieldrin, mirex, and selected PAHs.

Coordination and Outreach

The Alaska Natives, particularly those of coastal villages, have always shown a keen interest regarding the population size and health of marine mammals. This interest is also reflected in their support for the AMMTAP. The collection of tissues in the field has usually been a joint effort between the subsistence hunters and project scientists. Whenever appropriate, other agency representatives and researchers are consulted.

Ringed and bearded seal sampling has involved work with the North Slope Borough's Department of Wildlife Management and Alaska Native organizations of Nome (Kawerak, Inc., Sitnasuak Native Corporation, the Nome Eskimo Community, and the Norton Sound Health Corporation). Northern fur seal sampling required coordination and cooperation with NMFS and the Aleut community of St. Paul. Beluga whale sampling was possible because of close working relationships with the Inupiat villages of Point Hope and Point Lay and with personnel from the North Slope Borough's Beluga Subsistence Harvest Survey Program. The sampling of harbor seal and northern sea lion in the Gulf of Alaska was conducted partly to support the Alaska Department of Fish and Game's Prince William Sound Subsistence Foods Monitoring Program and required the support of the Native villages of Chenega Bay, Tatitlek and English Bay. Besides the organizations mentioned above, the project has also received support from the Eskimo Walrus Commission, the Alaska and Inuvialuit Beluga Whale Committee, the Alaska Eskimo Whaling Commission, and the North Slope Borough's Fish and Game Management Committee.

An important AMMTAP accomplishment has been the establishment of a standard sampling protocol which carefully documents collection and handling procedures and minimizes sample contamination during collections. The National Marine Mammal Tissue Bank, recently established by the NMFS Office of Protected Resources, has adopted this protocol. European and Canadian scientists engaged in similar research are frequently consulted to exchange data and information, either in international forums or during bilateral discussions. The U.S.–German Seminars of State and Planning on Environmental Specimen Banking is one such forum. These seminars are usually attended by researchers from the United States, Germany, Canada, Sweden, Norway, Finland, Denmark, and Japan.

Future Directions

Discussions are underway to develop collaborative investigations with Canadian researchers on the distribution of organochlorine compounds in the beluga whales of the North American Arctic. A joint effort to identify appropriate contacts in the U.S.S.R. and to develop collaborative investigations on contaminants in this species from a circumpolar perspective is also being considered.

So far AMMTAP has contributed significantly toward the archiving of marine mammal tissues collected and stored using carefully controlled procedures. It is developing into a resource that

will be useful in addressing important questions on the distribution and fate of contaminants throughout the polar ecosystem as reflected in marine mammal tissues. It is anticipated that the scope of the Alaskan Marine Mammal Tissue Archival Project will continue to grow, and arrangements will be made for detailed chemical analyses of archived tissues.

Publications

Alaskan Marine Mammal Tissue Archival Project: A Project Description Including Collection Protocols, by P.R. Becker, S.A. Wise, B.J. Koster and R. Zeisler: National Bureau of Standards, U.S. Department of Commerce, Gaithersburg, Maryland, NBSIR 88-3750, 1988.

Alaskan Marine Mammal Tissue Archival Project: Acquisition and Curation of Alaskan Marine Mammal Tissues for Determining Levels of Contaminants Associated with Offshore Oil and Gas Development, by P.R. Becker, S.A. Wise and R. Zeisler: OCSEAP Annual Report, NOAA, U.S. Department of Commerce, Anchorage, Alaska, October 31, 1988.

Alaskan Marine Mammal Tissue Archival Project: Acquisition and Curation of Alaskan Marine Mammal Tissues for Determining Levels of Contaminants Associated with Offshore Oil and Gas Development, by P.R. Becker, S.A. Wise and R. Zeisler: OCSEAP Annual Report, NOAA, U.S. Department of Commerce, Anchorage, Alaska, October 31, 1989.

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The Arctic and United States Foreign Policy, 1730–1990

SAMUEL E. FRY

This chronology is an appendix to "The Arctic and United States Foreign Policy," a study which is nearing completion. It focuses primarily on events relating to the development of United States foreign policy and the northern polar region rather than on a history of American involvement in the area.

Alexander Baranov
1746–1819
Chief Manager of the Russian–American Company's settlements in North America from 1790–1818, and founder of the capital of Russian America at Sitka.

Samuel E. Fry is a retired Foreign Service Officer in the Office of the Historian of the Department of State

1730s

The first whaling ships from the American colonies visited eastern Arctic waters in the Davis Strait between Canada and Greenland.

1765

American natural scientist Ezra Stiles, with the assistance and intercession of Benjamin Franklin, wrote to Russian academician Mikhail Lomonosov regarding Arctic science matters covering climate, magnetism, vegetation, and exploration, and discussed the importance of Arctic exploration (*The United States and Russia—The Beginning of Relations 1765–1815*, U.S. Government Printing Office, 1980, p. 3).

1784

After extensive exploration voyages beginning in 1741 and ranging from the Bering Strait to present-day southern Alaska, including the Aleutian Islands, Russia claimed the huge territory as Russian America, establishing the first European settlement and beginning the commercial exploitation of the sea otter.

1789

John Churchman, government clerk, surveyor–mathematician and geophysicist, petitioned the First U.S. Congress to subsidize his proposed expedition to the high Arctic at Baffin Bay to verify his theories concerning magnetic variation and to determine the existence of a northwest passage from the Atlantic to the Pacific Oceans. Congress declined support for this first attempt to interest the U.S. Government directly in the Arctic, and again in 1791 when Churchman asked for $3,000 to acquire two 130-ton ships for a Baffin expedition. Churchman was elected to the Russian Imperial Academy of Sciences in 1795 for his Arctic interests and for the research on magnetic declination he provided to the Academy. Congress did not authorize funding for U.S. Government-sponsored Arctic exploration until 1870 (*United States Polar Exploration*, edited by Herman R. Friis, Ohio University Press, 1970).

An American merchant consortium was formed in Boston to exploit the potential sea otter fur trade from California to southern Alaska. The Russian Government was alarmed by the "Yankee" commercial penetration and influence on the Native peoples in Russian America (Alaska).

1799

July 19—Russian Emperor Paul I chartered the Russian–American Company to manage Russia's North American possessions.

1803

Because the Chinese did not permit Russian shippers into their ports, a Boston company signed an agreement with the Russian–American Company in Alaska to supply a wide range of goods in return for sea otter pelts destined for the China market at Canton on American ships.

1808

The Russian Government formally protested to the United States Government regarding the "illegal" trading by American shippers with Alaskan natives. Protests would be made periodically for the next 50 years.

1818

October 20—The United States and Great Britain signed a Convention on Fisheries, Boundaries and Slaves, establishing the 49th parallel of north latitude as the U.S.–Canadian boundary from Lake of the Woods (Minnesota) to the Rocky Mountains, and providing for joint usage of territory from Oregon to the Alaska panhandle (53 degrees north latitude) for a ten-year period without prejudice to future territorial claims (8 Stat. 248; Treaty Series 112).

1822

February 11—An "ukase" from Russian Tsar

John Quincy Adams
1767–1848
Minister to Russia 1809–1814
Secretary of State 1817–1825
President 1825–1829

His diplomacy stopped Russian territorial expansion in North America.

Alexander I was delivered to Secretary of State John Quincy Adams. The imperial order extended Russian territorial claims in North America south to 51 degrees north latitude and effectively barred foreign vessels from operating in the Bering Sea and Aleutian Islands. The American and British governments protested vigorously.

1823

December 2—President James Monroe's pronouncement of the Monroe Doctrine was presented partially in response to Tsar Alexander's "ukase" extending Russian territorial claims for Russian America.

1824

April 17—The United States and Russia signed a Convention Regarding Navigation, Fishing and Trading on the Pacific Ocean and Along the Northwest Coast of America. The Convention put to rest the offending territorial "ukase" issued by the Tsar in 1822 by reopening Russian America to United States commerce, with both countries agreeing not to establish any settlements above or below 54 degrees 40 minutes north latitude, and with the United States agreeing that its subjects would not supply alcohol or firearms to Alaska Natives, subject only to U.S. inspection (U.S. Stat. 302; Treaty Series 298).

1825–1845

The United States began to populate the Pacific Northwest, and its whaling fleet dominated the North Pacific and Bering Sea. The possibility of war with Britain loomed because of popular demand in the United States to establish the U.S.–Canadian border at 54 degrees 40 minutes north latitude. The American political slogan "Fifty-Four Forty or Fight" was coined.

1838

December 3—President Martin Van Buren, in his Second Annual Message to Congress, recounted the diplomatic activity relating to the Russian refusal to renew trading privileges for United States citizens in Russian America granted in the U.S.–Russian Convention of 1824. He suggested that the situation in the far Pacific Northwest would "deserve the careful consideration of Congress" (*Messages and Papers of the Presidents*, Vol. IV, 1360–1835, pp. 1704–05).

1846

June 15—The United States and Great Britain signed the Oregon Boundary Treaty establishing the 49th parallel of north latitude as the U.S.–Canadian boundary to the Pacific Ocean (9 Stat. 869; Treaty Series 120).

1848

The first American-flag whaling vessel, *Superior*, captained by James Royce, entered the Arctic Ocean through the Bering Strait.

1850s

Political forces in the United States wishing to extend American political and economic influence in Asia gained strength and called for a strong U.S. position in the North Pacific. Senator William H. Seward, later Secretary of State, was one of the movement's prominent leaders.

1850

May 2—Congress authorized President Millard Fillmore to receive two Arctic exploration vessels from Henry Grinnell, a New York businessman, for transfer to the U.S. Navy. The vessels and naval volunteers were to join the international search for missing British explorer Sir John Franklin and party (31st Congress, Sess. I., Joint Resolution 7). International cooperation in the high Arctic during the search for Franklin was the impetus for the first entry of the United States into serious Arctic exploration.

1852

July 2—Congress authorized $125,000 for the Navy Department to survey the Bering Sea and Arctic Ocean fishing areas. Senator William H. Seward stressed the strategic importance for the United States, and particularly for its maritime interests, of the Northern Pacific area as a commercial link to Asia (32nd Congress, Sess. I., Ch. 109).

1854

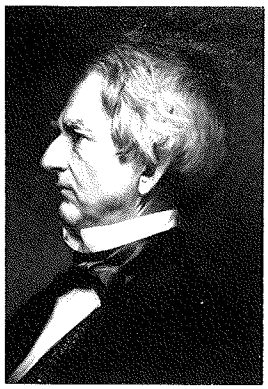
Secretary of State William Marcy told Russian Minister to the United States Eduard de Stoeckl that the U.S. was willing to purchase Alaska.

1859

Assistant Secretary of State John Appleton approached the Russian Minister to the United States Eduard de Stoeckl with an offer of $5 million to purchase Alaska.

1865

Construction work began on the Collins Overland Telegraph Line from California, across Alaska to the Bering Strait, and south to the Amur River in Russia. Led by Secretary William H. Seward, the State Department fully supported the project. Project studies provided valuable information to the U.S. Government about Alaska. The project ended in 1867 when its potential usefulness was undercut by the successful opening of the Atlantic Cable.



William H. Seward
Secretary of State 1861–1869

Both as a Senator and Secretary, Seward was architect of the Alaska purchase in 1867, and a leader in the movement to extend American political and economic strength in Asia through the Pacific Northwest

1867

March 30—The United States signed a Convention with Russia for the purchase of Russian America (Alaska) for $7.2 million. By becoming an Arctic nation the United States expanded its geographic size by nearly 20 percent with the addition of the 586,412-square-mile Alaskan territory. The Convention was proclaimed in force by President Andrew Johnson on June 20, 1867 (15 Stat. 539; Treaty Series 301).

1870

July 1—Congress approved "An Act to Prevent the Extermination of Fur-bearing Animals in Alaska." The Act covered all fur sealing in the Pribilof Islands by providing a private monopoly lease for twenty years, regulating time and method of hunting, and proscribing all offshore (pelagic) hunting. The legislation set in motion a chain of events leading to international confrontation, long diplomatic negotiations, and arbitration with Great Britain and Canada (41st. Congress, Sess. II., Ch. 189).

July 12—Congress authorized $50,000 for President Ulysses S. Grant to "send out one or more expeditions toward the North Pole," the scientific operations to be established with the advice of the National Academy of Sciences (41st. Congress, Sess. II., Ch. 251). This was the first and only Congressional act fully funding an Arctic expedition during the 19th Century. All others were sponsored either entirely by individuals or private organizations or with infrastructure support from the U.S. Government, including loan of military personnel. This practice continued well into the 20th Century.

1871

May 8—The United States and Great Britain signed the Treaty of Washington providing *i.a.*, ascending or descending access in perpetuity to British and American citizens on the three navigable rivers (Yukon, Porcupine, Stikine) flowing across the Alaskan/Canadian border, subject only to regulations consistent with free navigation (17 Stat. 863; Treaty Series 133).

1880

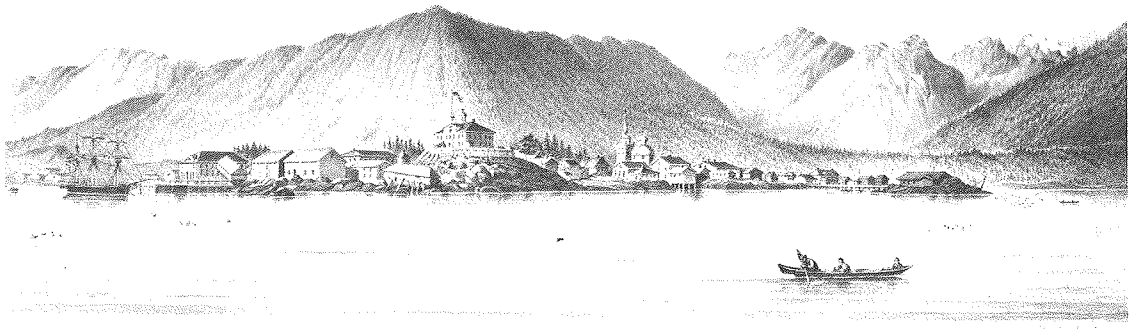
May 1—Congress authorized President Rutherford B. Hayes, in preparation for a proposed International Polar Year, to establish a temporary Arctic station north of eighty-one degrees north latitude for scientific observation and exploration, and to develop or discover new whaling grounds. Congress also approved the use of a privately donated vessel and public contributions for the expedition (46th Congress, Sess. II., Ch. 72).

1882

The United States participated with 11 other nations in the First International Polar Year, the first attempt at coordinated international cooperation in polar geophysical science. The United States established two Arctic stations at Point Barrow, Alaska, and Ellesmere Island, Canada, and participated in an identical one-year series of geophysical scientific observations simultaneously with other participants.

1889

March 2—Congress amended the July 1870 fur seal legislation to prohibit all pelagic fur seal hunting in the Bering Sea, requiring the President to publicize the ban annually, and authorizing the arrest of persons violating the ban along with seizure of their vessels. The legislation challenged established international maritime law concepts in the name of conservation of an endangered species and preservation of maritime resources (50th Congress, Sess. II., Ch. 415).



Sitka, Capital of Russian America, about 1850. Baranov's "castle" is at center with the still-existing St. Michael's Church at center left.

1891

June 15—The United States and Great Britain signed an Interim Agreement on fur seal fisheries in the Bering Sea prohibiting fur seal hunting in designated areas. The agreement provided for subsistence hunting by indigenous Aleut peoples (27 Stat. 980; Treaty Series 140).

1892

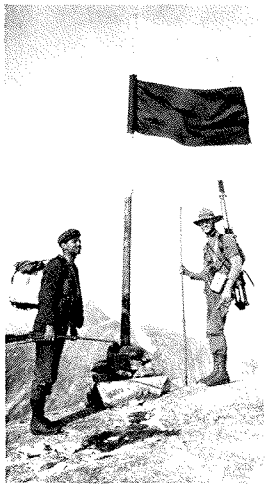
February 29—The United States and Great Britain signed an Arbitration Convention establishing a Joint Commission to resolve all questions dealing with jurisdictional rights in the Bering Sea and the asserted right by the United States to control pelagic fur seal hunting in international waters (27 Stat. 947; Treaty Series 140-1).

April 18—The United States and Great Britain signed a Convention on Fur Seal Fisheries in the Bering Sea (27 Stat. 952; Treaty Series 140-3). The Convention renewed the existing *modus vivendi* in the Bering Sea and was terminated in 1893 upon rendering of the arbitration award pursuant to the Arbitration Convention of February 29, 1892.

July 22—The United States and Great Britain signed a Convention establishing commissions for a joint or coincident survey of the Alaska–British Colombia–Northwest Territory boundary to facilitate resolution of the Alaska boundary dispute (27 Stat. 955; Treaty Series 142). The Convention was extended in 1894 to expire December 31, 1895.

1893

August 15—The decision of the Bering Sea Arbitration Tribunal was rendered against the United States on all major points, including lack of U.S. jurisdiction over the Bering Sea beyond the three-mile limit. The Tribunal established regulations for pelagic sealing which were implemented by domestic legislation in the United States and Great Britain in 1894. The Bering Sea controversy succeeded in raising fundamental issues about broader interests of the international community in conserving maritime resources.



American surveyors, under the authority of the 1906 U.S.–Canadian Boundary Convention, begin marking the 141st meridian to the Arctic Ocean and the Alaska Panhandle border with British Columbia.

1894

May 4—The United States and Russia signed an Agreement on a fur seal fisheries *modus vivendi* in the Bering Sea and the North Pacific Ocean (28 Stat. 1202; Treaty Series 307). The Agreement was terminated by the Convention of July 7, 1911.

August 18—Congress authorized $7,500 for the support of a reindeer station at Port Clarence, Alaska, near the Bering Strait, to assist in developing reindeer herds purchased in Siberia as a permanent and secure food supply for Native Arctic peoples and others in Alaska (53rd Congress, Sess. II., Ch 301). Subsequent international aspects of Alaskan reindeer herd development included purchases from Scandinavian Lapland, settlement of Lapp herders in Alaska, and Canadian cooperation in cross-breeding and management practices.

1896

Major gold deposits were discovered in the Canadian Yukon, followed by a massive influx of prospectors and others into the northern part of the Alaska panhandle and adjacent Canadian territory.

1898

April 1—The United States established a consulate at Dawson City, Yukon Territory, Canada, less than 200 miles from the Arctic Circle near the Alaska border, to assist the thousands of American citizens flooding into the Subarctic in the search for gold. The consulate was closed in 1915.

1899

October 20—The United States and Great Britain exchanged notes establishing a provisional boundary line in the contested Lynn Canal area of the Alaska panhandle (Treaty Series 146 1/2).

1903

January 24—A Convention between the United States and Great Britain established a tribunal of six "impartial jurists," three appointed by each country, to attempt a resolution of the Alaska boundary dispute (32 Stat. 1961; Treaty Series 419).

October 17—The Alaska boundary commissioners rendered a decision resolving the Alaska boundary dispute in favor of the United States.

1905

March 25—The United States and Great Britain agreed to an Exchange of Notes accepting the report of the Alaska Boundary Commissioners, thus completing the award under the 1903 Alaska Boundary Convention.

1906

April 21—The United States and Great Britain signed a Convention establishing a boundary commission, with a commissioner appointed by each country, to mark the U.S.–Canadian boundary along the 141st meridian to the Arctic Ocean (34 Stat. 2948; Treaty Series 452).

1909

April 6—U.S. Arctic explorer and naval officer Robert E. Peary claimed victory in reaching the geographic North Pole with aide Matthew Hensen

and four Eskimos. Although challenged, the claim stands. The Pole achievement capped Peary's long Arctic career, including establishment in 1892 for the first time that Greenland is an island.

Elihu Root
Secretary of State 1905–1909

As Secretary of War, Root was one of three U.S. members of the 1903 Alaska Boundary Tribunal. As a Senator in 1912, Root introduced legislation which led to the 1916 U.S.–U.K. Migratory Bird Convention protecting birds flying to and from arctic and subarctic breeding areas.

1911

February 7—The United States and Great Britain signed a treaty for the preservation and protection of fur seals (37 Stat. 1538: Treaty Series 563). Superseded by July 7, 1911 Treaty.

July 7—The United States, Russia, Japan and Great Britain signed a Convention For Preservation and Protection of Fur Seals. The Fur Seal Treaty was one of the first major international conservation treaties. All pelagic sealing north of the thirtieth parallel in the Pacific Ocean was prohibited. Each party agreed to enact and enforce national legislation, including prohibition of illegal fur seal skin importation, to make the treaty provisions effective. Allowance was made for subsistence hunting by Native peoples (Stat. 1542; Treaty Series 564).

1914

January 30—The first international agreement on the Safety of Life at Sea was signed providing for an ice patrol in the North Atlantic in response to the *Titanic* maritime disaster in 1912. The United States agreed to manage the patrol during the iceberg season, and the U.S. Coast Guard assumed the responsibility in 1914. Building on international cooperation on an Arctic-related issue, Congress enacted legislation on June 25, 1936, requiring the U.S. Coast Guard to administer the International Ice Observation and Ice Patrol Service (74th Congress, Sess. II, Ch. 807; 49 Stat. 1922). Financial and other nonoperational arrangements for the International Ice Patrol are managed by the Department of State (7 UST 1971; TIAS 3597).

June 16—An International Conference on Spitzbergen (Svalbard) was convened in Oslo, Norway, to determine the status of the Arctic archipelago under international law and the rights of persons engaged in economic activity in the territory then considered *terra nullius*, or "no man's land." This was the first international conference called to determine the legal status of an unclaimed Arctic territory. The conference adjourned in July 1914 and the First World War precluded further actions until the 1918–1920 Paris Peace Conference.

1916

August 4—The United States appended a declaration to the Convention Between the United States and Denmark for the Cession of the Danish West Indies, recognizing the extension of Danish political and economic interests to the whole of Greenland (39 Stat. 1706; TS 629). The U.S. action was strongly criticized by polar explorer Admiral Robert E. Peary, citing Greenland's potentially valuable strategic location for the United States and urging consideration of its purchase. The declaration effectively precluded any future U.S. territorial claims in Greenland and paved the way for close U.S.–Danish cooperation in Greenland during World War II and the postwar period.

August 16—The United States and Great Britain signed a Convention for the Protection of Migratory Birds. As one of the earliest international environmental agreements, the Convention identified and protected categories of migratory birds, most of which used Arctic and subarctic areas, with common U.S.–Canadian flyways, breeding, wintering and feeding areas. Eskimos and Indians were excepted from some regulations for subsistence hunting for food and skins for clothing (39 Stat. 1702; TS 628). Domestic U.S. challenge to the Convention led to the landmark 1920 U.S. Supreme Court decision upholding the constitutionality of Congressional legislation pursuant to implementing an international treaty (Missouri vs. Holland, 252 U.S. 416).

1920s–1930s

American prophets of coming Arctic strategic and economic importance received little support from U.S. Government policy makers. Army General William "Billy" Mitchell (1879–1936) called the Arctic the future springboard for air warfare and foresaw the crucial impact of great circle air routes on strategic military planning. He wrote of his ideas in *Our Air Force*, 1921; *Winged Defense*, 1925; and *Skyways*, 1930. Arctic explorer and scholar Vilhjalmur Stefansson (1879–1962) laid out a broad master plan for development of Arctic natural and renewable resources, communication centers, and circumpolar international cooperation on a grand scale. He outlined his plans in *Friendly Arctic*, 1921; *The Northward Course of Empire*, 1922; and *Arctic Manual*, 1941. Representative of a small core of Arctic "believers," neither was taken seriously until the outbreak of World War II.

1920

February 9—Eighteen countries, including the United States, signed the Treaty of Paris on the status of the Spitzbergen (Svalbard) archipelago recognizing Norwegian sovereignty and establishing a political, economic and environmental regime for its development and peaceful utilization. By this treaty Svalbard became the first and only Arctic territory demilitarized by international agreement (43 Stat. 1892; TS 686).

Robert Lansing
Secretary of State 1915–1920

In 1917 Lansing reversed the U.S. position on a settlement of the Spitzbergen (Svalbard) issue, which led to Norwegian sovereignty over the archipelago and its demilitarization under the 1920 Treaty of Paris.

1922

February 6—The United States, Great Britain, France, Italy and Japan signed the Limitation of Naval Armament Treaty (Washington Treaty). At the insistence of Japan, the United States agreed not to fortify the Aleutian Islands during the Treaty period. Upon termination of the Treaty in 1936, the United States constructed no Aleutian military bases west of Dutch Harbor until 1942 (43 Stat 1655; Treaty Series 671).

1923

March 2—The United States and Great Britain signed a convention to preserve the halibut fishery in the Northern Pacific Ocean and Bering Sea, and to establish an International Fisheries Commission to study the halibut life cycle and make recommendations for regulatory development (43 Stat. 1841; Treaty Series 701). The Convention was renegotiated with Canada and replaced in 1930, 1937, and on March 2, 1953, when the Commission was enlarged, restructured, and renamed as the International Pacific Halibut Commission (5 UST 5; TIAS 2900).

1925

October—International lawyer David Hunter Miller published "Political Rights in the Polar Regions," a study which became the benchmark analysis of Polar sovereignty questions for the State Department and other U.S. foreign policy makers (*Foreign Affairs*, Vol. 4, October, 1925, pp. 47–60). Miller, a distinguished diplomat and international law specialist, joined the State Department Historical Adviser's Office in 1929 as Editor of Treaties and was appointed Historical Adviser in 1931.

1926

May 9—Two Americans, Commander Richard E. Byrd and Floyd Bennett, became the first persons to reach the North Pole by airplane. Conquest of the Pole by air intensified the activities of advocates for greater U.S. Government involvement in Arctic affairs, including research and strategic military planning.

1928

The American Geographical Society (AGS) published *Problems of Polar Research*, and called for a world conference on objectives in Polar Research. The AGS stated that science, not adventure, would be the ruling motive in future Polar work, focusing on scientific principles rather than personalities (Special Publication No. 7, The Commonwealth Press, Worcester, Massachusetts, 1928).

1929

February 19—Congress approved an annual $300 appropriation for five years for the International Society for the Exploration of the Arctic by Means of the Airship. Founded in 1926, the 19-nation society was organized to establish a chain of geophysical observation stations across the Arctic circumpolar area. This was one of the important initial attempts to establish international cooperation to provide Arctic weather and other scientific information on a regular basis. When presented to Congress in 1928, U.S. membership was strongly recommended by Secretary of State Frank B. Kellogg and supported by President Calvin Coolidge (70th Congress, Sess. II, Ch. 230).

1931

September 24—The United States and 25 other nations signed the first Convention for the Regulation of Whaling. The taking of several species of indigenous or migratory Arctic whales was prohibited. Coastal Native peoples, using indigenous craft and no firearms, were permitted to take excepted whales for subsistence use (49 Stat. 3079; Treaty Series 880).

1932

March 18—Congress approved a Joint Resolution appropriating $30,000 for the Department of State to defray expenses of participation by the U.S. Government in the Second Polar Year program from August 1, 1932 to August 31, 1933. The Secretary of State was authorized to transfer all or part of the fund to the Coast and Geodetic Survey, through the Department of Commerce, for field supplies, transportation, temporary buildings, scientific instruments, and printing and binding of reports.

1933

September 21—The State Department published a study of "The Polar Regions: Geographical and Historical Data for Consideration in a Study of Claims to Sovereignty in the Arctic and Antarctic Regions," by Samuel W. Boggs, Department Geographer in the Office of the Historical Adviser. This was a key document in attempts by the State Department to develop a national polar regions policy. The study strongly differentiated between the nature and validity of Arctic and Antarctic sovereignty claims because of area differences, and discouraged American acceptance of the sector principle for territorial claims as espoused by Canada and the Soviet Union. Boggs suggested the need for new international law dealing with the status of sea ice areas that could be occupied for long periods, and questioned whether

"effective occupation" of territory, as defined for temperate zone areas, was possible in polar areas to sustain sovereignty claims. The study foresaw the gathering impact of potential Arctic great circle air routes on territorial sovereignty (U.S. National Archives, State Department File (800.014 Arctic/31).

1934

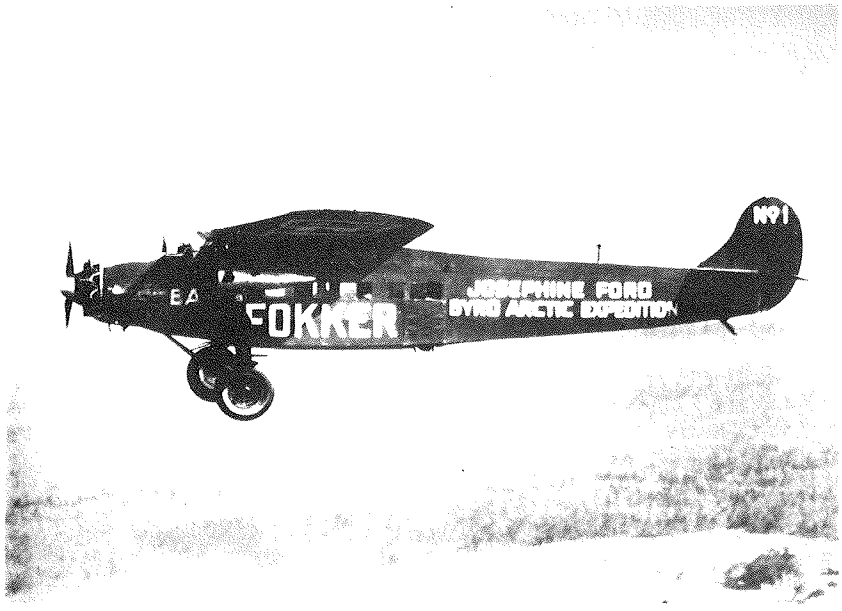
March 12 and 24—The United States and Denmark concluded a reciprocal air navigation agreement by an Exchange of Notes, including specific reference to the operation of civil aircraft in and over the Arctic territories of both nations in Alaska and Greenland (48 Stat. 1855, 7 Bevans 92).

June 23—Alexander Troyanovsky, the first Ambassador from the Soviet Union to the United States, predicted the establishment of U.S.–U.S.S.R. air connections via Alaska, noting in one of his early speeches in the United States that "The time is coming when Alaska will be an important stopping point on air lines connecting your Pacific Coast with Europe by way of the Arctic." (*New York Times*, June 24, 1934, VIII, 12:3.)

1938

February 7—A Memorandum from the Soviet Union and subsequent exchanges of notes between the United States and the Soviet Union on March 26 and April 18, regularized summer visits to Siberia by American Eskimos in Alaska to meet with relatives living under Soviet jurisdiction. The arrangement reflected the timeless trading and cultural interchange of Arctic peoples in the Bering Strait area. The Soviet Union terminated the agreement on May 29, 1948.

Americans Richard E. Byrd and Floyd Bennett became the first persons to reach the North Pole by airplane on May 9, 1926, in a Fokker tri-motor.



1939

June 15—The United States Senate debated Resolution 119 authorizing and requesting the President to negotiate with Denmark for the purchase of Greenland. The resolution was referred to the Foreign Relations Committee and not reported out, but debate focused attention on the strategic implications of Greenland for U.S. national defense and the potential threat posed by the occupation of Greenland by a hostile power (*Congressional Record*, Vol. 84, Part 7, pp. 7211–7219).

1940

May 25—The United States established a consulate at Godthaab, Greenland, following the occupation of Denmark by Nazi Germany on April 9. The consulate was closed on October 9, 1953.

July–August—The first violations of Western Hemisphere territory by Nazi Germany occurred above the Arctic Circle in eastern Greenland for the purpose of establishing radio and weather stations to support German forces in the Battle of the North Atlantic. The United States reappraised strategic requirements for the defense of Greenland and the foreign policy implications of U.S involvement.

August 18—President Franklin D. Roosevelt and Canadian Prime Minister W.L. Mackenzie King issued the Ogdensburg Declaration concerning the mutual defense problems of the United States and Canada and the defense of the northern half of the Western Hemisphere (Department of State *Bulletin*, August 24, 1940, p. 154). The Ogdensburg Agreement, establishing a U.S.–Canadian Permanent Joint Board on Defense with broad powers for defense planning and coordination, became the cornerstone of all U.S–Canadian military cooperation during World War II and the postwar era.

October 11—Japan denounced the 1911 Convention for the Preservation and Protection of the Fur Seal and gave a one-year written notice of termination under terms of the Convention's Article XVI.

1941

April 9—The United States and Danish officials in Greenland exchanged diplomatic notes to establish the basis for the mutual defense of Greenland. Secretary of State Cordell Hull and Danish Minister Henrik Kauffmann signed an agreement whereby the United States undertook to maintain Danish sovereignty over Greenland despite the occupation of Denmark by foreign forces. The United States immediately began construction of air bases and other military facilities in Greenland (55 Stat. 1245; Executive Agreement Series

204). The Agreement of April 27, 1951, between the United States and Denmark terminated the April 9, 1941, Agreement.

July 1—The United States and the Republic of Iceland signed an agreement for the defense of Iceland, with the United States to withdraw all forces immediately at the end of the war (55 State. 1547; Executive Agreement Series 232). The Agreement was terminated on October 7, 1946.

October 23—The 1911 Convention for the Preservation and Protection of Fur Seals was terminated based on the withdrawal of Japan from the Convention.

December 8—The United States declared war on Japan following the Japanese attack on Pearl Harbor, Hawaii, and began the escalation of cooperation with Canada for the defense of Alaska through construction of military airfields and other bases in the far north.

1942

March 11—The United States and Canada began construction of the Alaska Highway from Edmonton, Alberta, to Fairbanks, Alaska, 125 miles south of the Arctic Circle. This effort became the largest single U.S. Army construction project in World War II outside the continental United States. For the first time Alaska and the Arctic were connected by road to the continental United States.

June 3—Japanese naval forces attacked U.S. military installations at Dutch Harbor, Alaska, and then proceeded to occupy the undefended Aleutian islands of Attu and Kiska on June 7 and 8.

1943

May 11–29—U.S. forces defeated the Japanese on Attu and retook the island with heavy casualties on both sides. A combined U.S.–Canadian force attacked Kiska on August 14 and found that the Japanese had withdrawn from the island and their remaining Aleutian outposts, thus ending hostilities in the Alaska Defense Command for the remainder of World War II.

1944

David Hunter Miller, State Department Historical Adviser, completed *The Alaska Treaty* for the Department's "Treaties and other International Acts of the United States of America" series, which he edited. Intended to be Volume 9 in the series, the U.S. government never published this definitive work when budgetary problems in the postwar period forced discontinuation of the project. It was published privately in 1981 (*Alaska History*, No. 18, The Limestone Press, Kingston, Ontario, Canada, 1981).

August 12—President Franklin D. Roosevelt, in a national radio address given after returning from a visit to Alaska and the Pacific, underscored the strategic importance of Alaska and the need to prevent "for all time to come" an attack upon the United States from the area of the Great Circle air route. From the national defense viewpoint the President deemed it essential that U.S. "control of this route shall be undisputed." Echoing William H. Seward and others from the 19th Century, he concluded that commercial developments would make Alaska the stepping stone for trade with China and Siberia in a coming era of vast economic interchange. He appointed an Alaska Commission to facilitate the settlement of ex-GIs in Alaska after World War II to populate "this new Frontier" (*New York Times*, August 13, 1944, p. 21). Roosevelt's Vice President, Henry Wallace, had been saying and writing along the same lines for years, and had conceived of some form of Arctic Compact that might unite Arctic nations in cooperative development of the northern regions (*The Price of Vision: The Diary of Henry A. Wallace*, p. 35).

August 15—The U.S. Navy began a ten-year oil exploration project on the North Slope of Alaska in an area designated in 1923 by President Warren G. Harding as Naval Petroleum Reserve No. 4. Extensive operations in a 70,000-square-mile area from the Arctic Ocean south to the Brooks Range confirmed by 1953 the presence of vast petroleum deposits in the American Arctic.

September 8—The Arctic Institute of North America was established and subsequently incorporated by the Canadian Parliament in 1945 as a private, nonprofit, tax-exempt research and educational organization for the collection and dissemination of information about the Arctic and Subarctic regions of the western hemisphere. The North American Arctic region was to be studied as a unit, and the assistance and cooperation of governments were to be sought where mutually helpful. In 1947 the Institute began publishing *Arctic*, a magazine using an interdisciplinary approach to a wide range of Arctic research issues. Initially headquarted in Montreal, the Institute relocated in 1979 to the University of Calgary, Alberta. The Institute's U.S. Corporation is headquartered at the University of Alaska–Fairbanks.

1946

October 7—The July 1, 1941 Defense Agreement between the United States and Iceland was terminated, including withdrawal within 180 days of U.S. military forces in Iceland, and establishment of an interim arrangement for continued use of Keflavik Airport in Iceland by the United States to fulfill obligations to control agencies in Ger-

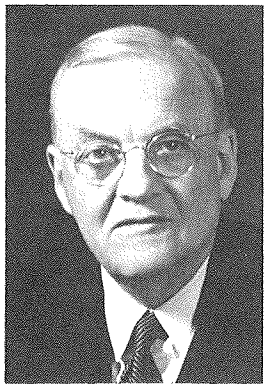
many (61 Stat. 2426; TIAS 1566).

December 2—The United States and 14 other nations signed the International Convention for the Regulation of Whaling, attempting to ensure effective conservation and development of whale stocks. The Convention established the International Whaling Commission (IWC), and provided a schedule of regulations applicable to signatories worldwide, including inspectors aboard ship. Certain whaling was prohibited *i.a.*, in large areas of the Arctic (62 Stat. 1716; TIAS 1849).

1947

March 17—The U.S. Air Force inaugurated a broad Arctic meteorological observation program, including routine flights to the North Pole.

August—The United States Navy established the Office of Naval Research's Arctic Research Laboratory at Point Barrow, Alaska. Designated the Naval Arctic Research Laboratory (NARL) in July 1967, NARL began a sustained program of valuable Arctic research, supported by the U.S. Government and academic institutions and involving thousands of scientists. The University of Alaska managed the NARL from 1954 until its closure in 1981.



John Foster Dulles
Secretary of State 1953–1959

As principal proponent of President Eisenhower's 1955 "Open Skies" disarmament plan, and its 1958 "Arctic Inspection Zone" corollary, Dulles believed that an arctic disarmanent plan could be a turning point in the Cold War.

1949

August 24—The North Atlantic Treaty Organization (NATO) was created. Establishment of NATO's strategic goals for the defense of Europe and North America provided the framework for a series of agreements among NATO partners with Arctic territories radically altering the Arctic world. Massive military construction projects from Alaska to Iceland began in the early 1950s.

1951

April 27—The United States and Denmark signed an Agreement for the Defense of Greenland pursuant to the North Atlantic Treaty of 1949 (2 UST 1485; TIAS 2292). The April 9, 1941, Defense of Greenland Agreement was terminated.

May 5—The United States and the Republic of Iceland signed a defense agreement pursuant to the North Atlantic Treaty of 1949 (2 UST 1195; TIAS 2226). The agreement of October 7, 1946, for interim U.S. use of Keflavik Airport in Iceland was terminated.

1952

March—The U.S. Air Force established a weather and geophysical research station on floating Arctic Ocean ice island T-3. Abandoned in March 1954, T-3 was reoccupied for use during 1955–1958 as part of the program of the U.S. National Committee for the 1957–1958 International Geophysical Year, and in subsequent years for U.S. Arctic research programs.

1953

August 7—Congress enacted the Outer Continental Shelf Lands Act, establishing Federal jurisdiction and providing regulations for the leasing of outer shelf areas for oil, gas or other mineral development (Public Law 212; 67 Stat. 462). Although not Arctic-specific, the legislation affected vast areas off Alaska, including the Gulf of Alaska, North Pacific, and the Bering, Chukchi, and Beaufort Seas.

1955

May 5—The United States and Canada agreed to establish an electronic warning and control system 3,000 miles across the high Arctic from Point Barrow, Alaska, to Baffin Island, Canada. The system was later extended to Greenland to provide a distant early warning (DEW) of an air attack against North America. The $600 million DEW Line became operational by 1958. The agreement included specific guidelines for "matters affecting Canadian Eskimos," including protection of their hunting economy (6 UST 763; TIAS 3218).

July 21—At the Geneva Heads of Government Conference, President Dwight D. Eisenhower offered a disarmament proposal concerning aerial inspection of the United States, Soviet Union and (certain) other areas. The so-called "Open Skies" proposal, never accepted by the Soviet Union, evolved into an "Arctic Zone Inspection Plan" proposal during the following three years.

1956

December—The United States Committee for the 1957–1958 International Geophysical Year (IGY) proposed to the International Council of Scientific Unions (ICSU) that the IGY cooperative scientific programs for the Antarctic be extended beyond the formal conclusion of the IGY to realize the full benefit from the large investment in stations and equipment made by the 12 nations participating in the southern polar program. The ICSU approved the establishment of a Scientific Committee on Antarctic Research (SCAR) in 1957, and the first SCAR meeting was held February 3–5, 1958. Establishment of the SCAR was a major historical achievement in polar affairs, influencing a subsequent call by the United States for an Antarctic Treaty and serving as a model providing elements for possible consideration in international scientific cooperation in the Arctic circumpolar area. As a nongovernmental body, SCAR fostered scientific information exchange through meetings, symposia and publications, and

responded to requests for advice on scientific needs from Antarctic Treaty nations.

1957

February 9—The United States, Japan, Canada and the Soviet Union ratified the Interim Convention on Conservation of North Pacific Fur Seals establishing the North Pacific Fur Seal Commission. The Convention sought to achieve the maximum sustainable productivity of North Pacific Ocean fur seal resources. The ratification replaced the international agreement signed in 1911 and interrupted by World War II (8 UST 2283; TIAS 3948). The Convention was amended in 1963, 1969, 1976 and 1980.

. . . the Arctic [international inspection] proposal was highlighted as a possible first step toward a disarmament process in view of the key strategic importance of the northern polar areas

July 1—The International Geophysical Year (IGY) began. The United States established or modified existing facilities at 76 Arctic locations for continuous scientific observations, including 38 stations manned in cooperation with Canada, Sweden, and Denmark. The major U.S. scientific efforts took place in Antarctica, where 12 countries established 60 research stations. U.S. Navy logistical support was subsequently institutionalized to support all continuing U.S. Antarctic programs. The IGY formally concluded December 31, 1958, but international cooperation in the Antarctic continued under the auspices of the Scientific Committee on Antarctic Research (SCAR) of the International Council of Scientific Unions (ICSU).

August 29—The United States, Canada, France and Great Britain submitted a working paper to the U.N. Disarmament Commission proposing, as an alternative to a broad "Open Skies" aerial inspection program covering all of the United States, Canada and the Soviet Union, that an Arctic zone of inspection be established as a safeguard against the possibility of surprise attack. The Arctic zone proposal engendered heated debate over the next year (American Foreign Policy: Current Documents, 1957, p. 1320).

1958

January 17—The National Academy of Sciences established the Committee on Polar Research, subsequently designated the Polar Research Board (PRB), in response to a National Science Foundation request for advice on the U.S. Antarctic Program. The PRB monitored the status and needs of polar sciences and assisted U.S. Government agencies in developing polar research programs responsive to scientific opportunities and national interests in the Arctic and Antarctic, including publication of polar research strategy studies since 1984.

April 29—The U.S. introduced a U.N. Security Council Resolution recommending establishment of an international inspection system for the Arctic zone (Department of State *Bulletin*, May 19, 1958, p. 816). This potentially far-reaching initiative was an offshoot of President Dwight D. Eisenhower's broader 1955 "Open Skies" disarmament proposal. The subject of intensive international debate for many months, the Arctic proposal was highlighted as a possible first step toward a disarmament process in view of the key strategic importance of the northern polar areas. The Arctic zone concept included ground inspection posts, advance notice of all flights and other significant military activity in the Arctic, and inclusion of all states with Arctic territory in the inspection process.

April 30—President Dwight D. Eisenhower urged U.N. Security Council acceptance of an Arctic aerial inspection plan, referring to the crucial strategic importance of the Arctic and the need to reduce military tension in the northern Polar area. Secretary of State John Foster Dulles stated on May 1 that Soviet acceptance of an Arctic inspection zone could mark a turning point in the Cold War (*American Foreign Policy*, Current Documents, 1958, pp. 1381–1384).

May 2—The Soviet Union vetoed a United Nations Security Council resolution recommending establishment of an international inspection system for the Arctic zone (Department of State *Bulletin*, May 19, 1958, p. 816).

May 3—President Dwight D. Eisenhower invited the eleven nations working in the Antarctic during the International Geophysical Year (IGY), including the Soviet Union, to confer on a treaty ensuring that the Antarctic would be used only for peaceful purposes in the spirit of successful IGY international scientific cooperation. All eleven nations accepted the invitation (Department of State *Bulletin*, June 2, 1958, pp. 910–912).

July 10—The United States began construction of the Ballistic Missile Early Warning System (BMEWS) Site 1 at the U.S. Strategic Air Command base at Thule, Greenland, 600 miles north of the Arctic Circle. The completed system included sites at Clear, Alaska, and in the United Kingdom. A BMEWS agreement for communications support was signed with Canada on July 13, 1958 (10 UST 1260; TIAS 4264). The Thule BMEWS was fully operational in January 1961, the Alaska site

in September 1961, and the U.K. site in 1963.

August 3—The American nuclear-powered submarine USS *Nautilus* became the first ship to reach the North Pole, also completing the first successful underwater transpolar voyage from Point Barrow, Alaska, to the Greenland Sea. The voyage underscored the growing strategic military importance of the Arctic Ocean.

1959

January 3—President Dwight D. Eisenhower proclaimed Alaska the 49th state (Public Law 85-508, July 7, 1958; 72 Stat. 339).

December 1—Twelve nations signed the Antarctic Treaty, establishing a formal international legal framework for scientific research, data exchange, environmental preservation, and other issues of mutual concern in the entire Southern polar region. The landmark Antarctic Treaty prohibited establishment of military bases, weapons testing, or military maneuvers, continued freedom of scientific investigation as applied during the 1957–58 International Geophysical Year, and encouraged maximum international cooperation in the exchange of information and scientific personnel (12 UST 794; TIAS 4780).

1963

March 4—The Committee on Polar Research (later designated the Polar Research Board) of the National Academy of Sciences (NAS) completed a report on polar research conducted by the United States. NAS, independent of Defense Department research activities, found that Arctic research was being critically neglected on a national level, and that unlike international programs established under the Antarctic Treaty of 1959, no specific agency or group was providing international liaison for cooperation in the Arctic.

1964

The Office of International Scientific Affairs (SCI) in the Department of State proposed for discussion within the Department an initiative for an international treaty for the technological advancement of the Arctic, and suggested consulting with Arctic nations, including the Soviet Union, to determine interest in such a treaty. The State Department conducted an informal survey of Arctic research and development programs in the eight Arctic nations, noting that all except the United States had some centralized control and coordination of such research, including international programs.

1965

The State Department formed and chaired an *ad hoc* Interagency Arctic Working Group to compile a report of U.S. and foreign Arctic research and to explore the possibility of an international meeting on Arctic research and development.

1966

August 25—The State Department determined that action plans for international Arctic science cooperation should be initiated but must be tied to coordination of domestic Arctic programs by a formally designated agency rather than an *ad hoc* working group. The State Department asked the National Science Foundation to consider forming such an interagency group. Discussion of this suggestion was carried out in the *ad hoc* working group and with the White House Office of Science and Technology (OST) during 1967.

November 2—Congress enacted the Fur Seal Act to protect the North Pacific Ocean fur seals, provide for the administration of the Pribilof Islands, and to protect sea otters on the high seas (Public Law 89-702; 80 Stat. 1091).

1968

March 13—Oil companies announced Alaskan North Slope oil discoveries at Prudhoe Bay on the Arctic Ocean. A confirmation on June 25th of immense Alaskan reserves of commercially exploitable petroleum irreversibly changed the face of the Arctic by escalating domestic development, and requiring reassessment of U.S. foreign policy relating to international energy supply relationships, exchange of scientific and environmental information, and possible mechanisms for international Arctic cooperation.

March 27—By direction of the White House Office of Science and Technology, the National Science Foundation (NSF) established the Interagency Arctic Research Coordinating Committee (IARCC). Membership included the Departments of State; Agriculture; Commerce; Defense; Transportation; Interior; Health, Education and Welfare; and NASA, the Atomic Energy Commission, U.S. Army Corps of Engineers, and the Environmental Protection Agency. In 1968 the IARCC prepared the first interagency report attempting to structure the elements of a comprehensive national Arctic policy. The State Department used this information in formulating the first foreign policy initiatives for international scientific Arctic cooperation. The IARCC 1972 Five-Year Plan for Arctic Research was the first national effort to catalog and coordinate unclassified federally funded Arctic research activities. NSF pubished the *Arctic Bulletin* quarterly from 1973–1978, including annual summary reports of U.S. Arctic research and related activities. The IARCC was dissolved on June 30, 1978, as part of a Presidential reorganization plan, and the *Arctic Bulletin* ceased publication.

October 4—The State Department's Policy Planning Staff and the Bureau of International Scientific and Technological Affairs submitted a proposal for a "Northlands Compact" to Secretary of State Dean Rusk. The Compact concept included a framework for international Arctic cooperation led by the United States, Canada and the Soviet Union. It was designed to stimulate international efforts toward Arctic development in areas ranging from health and communications to transportation and environmental studies. Secretary Rusk approved the paper for further internal State Department study and discussion only.

1969

August–September—The U.S.-owned tanker *Manhattan* traveled through the Northwest Passage of the Canadian Arctic to determine the commercial feasibility of transporting Alaskan oil to the eastern U.S. The voyage of a tanker configured for ice breaking triggered strong Canadian concerns over issues of Arctic sovereignty, the environment and maritime jurisdiction, and led to Canadian legislation of concern to the United States.

1970

January 1—Congress enacted the "National Environmental Policy Act of 1969," providing a declaration of national environmental policy, requiring environmental impact statements of proposed Federal actions, and establishing the Council on Environmental Quality (Public Law 91-90; 83 Stat. 852).

April 15—Assistant to the President for National Security Affairs and National Security Council Director Henry A. Kissinger issued a directive for the preparation of an interagency review of United States Arctic policy.

1971

August 9—The *ad hoc* Interagency Committee on U.S. Arctic Policy sent a report to President Richard M. Nixon in response to the April 15, 1970, National Security Council Directive, indicating the lack of a coordinated U.S. Arctic policy and presenting recommendations for an Arctic policy statement, coordination mechanism, and international Arctic cooperation.

December 18—President Richard M. Nixon signed the "Alaska Native Claims Settlement Act" (ANCSA), providing Alaska Natives with title to 40 million acres of land and compensation of $962.5 million for extinguishment of aboriginal title to any additional lands in Alaska. Twelve regional Native corporations were established for fund distributions to individuals and village corporations (Public Law 92-203; 85 Stat. 688). This landmark legislation influenced consideration of claims by indigenous peoples with governments worldwide and fully opened the way for massive resource development in the United States Arctic, including the Prudhoe Bay oil field complex.

December 22—The National Security Council issued National Security Decision Memorandum (NSDM) 144, "United States Arctic Policy and Arctic Policy Group." President Richard M. Nixon decided that the policy of the United States was to provide for essential U.S. security interests in the Arctic, including freedom of the seas and superjacent space, support sound and rational Arctic development, and promote mutually beneficial international Arctic cooperation. NSDM 144 created the Interagency Arctic Policy Group (IAPG), chaired by the State Department, to oversee implementation of U.S. Arctic policy and review and coordinate programs in the Arctic with the exception of domestic Arctic-related matters internal to Alaska. It also approved development of a coordinated U.S. Arctic research plan, including possible cooperation with other countries.

1972

July 21—In response to NSDM 144 of December 22, 1971, the Interagency Arctic Policy Group submitted its first report, "U.S. Arctic Programs: Review and Recommendations," to President Richard M. Nixon. The report requested approval of a draft "Northlands and Arctic Cooperation Compact" as the basis for developing an Arctic international cooperation framework, and recommended an international conference on Arctic cooperation hosted by the United States.

October 21—Congress enacted the "Marine Mammal Protection Act" establishing a national policy for the protection of marine mammals and a Marine Mammal Commission. The Act had wide-ranging implications for U.S. Arctic foreign policy. Commission responsibilities included, *i.a.*, reviewing international conventions such as the Whaling Convention Act of 1946 and the 1957 Interim Convention on North Pacific Fur Seals, and recommending to the Secretary of State appropriate policies for existing international arrangements or new arrangements for the protection and conservation of marine mammals. The Act included regulated exceptions for Alaska Natives for subsistence hunting and other activities (Public Law 92-522; 86 Stat. 1027).

October 27—Congress enacted the "Coastal Zone Management Act," affirming a national interest in the effective protection and development of U.S. coastal areas, including the Arctic Ocean, by encouraging and assisting coastal states to implement rational coastal management programs

(Public Law 92-583; 86 Stat. 1280). The concept of a single international coastal zone management regime for the entire North American Arctic coast became the principal initial focus in the development by 1977 of the Inuit Circumpolar Conference.

1973

January 22—The National Security Council issued National Security Decision Memorandum (NSDM) 202, "Arctic Program Review and Recommendations," which reaffirmed President Richard M. Nixon's decision that the United States actively develop and pursue bilateral and multilateral cooperation in the Arctic in areas of scientific research, resource development and environmental protection. However, NSDM 202 ruled out U.S. discussions with Canada, the Soviet Union, and other countries with Arctic interests with the aim of promoting the establishment of a multinational Northlands and Arctic Compact and the convening of an international conference to this end. NSDM 202 ended U.S. Government consideration during the 1970s of an international structure for Arctic cooperation. The Interagency Arctic Policy Group, although remaining formally constituted, did not hold any meetings until near the end of the Carter Administration in 1979. Arctic and Arctic-related issues were subsumed in the work of the Third United Nations Conference on the Law of the Sea (LOS), which convened in 1974.

A major event in the history of Native Arctic peoples, the establishment of the Inuit Circumpolar Conference in 1977 attracted the attention of indigenous peoples' movements worldwide

November 15—The United States, Canada, Denmark, Norway, and the Soviet Union signed a multilateral agreement for the Conservation of Polar Bears which recognized the polar bear as a significant Arctic resource requiring special protection through coordinated national measures by states of the Arctic region. A unique feature of the agreement was its operation through a polar bear technical specialists group of the Species Survival Commission, International Union for the Conservation of Nature and Natural Resources (IUCN). The agreement entered into force for the United States on November 1, 1976 (27 UST 3918; TIAS 8409).

1976

April 13—Congress enacted the Fishery Conservation and Management Act, establishing a 200-nautical-mile fishery conservation zone contiguous to the U.S. territorial sea. The State Department, with the Commerce Department, was to allocate allowable levels of foreign fishing in the United States zone, and the State Department was to negotiate new international fishing agreements, issue registration permits for each foreign national fishing vessel, and determine and certify for the Treasury Department foreign compliance with the Act. The Act established, *i.a.*, the North Pacific Fishery Management Council with authority over the Arctic Ocean, Bering Sea, and Pacific Ocean seaward of Alaska, and set the stage for increased United States participation in the rich Bering offshore fishery worked largely until then by Japan and the Soviet Union (Public Law 94-265; 90 Stat. 331).

November 19—The United States and the Soviet Union signed a Convention on the Conservation of Migratory Birds and Their Environment. This wide-ranging Convention identified and protected birds with common U.S.–U.S.S.R. flyways, breeding, wintering, and feeding areas. Indigenous peoples in Alaska and Soviet areas were excepted from Convention regulations regarding subsistence hunting as determined by national regulations (29 UST 4647; TIAS 9073).

1977

June 12–17—The Inuit Circumpolar Conference (ICC) held its first meeting at Barrow, Alaska, marking the beginning of an Inuit (Eskimo) international institutional response to questions about an Inuit future as a united people. Inuit representatives attended from Alaska, Canada and Denmark (Greenland). Resolutions called upon those national governments to negotiate a uniform Arctic resources development regime and an international Arctic policy, establish Inuit health care, education and cultural exchange programs, allow restriction-free Inuit travel across the Arctic, and demilitarize the Arctic. A major event in the history of Native Arctic peoples, the establishment of the ICC attracted the attention of indigenous peoples' movements worldwide. Subsequent triennial ICC meetings provided the only continuing forum for multilateral discussion and implementation of international cooperation in the Arctic.

July 28—The first oil from Prudhoe Bay on the Arctic Ocean reached the marine shipping terminal at Valdez, Alaska, through the 800-mile Trans-Alaska Pipeline, completing a three-year construction project. The North Slope's eventual output would provide more than twenty percent of domestic United States oil production.

1978

June 30—President Jimmy Carter's Science

Adviser announced the dissolution of the Interagency Arctic Research Coordinating Committee (IARCC) in accordance with the President's Reorganization Plan #1 of October 18, 1977, and Executive Order 12039 of February 26, 1978. IARCC functions for coordinating polar research in Alaska and on the continental shelf were assigned to the Interior Department and to the National Oceanic and Atmospheric Administration for offshore and Gulf of Alaska research. The National Science Foundation assumed responsibility for assessing the need for additional Arctic research coordination and establishment of appropriate mechanisms. The State Department-chaired Interagency Arctic Policy Committee continued its mandate to coordinate international and foreign affairs activities related to U.S. Arctic activities.

1979

November 8—Assistant to the President for National Security Affairs Zbigniew Brzezinski sent a memorandum on "Arctic Policy" to the Secretaries of State and Defense, reconstituting the Interagency Arctic Policy Group (IAPG) chaired by the Assistant Secretary of State for Oceans and International Environmental and Scientific Affairs. The IAPG had been dormant since 1973, subsequent to the issuance of NSDM 202 on January 22, 1973.

1980

September 17—The Department of State forwarded to the National Security Council several papers prepared by the reactivated Interagency Arctic Policy Group, including an agreed statement of national goals and objective in the Arctic. The studies covered outstanding Arctic policy problems and issues, and included outlines of various agency responsibilities and activities. Caught in the transition of the Carter and Reagan administrations, the studies elicited formal comment from neither.

December 2—Congress enacted the Alaska National Interest Lands Conservation Act (Public Law 96-487; 94 Stat. 2371). Section 1107 called for an Arctic research study by the Interior, Defense and Energy Departments, including "developing a comprehensive Arctic policy for the Federal Government" which accommodates the development and use of Arctic resources with consideration for the unique nature of the Arctic environment and the needs of Native residents. The State Department convened the Interagency Arctic Policy Group, reconstituted in 1979 by the National Security Council, to explore international implications of the Alaska National Interest Lands legislation.

1982

October 22—The State Department sent an Interagency Arctic Policy Group memorandum to the White House which concluded that the basic Arctic policy set forth in the 1971 National Security Decision Memorandum (NSDM) 144 remained valid, and recommending that President Ronald Reagan reaffirm that policy in a new national Arctic policy statement.

1983

April 14—The White House issued National Security Decision Directive (NSDD) 90, "United States Arctic Policy." President Ronald Reagan cited unique and critical U.S. interests in the Arctic region related directly to national defense, resource and energy development, scientific inquiry, and environmental protection. The President reaffirmed the major policy elements of the 1971 NSDM 144, including promotion of mutually beneficial international Arctic cooperation, and charged the Interagency Arctic Policy Group (IAPG) to review and coordinate policy implementation and U.S. international programs and activities in the Arctic. Although not responsible for purely domestic Arctic matters, the IAPG was directed to ensure close cooperation of agencies concerned with those domestic matters. The IAPG was also instructed to prepare reports on how best to coordinate U.S. Arctic activities with other nations, and to determine what federal services, by priority, the U.S. Government might have to provide in the Arctic over the next decade.

May 12—The United Nations Economic and Social Council recognized the Inuit Circumpolar Conference (ICC), founded in 1977, as a "U.N. Non-Governmental Organization in consultative status."

1984

July 31—Congress enacted the "Arctic Research and Policy Act of 1984" providing for a comprehensive national policy dealing with U.S. research needs and objectives in the Arctic. The Act, *i.a.*, established an independent national Arctic Research Commission and an Interagency Arctic Research Policy Committee chaired by the National Science Foundation. The Act completed the statutory framework for the development and implementation of U.S. Arctic policy in its totality. Coordination and promotion of cooperative scientific research programs with other nations was subject to the foreign policy guidance of the Secretary of State (Public Law 98-373; 98 Stat. 1242).

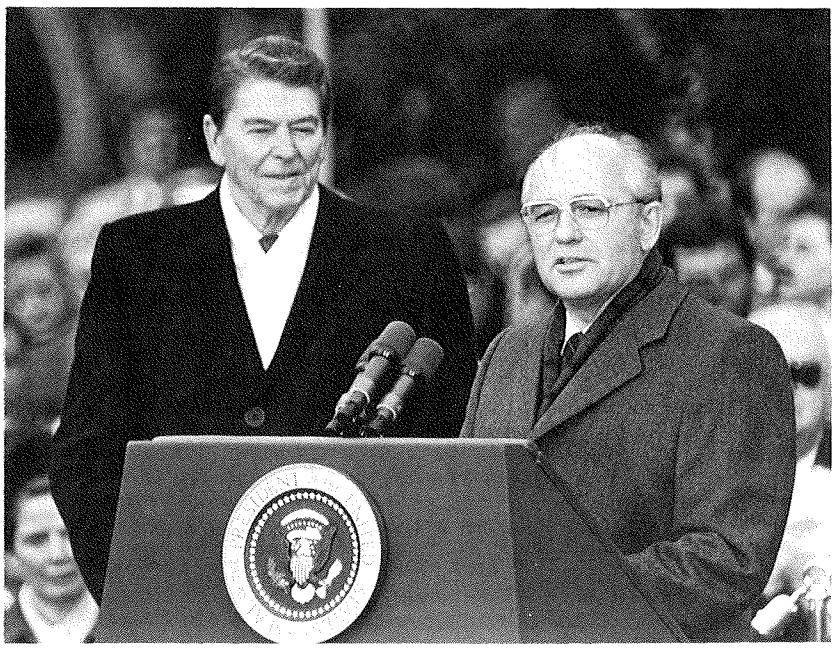
October—The 1957 Interim Convention on the Conservation of the North Pacific Fur Seals expired. A protocol extending the Convention until

1988 was not ratified by the U.S. Senate because of pressure from environmental groups calling for cessation of all fur seal harvesting. Without a Convention in force, the U.S. fur seal herds on the Pribilof Islands were to be managed under the terms of the Marine Mammal Act of 1972.

December 22—In response to National Security Decision Directive 90 of April 14, 1983, the State Department transmitted an Interagency Arctic Policy Group memorandum, "U.S. Government Services That Will Probably Be Needed In The Arctic By The End Of The Decade," to the White House. The report prioritized fourteen areas where services will be needed, surveyed current and projected development throughout the Arctic, and suggested that the most significant changes in the U.S. Arctic will concern oil and gas development, national defense activities, improvement in transportation, increasing U.S. participation in Bering Sea Fisheries, minimizing environmental impact, and political activism among the Inuit.

1986

March 19—The International Union for Circumpolar Health (IUCH) was established, with the secretariat located at the School of Health Sciences at the University of Alaska, Anchorage. The Union provided a structure for bringing together northern medical research on a worldwide basis by promoting international cooperation, encouraging and supporting research and the exchange of scientific information in circumpolar health sciences, and participating in the International Council of Scientific Unions. The nongovernmental American Society for Circumpolar Health, founded in 1967, represents the United States in the IUCH.



President Ronald Reagan and then U.S.S.R. General Secretary Mikhail Gorbachev at their 1987 Washington summit meeting, where they expressed support for development of bilateral and regional cooperation among arctic countries

June 20—As a result of informal discussions among scientists from Arctic nations during a meeting of the Scientific Committee on Antarctic Research (SCAR), an initiative about establishing a nongovernmental body as a forum to explore Arctic research issues and develop cooperative research plans was favorably received by the Federal Republic of Germany, Finland, France, Japan, Norway, Poland, the Soviet Union, Sweden and the United Kingdom. Working from a subsequent action proposal prepared at an informal consultative meeting on February 13, 1987, eight Arctic countries in March 1988 unanimously agreed that an International Arctic Science Committee (IASC) should be established as a nongovernmental body.

1987

June 23—The National Science Foundation-chaired Interagency Arctic Research Policy Committee transmitted to President Ronald Reagan the *United States Arctic Research Plan* in accordance with the Arctic Research and Policy Act of 1984. The Plan included a statement of U.S. Arctic research policy and goals and objectives in Arctic research, including a statement of national needs and priorities in the areas of national security, rational resource development, and acquisition of new scientific knowledge in the Arctic. The Plan was developed in consultation with the Arctic Research Commission, the Governor and other officials of Alaska, residents of the Arctic, the private sector, and public interest groups.

July 17—The United States and Canada signed an agreement on the Conservation of the Porcupine Caribou Herd, establishing an International Porcupine Caribou Board. The Board was to administer the Agreement by ensuring opportunity for customary and traditional uses of the herd, and cooperation and communication between governments on research and herd management. Alaskan state and Native Alaskan groups played an influential role in the formulation of the U.S. negotiating position.

December 10—President Ronald Reagan and U.S.S.R. General Secretary Mikhail Gorbachev issued a Joint Statement at the conclusion of the December 7–10, U.S.–U.S.S.R. Summit Meeting, noting that they had exchanged views on means of encouraging expanded contacts and cooperation on issues relating to the Arctic. The two leaders expressed support for development of bilateral and regional cooperation among Arctic countries on these matters, including coordination of scientific research and protection of the region's environment (*American Foreign Policy: Current Documents*, 1987, Doc. 193, p. 360).

1988

January 11—The United States and Canada agreed, after 24 months of discussions, on a framework for Arctic cooperation, affirming that navigation and resource development in the Arctic must not adversely affect the unique environment of the region and the well-being of its inhabitants. Both sides agreed to facilitate navigation by their icebreakers in their respective waters, and to develop and share research information. The United States pledged that all navigation by U.S. icebreakers within waters claimed by Canada to be internal would be undertaken with Canadian consent. Both sides agreed that nothing in the Agreement would affect respective U.S. or Canadian positions on the Law of the Sea in this or other maritime areas or respective positions regarding third parties. President Ronald Reagan noted that the agreement is a "pragmatic solution based on our special bilateral relationship, our common interest in cooperating on Arctic matters, and the nature of the area . . . without prejudice to our respective legal positions, and it sets no precedents for other areas." (Department of State Press Release #3, January 14, 1988).

May 31—The U.S. and the U.S.S.R. signed a Comprehensive Agreement on Mutual Fisheries Relations providing the U.S. fishing industry for the first time with access to Soviet waters and reciprocal access by Soviet fishermen to the U.S. Exclusive Economic Zone (EEZ). The Agreement provided a basis for expanded bilateral cooperation on fisheries issues, including the unregulated fisheries of the central Bering Sea.

December 10–11—Building on preliminary meetings in 1986 and 1987, a Planning Group with representatives from Canada, Denmark and Greenland, Finland, Iceland, Norway, Sweden, the United States and the Soviet Union, proposed draft "Founding Articles for an International Arctic Science Committee" (IASC), including the framework for a nongovernmental organization to encourage and facilitate international consultation and cooperation for Arctic scientific research.

1989

September 20–26—At the initiative of the Finnish Government, a Consultative Meeting for the Protection of the Arctic Environment was attended by representatives of the eight countries with Arctic territory. The group explored possibilities for international cooperation in protecting the Arctic environment, including integrated action programs for research, continuing field investigations of environmental problems affecting northern areas, and compilation of a definitive list of all existing multilateral and bilateral agreements pertaining to the protection and preservation of the Arctic.

September 23—The United States and the Soviet Union signed an agreement creating the Bering Straits Regional Commission to promote cooperation in the Straits region and to provide a forum for resolving minor regional disputes at the local level. The Commission, with three Soviet and three American members, was to investigate and resolve unintentional border crossings, return fishing equipment, and assist in arranging emergency services, medical treatment, search and rescue activities, and death notification (Department of State *Bulletin*, November 1989, p. 22).

September 23—The United States and the Soviet Union signed an agreement "Concerning Mutual Visits by Inhabitants of the Bering Straits Region," replacing a 1938 Agreement which was terminated by the Soviet Union in 1948. The new agreement allowed Native inhabitants of the Straits area to visit relatives and others in prescribed areas in the respective countries by using established entry and exit checkpoints after notifying the Bering Straits Commission. The arrangement recodified age-old regional trading and cultural interchange (Department of State *Bulletin*, November 1989, p. 24).

1990

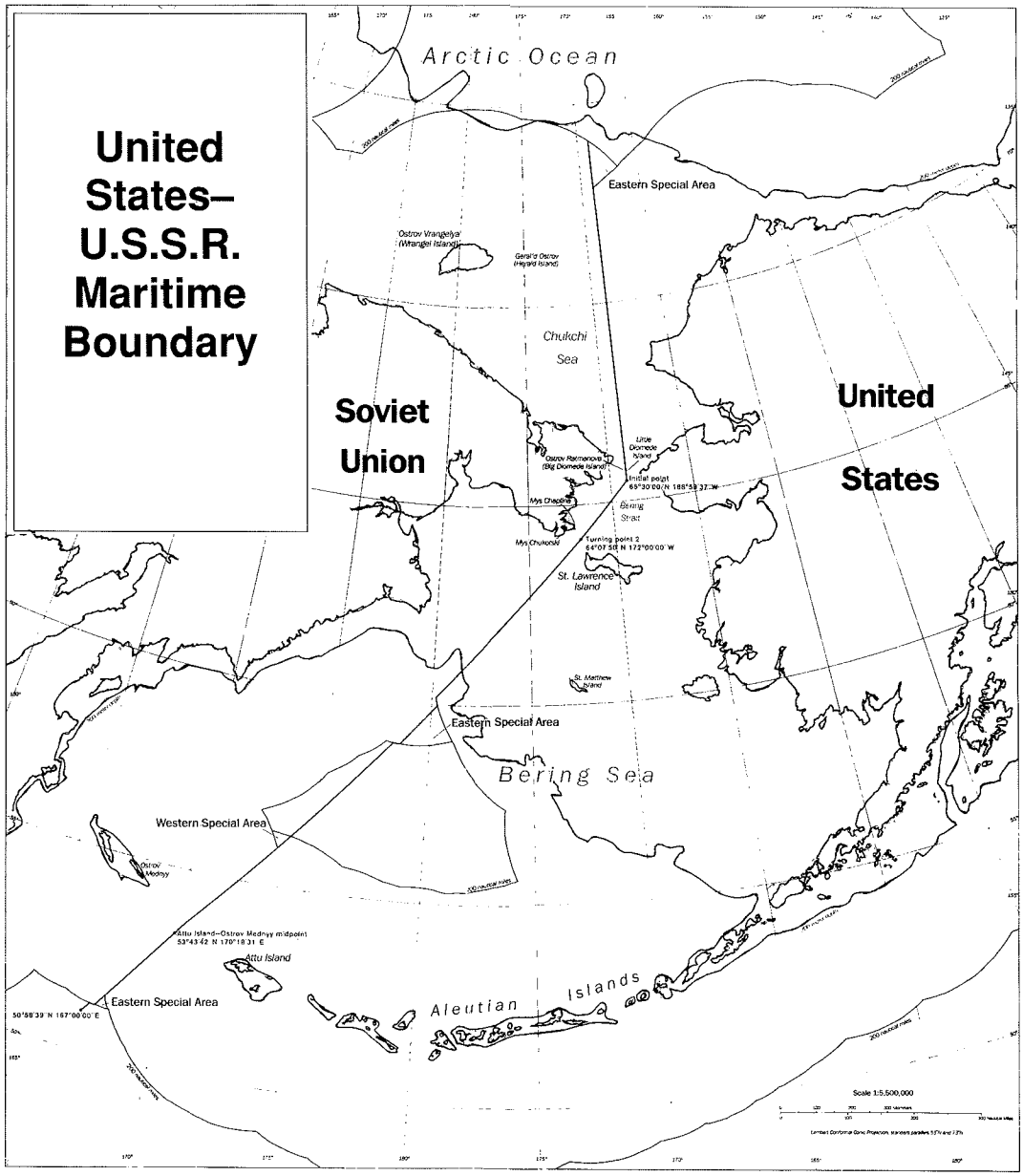
April 18–23—Representatives of the eight countries with Arctic territory attended a preparatory meeting for the protection of the Arctic environment as a sequel to a 1989 Finnish initiative. Conference themes included the need for international ecological cooperation in the Arctic region, improving Arctic environmental protection through strengthening and broader application of existing legal instruments, and development of an Arctic environmental protection strategy. Finland offered to host a 1991 meeting for high-level officials to discuss Arctic environmental protection.

June 1—President George Bush announced at the conclusion of the Washington Summit meeting with U.S.S.R. President Mikhail Gorbachev the signing of a U.S.–U.S.S.R. Maritime Boundary Agreement resolving differences concerning national boundaries and resource jurisdiction in the North Pacific Ocean, Bering Sea, and Arctic Ocean. After nine years of negotiation, the United States and the Soviet Union agreed that the line in the 1867 U.S.–Russia Convention ceding Alaska is the maritime boundary along its entire length. Further provisions ensured that all areas within 200 miles of either coast fall under the resource jurisdiction of one or the other party. The U.S.S.R. transfered three "special areas" to U.S. jurisdiction that are within 200 miles of the Soviet coast, but on the U.S. side of the maritime boundary. The

U.S. transfered one "special area" within 200 miles of the U.S. coast, but on the U.S.S.R. side of the maritime boundary. The Agreement placed seventy percent of the Bering Sea under U.S. jurisdiction (*Weekly Compilation of Presidential Documents*, June 4, 1990, p. 868).

June 1—The United States and the Soviet Union issued a Joint Statement on the Establishment of a U.S.–U.S.S.R. International Park in the Region of the Bering Strait. Presidents George Bush and Mikhail Gorbachev, at the conclusion of the Washington Summit meeting, expressed support for bilateral expansion of cooperation in the fields of environment and cultural heritage by protecting jointly the land and sea areas of the Bering Strait area. Both countries recognized the common heritage of the Bering area and will seek during 1990–91 to sign a protocol formally establishing the International Park, and to work out all details connected with the functioning of the park (*Weekly Compilation of Presidential Documents*, June 4, 1990, p. 865).

August 28—Representatives of national scientific organizations from the eight countries with Arctic territory, with the United States represented by the National Academy of Sciences, signed an agreement establishing a nongovernmental International Arctic Science Committee (IASC). The IASC is to cover all fields of Arctic science and to provide a forum for discussion, cooperation, and exchange of information. Working bodies are to assist in coordinating regional Arctic science programs and to help integrate Arctic science with studies of global environmental systems. IASC membership is to be open to all countries with significant Arctic science programs.



Alaska Department of Fish and Game

The Alaska Department of Fish and Game is one of three State natural resource departments in Alaska. Its Commissioner is directed by statute to ". . .manage, protect, maintain, improve, and extend the fish, game and aquatic plant resources of the state in the interest of the economy and general well-being of the state."

As the pace of human settlement and natural resource utilization increases in Alaska, it is imperative that state-of-the-art biological and sociological research be conducted to facilitate the complex fish, wildlife, and habitat management decisions that inevitably arise. The following projects represent ADF&G's efforts to provide this valuable research information.

Division of Wildlife Conservation

W. Lewis Pamplin, Jr., Director

Population Ecology of Wolves in Gates of the Arctic Park and Preserve

In 1986, the National Park Service and the Alaska Department of Fish and Game initiated a cooperative study to determine the demography and distribution of wolves in and adjacent to Gates of the Arctic National Park and Preserve (GAAR) and to assess the harvest of wolves from this population. Wolf food habits and prey relationships are also being evaluated. The study area includes much of GAAR in the central Brooks Range. Research activities include extensive (monthly) and intensive (daily) monitoring of 10 to 15 radio-marked wolf packs; collection of wolf harvest data in communities in and around GAAR; annual necropsy of 20 to 40 wolves harvested in the area to assess sex, age, and nutritional and reproductive condition; and analysis of summer food habits based on scats collected at dens. Results to date indicate that GAAR currently supports a moderately dense and productive wolf population that relies primarily on caribou, sheep and moose for food. Harvest within GAAR has averaged about 26 wolves per year. At least 4 and possibly 10 wolves have dispersed up to 480 miles. Field studies supported with approximately $500,000 will continue into mid-1990.

Investigators: Layne G. Adams, Bruce W. Dale and Brad Shults, NPS, Anchorage; Robert O. Stephenson, ADF&G, Fairbanks

ADF&G report submitted by Commissioner Don W. Collinsworth

Use of Kasegaluk Lagoon by Marine Mammals

Beluga whales and spotted seals are seasonally the most abundant marine mammals in the Kasegaluk Lagoon region of the northeastern Chukchi Sea. Both species are important subsistence resources for local residents, with belugas making up over 50% of the annual harvest of wild foods at Point Lay in some years. Aerial surveys of spotted seals were initiated by ADF&G in 1989 and will continue through 1990. In addition, a field camp will be established to describe haulout behavior of the seals in order to facilitate interpretation of aerial survey data. Surveys of beluga whales, to begin in 1990 and continue through 1991, will locate and enumerate concentrations of belugas along the lagoon coastline. At present, details of beluga movements between lagoon passes, or between the coast and the pack ice, are poorly known. The North Slope Borough Department of Wildlife Management and residents of Point Lay will also participate in the study, which is being funded by the Minerals Management Service at a cost of $140,000.

Investigators: Kathryn J. Frost and Lloyd F. Lowry, ADF&G, Fairbanks

Movement Patterns of the Porcupine Caribou Herd in Relation to Oil Development

The Porcupine Caribou Herd (PCH) is composed of approximately 165,000 animals that migrate seasonally between wintering areas in the boreal forests of northwestern Canada and northeastern Alaska and the calving grounds on the Arctic Coastal Plain within the Yukon Territory and Alaska. Large-scale industrial development of nonrenewable resources is planned throughout this petroleum-rich area. Oil production is currently underway on and adjacent to the traditional calving grounds of the smaller Central Arctic Caribou Herd (CAH) 100-150 miles to the west. Since 1985, caribou in the PCH and CAH have been successfully relocated several times per day by a satellite-tracking system. Movement patterns in relation to topographic features and broad habitat types will be determined and compared between the two herds. Movements in relation to petroleum production facilities will be determined for CAH caribou, and these data will be used to predict ef-

fects of potential development on the PCH. This cooperative study between the U.S. Fish and Wildlife Service and the Alaska Department of Fish and Game will continue through 1993.

Investigators: Kenneth R. Whitten and Wayne L. Regelin, ADF&G, Fairbanks

Distribution and Productivity of the Central Arctic Caribou Herd in Relationship to Petroleum Development

The Central Arctic Herd (CAH) is a discrete subpopulation of about 18,000 caribou that ranges roughly between the Colville and Canning rivers, an area that encompasses the production and transportation facilities of the majority of active North Slope oilfields. Oilfield production complexes alter the distribution and movement of many CAH caribou in the coastal zone during the spring and summer, affecting access to and use of calving grounds, coastal insect relief areas, and summer range. This cooperative study (with the U.S. Fish and Wildlife Service, University of Alaska, Alaska Biological Research, and Alaska Department of Transportation and Public Facilities) has two major components: 1) a case history assessment of CAH population status and distribution in relation to oilfield development, and 2) a specific investigation of the influence of female body condition on reproductive performance. The former is a straightforward monitoring program, while the latter involves clarifying the relationships linking body weight and composition of females with calf production and survival. By incorporating this study with complementary research in a computer simulation model, the consequences of a disturbance-induced change in habitat use by the population can be projected. This study will continue through 1992.

Investigators: Raymond D. Cameron, Walter T. Smith and Steven G. Fancy, USFWS, Fairbanks

Demography of Noatak Grizzly Bears in Relation to Human Exploitation and Mining Development

Increasing human populations have significantly reduced the abundance and distribution of grizzly bears in North America. To avoid population declines in Alaska, management decisions and prediction of development impacts on bears must be based on accurate biological information. No studies have yet been conducted to determine the status of grizzly bears in Game Management Unit 23 in northwestern Alaska. GMU 23 has experienced an increasing harvest of bears and includes the site of the Red Dog Mine, an open pit lead and zinc mine that, when operating at full capacity, will be the largest mine of its kind in the world. This study will estimate the density, population structure, movements, and reproductive parameters of grizzly bears in the southwest Brooks Range as an aid in evaluating the impacts of both human exploitation and industrial development on bear populations. Radio collars and satellite telemetry are being used to mark bears and assess management decisions. The improved understanding of grizzly bear population dynamics in relation to human developments will provide a firm basis for devising rigorous management guidelines and mitigating any adverse effects of future mining activities. This cooperative study with the National Park Service will be completed in 1990 at a cost of $415,000.

Investigators: Warren B. Ballard, ADF&G, Nome; Kathryn E. Roney and Lee Anne Ayres, NPS, Kotzebue

Grizzly Bear Populations and Ecology in the Western Brooks Range, Alaska

An intensive grizzly bear research and monitoring effort was conducted in the Utukok Uplands area of the northwestern Brooks Range from 1977 to 1988. It provided information on changes in population structure and dynamics, productivity, mortality, movements, and fidelity to maternal home range. A current research project of ADF&G (in cooperation with the National Park Service and Bureau of Land Management) will address the role of unhunted productive population reservoirs in producing bears to supplement adjacent populations. Of 171 bears in the area that have been handled, radio contact has been maintained with 21 since 1977–78, and 25 bears were monitored from 1977 until their deaths. Of 16 bears monitored since they were cubs, 11 adult females have been observed consorting with males or have produced offspring. Captures have presented opportunities to determine effective ways to immobilize grizzly bears, utilize satellite telemetry to learn daily home range use, and collect samples to allow further analysis of genetic relationships within the population. The current segment of this long-term study will continue until 1992 at a future cost of $200,000.

Investigators: Harry V. Reynolds, ADF&G, Fairbanks, and Layne G. Adams, NPS, Anchorage

Demography and Movements of Wolves in Relation to the Western Arctic Caribou Herd of Northwest Alaska

A dramatic decline in the Western Arctic Caribou Herd (WAH) during the mid-1970s from between 200,000 and 300,000 to a minimum of 64,000 to 75,000 animals has been attributed to excessive human harvest and wolf predation. His-

torically among the largest herds in North America, the WAH currently numbers in excess of 330,000 animals and is an extremely important subsistence and recreational resource. Wolf populations declined along with the caribou, but unlike caribou have not recovered to historic levels. To anticipate and hopefully avoid future declines in both caribou and wolf populations and to maintain population levels recommended in the WAH management plan, caribou harvests and wolf and caribou population levels must be monitored accurately and regularly. Although reasonably accurate survey methods exist for monitoring large ungulate populations, statistically valid estimates of wolf density have only been obtained through expensive and time-consuming radiotelemetry studies. This method has not been widely used because the technique is costly and applicable only to relatively small areas. In 1988 this study was initiated by the Alaska Department of Fish and Game, in cooperation with the National Park Service and U.S. Fish and Wildlife Service, to evaluate the status of the wolf population, to develop and test improved sampling techniques, and to examine the dynamics of wolf populations in relation to movements of the WAH.

Investigators: Warren B. Ballard, ADF&G, Nome; Douglas N. Larsen, ADF&G, Kotzebue; Daniel J. Reed, ADF&G, Fairbanks; Lee Anne Ayres and Kathryn E. Roney, NPS, Kotzebue; Steven G. Fancy, USFWS, Fairbanks; Michael A. Spindler, USFWS, Kotzebue

Differential Impacts of Brown Bears on Caribou Calving in the 1002 Area and Potential Displacement Areas

The effects of calf predation by brown bears on caribou populations may increase if caribou are displaced from their traditional calving grounds on the coastal plain of the Arctic National Wildlife Refuge. Cumulative impacts of petroleum development within and adjacent to the calving grounds may result in displacement of the Porcupine Caribou Herd and increased mortality rates of newborn caribou calves. Possible causes of this increased mortality might be displacement into areas with higher densities of brown bear, where predation rates are higher or where a higher proportion of the bears regularly use caribou as a food source. The Department of Fish and Game and the U.S. Fish and Wildlife Service are cooperating in a study that will 1) compare the relative abundance of brown bears within and near areas of traditional caribou calving concentration, 2) determine factors affecting predator abundance in these areas and how they are related to predation on calving caribou, and 3) quantify use of caribou as a prey species and its relationship to brown bear productivity. The study will last from 1988 to 1991, and future expenditures are estimated at $120,000.

Investigators: Harry V. Reynolds, ADF&G, Fairbanks, and Gerald W. Garner, USFWS, Fairbanks

Division of Habitat

Frank Rue, Director, and Bruce H. Baker, Deputy Director

Aquatic Habitat Evaluation of Flooded North Slope Gravel Mine Sites

In 1986, preliminary field surveys conducted by ADF&G indicated that within the North Slope oil and gas fields 246 acres of flooded gravel pits and 559 acres of unflooded pits existed. Initial sampling also revealed the presence of both anadromous and resident fish species in several of the naturally flooded gravel pits. It became apparent that a significant opportunity existed for the rehabilitation of these sites, since all were located in proximity to stream or river systems. Habitat Division initiated the North Slope Gravel Pit Study in 1986 using general fund monies from the State of Alaska. In 1987, the project scope was expanded with the acquisition of additional funding from the oil and gas industry and federal coastal zone monies. The gravel pit study represents an ongoing long-term research effort by the ADF&G to gather critical resource information. Its primary objective is to maximize the benefits to fish and wildlife of the management of flooded gravel mine site habitat. The parallel objective is to gather data which clearly document, over the long term, the effectiveness of rehabilitation implemented on a site-specific and project-specific basis, and to include this knowledge in planning the rehabilitation of existing sites and the development of mining plans for new projects. Total project expenditures per year have averaged $100,000.

Investigators: Carl Hemming, Jack Winters and Phyllis Weber-Scannell, ADF&G, Fairbanks; Al Ott, ADF&G, Fairbanks

Division of Commercial Fisheries

Kenneth P. Parker, Director

The Division of Commercial Fisheries conducts an intensive stock assessment program for Pacific salmon stocks in major river systems north of and inclusive of the Kuskokwim River drainage. These assessments include enumeration of catch and escapement, and age composition sampling of catch and escapement, by species. Methods for escapement enumeration include aerial surveys and side scanning sonar counting. Sonar projects with associated gillnet sampling for species composition are

operating on the main stem of the Kuskokwim, Noatak, and Yukon rivers, as well as on important tributary systems of the Yukon (Anvik, Sheenjek) and Kuskokwim (Aniak).

Division of Subsistence

Steven R. Behnke, Director

Subsistence Salmon and Herring Harvest Surveys

Salmon and herring are important subsistence resources for the Yup'ik Eskimo villages along the Bering Sea coast and Yukon and Kuskokwim rivers in western Alaska. During the past several decades, commercial fisheries have been developed on stocks traditionally used for subsistence. Annual subsistence harvest surveys have been conducted by ADF&G to estimate the levels of subsistence harvest and use of salmon along the Kuskokwim and the Yukon, and the levels of subsistence harvest and use of herring in the Nelson Island and Nunivak Island area of the Bering Sea coast. This survey comprises household post-season interviews. Social information is also gathered on work group composition of traditional fishing units. The information is used for stock management and allocation decisions on commercial and subsistence uses by the Alaska Board of Fisheries and the North Pacific Fisheries Management Council. Project costs are $65,000.

Investigators: Michael Coffing and Mary Pete, ADF&G, Bethel

Subsistence Uses and Village Socioeconomic Systems

Subsistence harvest and distribution of wild resources are important components of the traditional mixed subsistence–market economies and cultures in rural Alaska. Impacts on traditional subsistence socioeconomic systems derive from several external sources: commercial development of natural resources (such as mining and commercial fisheries), settlement entry, roads, recreational hunting and fishing, and Federal and State regulation regimes. Baseline studies of subsistence uses and socioeconomic systems in selected communities are conducted by the Division of Subsistence, ADF&G. Methodologies include systematic household interviews, mapping, and participant observation. Quantitative data become part of a computerized data base containing over 100 villages statewide. Information is used in a broad number of economic development and resource management issues affecting traditional subsistence systems. Studies currently are being conducted in the villages of Tununak and Kwethluk (Yukon–Kuskokwim Delta), Kotzebue, Shishmaref, Brevig Mission, and Golovin (Northwest Arctic), and Nuiqsut and Kaktovik (North Slope). Combined project costs are $150,000.

Investigators: Mike Coffing and Mary Pete, ADF&G, Bethel; Sverre Pedersen, ADF&G, Fairbanks; Susan Georgette, Hannah Loon and James Magdanz, ADF&G, Kotzebue

Subsistence Caribou and Fish Harvest Monitoring, Kaktovik

Oil development on the North Slope has impacted traditional subsistence practices of local Inupiat villages, through displacement of migratory caribou and fish, habitat modification, and regulatory restrictions on subsistence fishing and hunting. Monitoring of the caribou and fish harvests and land uses of one case community (Kaktovik) on the North Slope is being conducted by the Division of Subsistence, ADF&G, to assess the level of impacts over time. This current study is in cooperation with the United States Fish and Wildlife Service, Arctic National Wildlife Refuge. Methodologies include systematic household interviews, land use mapping, and participant observation. Project cost is $28,600.

Investigator: Sverre Pederson, ADF&G, Fairbanks

Division of Sports Fisheries

Norvac Netsch, Director

Stock Assessment for Resident and Anadromous Fish Populations

The Division of Sports Fisheries conducts a stock assessment research program for resident and anadromous fish populations in stream and lake environments north of the Alaska Range. Most of this program consists of estimating: 1) abundance, 2) age, sex, and size composition, and 3) sustainable yields for various Arctic grayling, least cisco, humpback whitefish, inconnu, chinook salmon, coho salmon, sockeye salmon, rainbow trout, lake trout, Arctic char, Dolly Varden, northern pike, and burbot populations. The majority of the program takes place in the Tanana River and Tok. Information derived from this research effort is used to develop and implement fishery management strategies for the recreational fishery in the northern two-thirds of Alaska. Budget for this program totals approximately $1.7 million annually. Approximately 40 technical fisheries research reports are produced annually by the 20 fishery biologists involved with the program.

Investigator: John Clark, ADF&G, Fairbanks

Alaska Department of Health and Social Services

The Alaska Department of Health and Social Services administers a range of programs to assure the optimum mental and physical health and well-being of the Alaskan people so that each person can be as self-sufficient as possible.

DHSS has broad goals to guide it in meeting the needs of the people of the State. A large part of efficient service delivery is tied to prevention. The Department works to improve education and screening programs, which are at the heart of prevention. A major goal is to improve the quality of life of those served and encourage a healthy environment. In treatment, another goal seeks to involve clients in program planning. This principle is reinforced in the Department's desire to provide services to people in the least restrictive setting, maximizing their self-determination whenever possible.

DHSS has seven divisions headquartered in Juneau:

- Division of Public Assistance, which, among other programs, aids families with dependent children and provides food stamps
- Division of Medical Assistance, which provides financial assistance payments
- Division of Public Health, which provides public health and health care programs
- Division of Mental Health and Developmental Disabilities, which funds community mental health centers and agencies that provide services to developmentally disabled persons, as well as operating two institutional facilities, one for the mentally retarded and the other an acute-care psychiatric hospital
- Division of Family and Youth Services, whose services fall into two categories: Family Services, which provides protective and support services for children, youth and adults who are at risk of abuse, neglect, and exploitation, and Youth Corrections, which promotes public safety and reduces risks to citizens by preventing and correcting youth delinquency
- Division of Alcohol and Drug Abuse
- Division of Administrative Services

Also located in Anchorage is the Office of Prevention, which is designed to integrate prevention activities within the Department as well as provide a springboard for prevention initiatives within DHSS.

Highlighted in this report is an update of current research in the Division of Public Health, Section of Epidemiology, and a summary of the findings from the recently completed Alaskan Adolescent Health Survey.

Report submitted by Sharon Zandman-Zeman, Special Assistant, Office of the Commissioner, Department of Health and Social Services

Epidemiology

The Section of Epidemiology is responsible for surveillance, investigation, and control of acute and chronic diseases and injuries through defining causal factors, identifying and directing control measures, and providing a basis for policy development, program planning, and evaluation.

As part of this mission, the section is involved in a wide range of research activities on specific topics in the areas of infectious diseases, chronic disease, environmental and occupational illness, and injuries. Studies are initiated in response to disease outbreaks or unusual incidents that enable research questions to be studied and in carefully planned projects aimed at priority areas identified in the United States Arctic Research Plan and the American Public Health Association's "National Arctic Health Science Policy."

Great improvements have occurred in the health status of Arctic residents, and especially in Alaskan Natives since 1950. Many of these improvements have occurred as a result of research efforts that benefited not only Alaskans but also other citizens of the United States. For example, strategies for control of tuberculosis and use of isoniazid were first studied in Alaska in the 1950s. More recently, research by the Centers for Disease Control and the Indian Health Service on hepatitis B led to a statewide hepatitis B vaccine program that has demonstrated the effectiveness of the vaccine in controlling disease transmission and preventing a particularly lethal cancer, hepatoma.

Several studies are currently underway:

- Prevalence of diabetes and complications of diabetes
- Pregnancy outcome among women with diabetes
- Retinopathy and amputation among persons with diabetes
- Community exposure to lead ore in Skagway
- The contribution of reinfection to gonorrhea incidence
- Risk factors associated with general aviation crashes
- Surveillance of alcohol-associated motor vehicle crashes
- Use of existing data systems

- Causes of death, years of potential life lost, and life expectancy, 1980–1988
- Cardiovascular deaths among Alaskan Natives
- Omega-3 fatty acids and atherosclerosis among Alaskan Natives
- Deaths due to dog attack

Two major studies are of great importance to the Department. One is a study being done in collaboration with the Department of Pathology, Louisiana State University Medical Center, on atherosclerosis and omega-3 fatty acids in Alaskan Natives. This study is funded by the National Heart, Lung, and Blood Institute for a five-year period and is now in its second year. Many studies and reports from as early as the 1930s have suggested that Arctic indigenous peoples have less cardiovascular disease than other populations. Native diets of marine mammals and seafoods rich in omega-3 fatty acids have been thought to be the cause of this low incidence of atherosclerosis and coronary artery disease. The purpose of this research is to characterize the prevalence and extent of atherosclerotic lesions and to examine the relationship of omega-3 fatty acids and clinical risk factors to atherosclerosis. The study will help add to accumulating evidence that consumption of omega-3 fatty acids helps prevent atherosclerosis.

Another study of great importance is the investigation of health hazards associated with environmental exposure to lead ore in Skagway. In 1988, widespread environmental contamination of lead ore was discovered. Lead ore mined in Canada was being transported to Skagway and then shipped to overseas ore smelters. Samples from streets in residential areas were found to contain as much as 28,000 ppm lead and house dust samples as much as 144,000 ppm lead. An investigation was undertaken to determine if children or adults had been adversely affected. Widespread blood testing of workers and residents showed very low lead levels despite high levels of exposure to the ore. Findings of the investigation led to new awareness of the crucial importance of the differences in bioavailability of different chemical forms of lead. Ore in Skagway was of very low bioavailability as no smelting had occurred.

As a result of these findings, new attention has focused on the bioavailability of lead. Especially as it relates to environmental regulation, standards for cleanup or exposure have not taken into account differences in the chemical form of lead. While this approach may have been associated with few problems in the past, future efforts to eliminate lead exposure will need to be based on improved understanding of different risks from different chemical forms of lead.

Currently in progress, under the direction of the National Toxicology Program, are rat feeding studies to establish the bioavailability of lead oxide, lead sulfide, lead acetate, and lead ore from Skagway. Results of these studies will be used by many agencies and by industry to focus future lead abatement efforts and to establish more precise standards for the reduction of lead exposure.

Highlights are often summarized in the *Epidemiology Bulletin*, a free bimonthly publication produced by the Section of Epidemiology.

Adolescent Health Survey

An example of a completed project is the Alaskan Adolescent Health Survey. Released in June 1990, the results of the survey draw a picture of the perceived health status and risk behaviors of youth. Commissioned by DHHS and the Alaska Area Native Health Service, the survey contained 162 questions on a range of issues: health status, health-related behaviors, family life, feelings about school and school performance, behaviors and attitudes about foods and eating, use of alcohol, tobacco and drugs, sexual behavior and contraception, and involvement in antisocial or deviant behaviors. Over 5000 students in grades 7–12 completed the survey during the 1988–89 school year. All 55 school districts were invited to participate and 90 schools in 27 school districts did, although the largest school districts declined.

The goal throughout the study was to develop a statewide data base which, when coupled with morbidity and mortality data, would help those who plan and develop services at the state and local levels to better target those services. The Adolescent Health Survey is an important step in establishing a baseline of information against which efforts to improve the health of Alaskan youth can be measured. Without this information, it would be impossible to determine the effectiveness of our efforts to improve public health, particularly prevention activities.

The results suggest that most youths surveyed see themselves to be healthy. On the other hand, because of their dietary or behavioral patterns, 14% have risk factors which predispose to chronic illnesses later in life. These "predisposing factors" for illnesses such as cardiovascular disease and cancer appear to be more prevalent in smaller communities. For example, compared with the nation, more Alaskan teens appear to be overweight.

As is true for physical health, most teenagers in Alaska also see themselves as emotionally healthy. However, there is a significant minority of teenagers who report problems of grave concern. Over one in twenty describe themselves as severely

stressed. One in six report they have attempted suicide. Many have had family members or friends either attempt or commit suicide. Studies have shown that there is a strong association between suicidal behavior and other risk factors, such as eating disorders or premature pregnancy, and especially abuse.

Overall, the portrait which Alaskan youths paint of themselves is a mixed picture. Many are happy, physically fit and emotionally stable. But for a significant number, adolescence is a time of distress and problems. It is hoped that the findings of the survey will be used to target programs and sufficient resources to reduce the health risks revealed by it.

Copies of the report, The State of Adolescent Health in Alaska, are available from the Alaska Department of Health and Social Services, Juneau.

Alaska Science & Technology Foundation

The Alaska Science & Technology Foundation was established by the State in 1988 with a $6 million appropriation (see *Arctic Research of the United States,* Vol. 3, Spring 1989, p. 34, and Fall 1989, p. 67). An endowment was created to fund grants to promote and enhance science- and technology-related research and development in Alaska that will result in:

- Economic development
- Scientific and technological innovation
- Improved public health

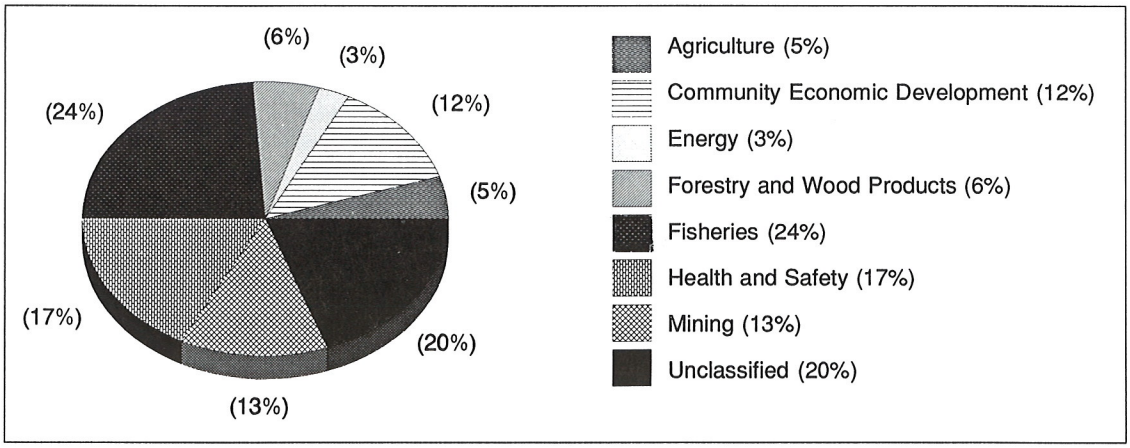
Currently there is $68 million in the endowment; a total of $100 million will be reached as funds become available.

The Foundation has made 30 grant awards to date (see tabulation), selected from a total of 224 proposals. These awards total $2,805,479 in ASTF funds with $3,091,968 in matching funds.

The *ASTF Newsletter* is available from ASTF, 550 W. 7th Avenue, Suite 360, Anchorage, Alaska 99501-3555.

Proposals submitted to ASTF

Technical area	No. of proposals
Community Economic Development	43
Fisheries	43
Energy	37
Unclassified	37
Health and Safety	26
Agriculture	15
Mining	15
Telecommunications	7
Foresty and Wood Products	6



$2.8 million in ASTF grants awarded.

Alaska Science and Technology Foundation Grant Awards

Project	Description	Alaska Benefits	Awarded/ Term	ASTF Funds	Matching Funds	Total Funds
1. Low-Cost Hydroturbine David R. Pahl Haines, Alaska	Construct and demonstrate a prototype low-cost hydroelectric power turbine for use with low water head.	Vast areas of Alaska, having no electric utility, are dependent on oil or diesel generators but have access to potential hydropower. Manufactured small-scale hydropower units are very expensive and impractical if stream flow is limited or seasonal. This non site-specific design features low-cost materials which can be fabricated and modified in a home workshop setting. If successful, the design will be disseminated to potential users in numerous other areas of the state where self-built hydrounits would be feasible and desirable.	1989 12 months	20,465	4,400	24,865
2. Remote Data Logger James E. Dryden Dryden & LaRue Instruments Anchorage, Alaska	Develop and produce an inexpensive rugged data logger to be manufactured and serviced in Alaska. Data loggers are small electronic instruments capable of sensing and recording information such as temperature, wind speed, water level, service voltage, power usage, etc.	Data loggers are used extensively in Alaska by utility companies, construction companies, fisheries biologists, regulatory agencies, and others since there are large areas of the state where little basic data is available. The complex loggers currently available cost several thousand dollars each and may measure a dozen different parameters. Simpler loggers which measure a few parameters but cost in the $500 range would have wide application in Alaska and elsewhere. Having the device produced and serviced in Alaska will be an economic benefit to the state.	1989 12 months	35,000	36,000	71,000
3. Alaska Shellfish Hatchery Development W. Michael Kaill Marine Research Company of Alaska Juneau, Alaska	Produce scallop seed from Alaska broodstock to enable commercial scallop farms to begin in Alaska. Documentation of hatchery techniques and hatchery design for Alaska will enable scallop hatchery development for Alaska.	Scallop farming in Alaska is now stymied by lack of seed, despite widespread interest. Alaska's nearshore environment is highly suited for shellfish mariculture. The potential production value for shellfish farming in Alaskan waters may reach tens of millions of dollars.	1989 25 months	94,900	163,700	258,600
4. Genetic Stock Identification of Important Commercial Fish in the Bering Sea Gerald F. Shields Institute of Arctic Biology University of Alaska Fairbanks, Alaska	Use modern biotechnology techniques to identify stocks of Bering Sea pollock for the purpose of proper management of this fishery.	This fishery is the largest on earth, and the potential economic recovery is massive if it is properly managed. Resolution of the origin and affinities of the Aleutian Basin ("donut hole") walleye pollock population could have international treaty consequences as well as guide the thinking of the North Pacific Fishery Management Council. The technology developed here could also be used to help manage a number of other economically-based fisheries in Alaska such as salmon and herring.	1989 30 months	232,738	202,851	435,589
5. Studies on Growth and Quality of Spruce Complex in Coastal Alaska Citkon Forest Products Anchorage, Alaska; John Alden Forest Geneticist Institute of Northern Forestry Fairbanks, Alaska	Determine the variation in survival and growth traits of spruce (Sitka and white spruce hybrids) in southcentral and southwest Alaska. Identify through genetic studies the extent of hybridization and rates of migration, and evolution of the hybrids.	Available timber stands are rapidly being harvested. Replanting and regrowth of depleted areas are going to be of ever-increasing importance to the future timber industry in Alaska. Project will determine the origin and range of Sitka spruce to improve yields in southwest forests and to help manage plantations. Results will be used by grantee in managing its forests and disseminated to other land owners in southcentral and southwest Alaska.	1989 12 months	56,375	110,000	166,375
6. Seafood Processing Tool Development Larry Smith Innerspace Technologies of Alaska Sitka, Alaska	Produce and utilize a fillet pin-bone remover to reduce the costs of value-added processing of Alaskan salmon products.	Producing high-quality, ready-to-cook entrees can increase the value of the product by two to three times, but it is very labor-intensive. Automating this process will help make these Alaskan products more competitive in outside markets. Grantee will use the tool, as well as make it available for other Alaska-based processing companies.	1989 21 months	84,550	55,100	139,650

Alaska Science and Technology Foundation Grant Awards

Project	Description	Alaska Benefits	Awarded/ Term	ASTF Funds	Matching Funds	Total Funds
7. Beekeeping in Alaska Stephen F. Petersen Toklat Apiaries Fairbanks, Alaska	Develop and disseminate information and materials regarding beekeeping in Alaska. Establish the viability of indoor vs. outdoor overwintering, develop an economic analysis based on scale operations, and cultivate the potential high-end export honey market.	Beekeeping in Alaska is currently a small-scale cottage industry producing excellent quality, pesticide-free honey tor local markets. Model projects will be established in Nenana and Delta to demonstrate ability of community units to produce honey for their own needs and excess honey for either wholesale or retail. Will double the number of beekeepers and colonies in Alaska. Expansion of the market for honey production and of utilization of bees for crop pollination could have broad application in vast areas of Alaska.	1989 24 months	82,702	33,060	115,762
8. Power Generation from Alaskan Coal–Water Fuel Warrack G. Willson Energy & Mineral Research Center Grand Forks, North Dakota; Dan Walsh Mineral Industry Research Laboratory University of Alaska Fairbanks, Alaska; Placer Dome U.S., Inc. Beluga Coal Fields	Test the technical and economic feasibility of drying the clean, but wet, Alaskan subbituminous coal and producing a coal-water slurry comparable to similar products being used in several countries around the world.	This type of slurry is currently being used to produce over 65 MW of power in Japan and can be burned in conventional oil-fired power plants. If successful, Alaskan coal would have an opportunity to compete in the new and rapidly developing steam coal market which is projected to reach 300 million tons per year by 2005. Alaska's estimated coal resources total over 5.5 trillion tons, possibly one-sixth of the world's reserves, but the majority is classified as low-rank coal due to high moisture content and inherently low heating value. This process would upgrade this coal.	1989 12 months	69,965	215,035	285,000*
9. Automatic Control System for Ilizarov Orthopedic Regeneration Hardware Juliann Perrigo Autogenesis Anchorage, Alaska	Develop an automatic system to control the tensioning process of a remarkable orthopedic device which is rapidly growing in use worldwide. The Ilizarov procedure regenerates and lengthens bone, tissue, blood vessels, and nerves using an external device fixed to the bone by slender pins. Regeneration occurs by extending the device at the proper rate and rhythm, applying tension to the bone.	Automation will allow greater control of the process and more beneficial results for the patient, with less pain. This biotechnical device will be manufactured in Alaska and potentially has a worldwide market. Biomedical technology is a low-impact, high-economic-benefit endeavor with no resource depletion implications. Such broadening of Alaska's economic base is highly desirable.	1989 12 months	226,675	100,000	326,675
10. Study of Terminal Area Troll Chinook Harvesting Lonnie L. Haughton F/V China Cove, Inc. Ketchikan, Alaska	Develop effective gear for salmon trolling in terminal hatchery areas under controlled conditions, and disseminate results to all Alaska troll permit holders.	International treaties have drastically reduced chinook salmon harvests for Alaska's troll fleet except for chinook salmon in terminal hatchery areas, where they are biologically much less susceptible to traditional lures, tackle, and techniques. Eighty-five percent of all trollers are resident Alaskans, and trolling is Southeast Alaska's largest fishery employer.	1989 36 months	90,550	52,700	143,250
11. Commercial Utilization of Arrowtooth Flounder Mel Monsen Alaska Fisheries Development Foundation, Inc. Anchorage, Alaska	Research and develop the most effective methods to allow utilization of Arrowtooth flounder, a fish which cannot currently be used commercially because its flesh softens quickly.	Arrowtooth flounder comprise over 60% of the flatfish biomass in the Gulf of Alaska. Success of the project would lead to Alaska's deriving an economic benefit from the utilization of a fish which now represents about 50% of the bottomfish catch but cannot be used commercially.	1989 12 months	50,000	93,000	143,000
12. Development of Alaskan-Grown Malting Barley Stephen M. Doﬁng University of Alaska Palmer, Alaska	Determine the feasibility of adapting malting barley to grow in Alaska; assess its potential market here and in the Pacific Rim.	Barley grows well in Alaska, with yields and quality comparable or superior to that produced in the contiguous United States. However, there has proven to be a limited viable market for feed barley, and many acres previously cleared for barley production are now lying fallow. If it is possible to use Alaskan-grown barley for malting, Alaska's ability	1989 20 months	6,500	4,500	11,000

* Exact amounts subject to negotiation.

Alaska Science and Technology Foundation Grant Awards

Project	Description	Alaska Benefits	Awarded/ Term	ASTF Funds	Matching Funds	Total Funds
		to produce barley may be utilized to supply brewing markets, both within Alaska and by export to the Pacific Rim.				
13. Applicability of Siberian Placer Mining Technology to Alaska Frank J. Skudrzyk Mineral Industry Research Laboratory University of Alaska Fairbanks, Alaska	Assess Siberian placer mining technology, exploration, engineering design and mining methods, processing and recovery, water treatment, and reclamation.	Approximately 80,000 people are employed in metal mining in Magadan Province, and the Soviets are generally recognized as the world's experts in exploration for the mining of placer deposits. The project will expedite transfer of appropriate technology to Alaska's placer mining industry and involves active industry participation to maximize the usefulness of the information developed.	1989 12 months	36,592	38,631	75,223*
14. Mined Land Reclamation with Woody Browse Species Yoshimitsu Mimuroto Idemitsu Alaska, Inc. Anchorage, Alaska; James E. Helling McKinley Mining Consultants, Inc. Palmer, Alaska	Expand and demonstrate the technology necessary for reclaiming mined land and reestablishing natural vegetation.	The project will occur in the permit area of the proposed Wishbone Hill surface coal mining project, eight miles north of Palmer, and will assist the development of the Matanuska Valley Moose Range. It will act as a demonstration and study area for similar projects restoring mined land for wildlife habitat, and will ultimately help to promote the responsible development of Alaska's mineral resources. End users such as mining, forestry, and landscaping communities will learn reasons and methods to match plant species with soil conditions on their own sites.	1989 34 months	31,103	43,170	74,273
15. Forest Production from Alaskan Native Trees Edmond C. Packee Division of Forest Sciences University of Alaska Fairbanks, Alaska	Analyze and identify native tree resources from the standpoint of potential end use resource volume, worldwide market for similar species, and production processes.	The project will determine resource requirements for native tree species trees to be used by forest product companies in Alaska. Minimum and optimum facility size for economic viability and competitive position in world markets, as well as suitable species and minimum volume of resource essential for successful operation, are items to be detailed. There are untapped millions of acres of boreal forest in central Alaska. An advisory committee of representatives from the timber industry will assist in assessing and disseminating results to maximize the economic benefit to Alaska.	1989 12 months	19,050	23,400	42,450
16. Prevalence of Cocaine in Newborn Infants A. John Caeton, M.D. Anita Todd Tigert, R.N. Harry Harrison, Jr., M.D. Alaska Neonatology Associates Anchorage, Alaska	Anonymous testing of infants for cocaine in the urine within 24 hours of birth. Project will allow improved program planning for services delivering care to pregnant women, mothers, infants, and children who suffer developmental and physical problems related to cocaine abuse or exposure.	Determining the prevalence of cocaine exposure in infants will provide valuable information for community planners as well as health planners. These children and their families will pose new demands on all public services. This study will provide the framework for a statewide prevalence study looking at cocaine use in pregnancy and its effects on newborns. This study will also enhance the ability to obtain future research funding in drug abuse at a federal level.	1990 6 months	27,701*	14,310	42,011
17. Low-cost District Heating for Rural Alaska Earle Ausman Polarconsult Anchorage, Alaska	Develop a simplified means of providing district heating to small structures in rural communities. The system will be designed and manufactured so that special equipment is not needed, and it can be installed by hand without machinery. There will be instructions to enable smaller type connections to be made without the need for expensive technical assistance.	Providing more reliable and less costly heat is of critical importance in many areas of Alaska. By designing more effective and less complicated ways to interconnect generators, district heating systems can use a central boiler, burn lower grade fuel, and save great amounts of money for a community. The Alaska Energy Authority will select the test site and help evaluate; successful results could extend the number of waste heat recovery units that would be economical.	1990 12 months	53,800*	25,000	78,800

* Exact amounts subject to negotiation.

Alaska Science and Technology Foundation Grant Awards

Project	Description	Alaska Benefits	Awarded/ Term	ASTF Funds	Matching Funds	Total Funds
18. Device to Measure Strength and Movement of the Neck and Lower Back J. Chelsea Lepley Alaska Research and Development, Inc. Anchorage, Alaska; David D. Beal, M.D., F.A.C.S. AK Head & Neck Specialists; Michael James, M.D. Morris R. Horning, M.D. Rehabilitation Medicine Association Anchorage, Alaska	Develop and test an integrated system to evaluate and aid treatment for human physical capacities for the neck and lower back. The system will provide a group of tools for rehabilitative and orthopedic medicine superior to devices currently available on the market.	Product will improve and expand the potential for understanding human performance. System would greatly benefit diagnosis and monitoring of spinal injuries, including whiplash neck injuries, and would be of considerable interest to insurance, legal, and medical communities. This type of new product development and manufacturing in Alaska will enhance the state's economy and help establish a resource base for other similar technology businesses.	1990 24 months	191,600*	197,800	389,400
19. Air-transportable Research Lab tor Use at Remote Sites Gerald D. Myers GDM, Inc. Fairbanks, Alaska	Final design and testing of compact, high-tech laboratory unit for use in field research in polar regions. The typical field lab now used is primitive and outdated. Initial research, sponsored by the National Science Foundation, identified the need, users, and the type of facility needed.	Testing of a prototype lab module will provide information on the properties of the construction materials under arctic conditions. The acquisition of this data will allow manufacturing and marketing of these compact field units as an Alaskan product. A substantial market demand exists worldwide, including government agencies, military applications and private-sector exploration needs in polar environments.	1990 12 months	211,783*	223,520	435,303
20. Potential Effects of North Slope Air Pollutants on Arctic Vegetation Robert Kohut Boyce Thompson Institute Cornell University Ithaca, New York; Alaska Oil and Gas Association Anchorage, Alaska	Measure whether existing air quality at Prudhoe Bay has affected or may affect tundra plant communities. Estimate the effects of future atmospheric emissions on tundra vegetation.	Project will provide definitive information on the effects of current air emissions on vegetation at Prudhoe Bay and estimates of effects of changing emissions. Results will provide guidance to regulatory agencies and allow effective air-quality standards to be adopted. Realistic assessments of environmental impacts are essential for the wise management of present oil operations, as well as any future development of new fields.	1990 60 months (subject to annual review and approval)	363,650	363,650	727,300
21. High-Temperature Drying of Alaskan Coals P.D. Rao Mineral Industry Research Lab, UAF Fairbanks, Alaska; Usibelli Coal Mine, Inc. DynNorTran Fairbanks, Alaska; Gilbert/Commonwealth, Inc. Reading, Pennsylvania; Western Research Institute Laramie, Wyoming	Determine the stability of Alaskan coals after drying by advanced processes; reassess transportation requirements and costs based on altered coal properties, develop an overall economic evaluation, and design a commercial plant. Participants—the Mineral Industry Research Lab, DynNorTran and Usibelli Coal Mine—are making in-kind as well as cash contributions. ASTF funds will leverage $150,000 from the Department of Energy's Clean Coal Technology Program.	Alaska contains over half the estimated 5.5 trillion tons of coal reserves in the U.S. However, most Alaskan coals have high moisture content but low sulfur. Testing will involve samples of Alaskan coal, dried by the inclined fluidized-bed process under development at Western Research Institute (WRI). Success will give Alaskan coals an opportunity to compete in the new and rapidly developing steam coal market, which could reach 300 million tons per year by the year 2005.	1990 12 months	74,213	175,787	250,000
22. Prediction Scheme for Volcanic Ash from Mt. Redoubt Hiroshi Tanaka Geophysical Institute, University of Alaska–Fairbanks Fairbanks, Alaska	Construct software to display the orientation, extension, and density of eruption plumes from Mt. Redoubt on a real-time basis. Will provide the Alaska Volcano Observatory with the ability to publish a series of maps to accurately predict the distribution of volcanic ash following an eruption, on an hourly basis. Japan Air Lines is providing the major funds, $50,000, for the project.	Availability of such maps to local and state governments, the U.S. Air Force, FAA and airlines en route and operating in the vicinity of the Anchorage International Airport will provide a significant public safety and economic benefit. While the prediction scheme will be designed for Mt. Redoubt, it can be applied to other volcanos whose eruptions pose a similar navigational hazard.	1990 5 months	5,000	60,000	65,000

* Exact amounts subject to negotiation.

Alaska Science and Technology Foundation Grant Awards

Project	Description	Alaska Benefits	Awarded/ Term	ASTF Funds	Matching Funds	Total Funds
23. Pasture Management for Muskoxen William B. Collins Musk Ox Development Corporation Palmer, Alaska	Develop a pasture management program to enable muskoxen producers to optimize production on a sustained yield basis. The goal is to provide a secure base from which to produce sufficient qiviut to employ up to 320 rural Alaskans in the knitting industry.	The benefits of improved animal and pasture health and productivity will have a direct economic impact on the qiviut knitting industry in rural Alaska. Muskoxen husbandry and its associated knitting industry are unique to Alaska and annually represent $500,000 to the state's economy.	1990 24 months	54,000	28,500	82,500
24. On-site Organic Waste and Wastewater Treatment System Clint Elston AlasCan, Inc. Healy, Alaska	Monitor and document an organic waste and greywater treatment system under both laboratory and actual installation conditions. Elston's patent-pending system has been recognized by a 1988 Department of Energy (DOE) Innovations Award as an environmentally sound, economic, water-saving alternative to sewers and septic systems.	Product is a decentralized and low-maintenance system for composting waste treatment of all human and organic wastes; the greywater separation is designed to produce clean effluent. Ideally suited for widespread Alaskan applications, the ASTF grant will provide testing data for permitting purposes, while DOE is providing funds for product development necessary to eventually establish a manufacturing operation. Market potential is enormous both in and outside Alaska.	1990 24 months	99,500	99,500	199,000
25. Remote Detection of Scour Near Bridge Piers Robert F. Carlson Dept. of Civil Engineering University of Alaska–Fairbanks, Alaska; Alaska Dept. of Transportation and Public Facilities; Northwest Regional Transportation Center, University of Washington Seattle, Washington	Develop instrumentation to measure scour at unattended sites and provide a warning of dangerous situations. Bridge failures occurring nationwide in flood conditions have led to a federal mandate for states to assess scour at every bridge site. Project will develop a marketable system to provide remote measurements of scour events near critical rural bridge locations using miniature radio telemetry technology.	The project will provide rural transportation districts in Alaska with a cost-effective method to conduct the required scour inspections and an alternative to existing operations and maintenance techniques. The technology will be marketable to other state, county and municipal road maintenance districts around the nation and the world. Further applications may be made to pipelines and offshore structures, which would open up an even larger market.	1990 24 months	110,550*	171,223	281,773
26. Modification of Crab Pots for Harvest of Pacific Cod Melvin J. Monsen, Jr. Alaska Fisheries Development Foundation Anchorage, Alaska	Develop an effective, but clean, method of fishing Pacific cod with modified crab pots. The goal is a harvesting method that maximizes Pacific cod catches but reduces crab and halibut by-catch. The project will use scientific sampling to evaluate the effectiveness of a number of crab pot modifications.	There is a growing concern with by-catch of halibut and crab in the enormous Pacific cod fishery in Alaska, which a new and efficient method of harvesting Pacific cod could help address. It would provide crab harvesters the opportunity to enter a lucrative fishery with minimal gear modification costs. It would also allow harvest and delivery of cod beyond existing by-catch closures.	1990 6 months	112,900*	54,200	167,100
27. Commercial Development of Innovative Placer Mining Technology John T. Larson Goldstream Exploration Fairbanks, Alaska	Develop means for commercial production of a unique mobile placer mining machine which meets state and federal regulations for water and land reclamation. Requiring considerably less fuel and water than current systems, and providing excellent gold recovery, these units will substantially increase the viability of small family-operated placer mines.	An abundance of excellent mining ground exists in Alaska which is not linked to transportation corridors for fuel supplies, and has inadequate water resources or water restrictions. These units are far more cost effective than large-scale operations. Alaska will benefit by a new manufacturing enterprise, and the industry will benefit by having service available locally for critical equipment.	1990 12 months	150,000*	230,000	380,000
28. Computer-aided Design for Precut Log Houses Jerry D. Green Superior Products, Inc. Anchorage, Alaska	Combine low technology log construction with high technology computerized design and drafting, to make log houses more affordable. The precut system provides a means to increase utilization of native species. It will also provide realistic alternatives for housing in rural areas which is easy to con-	Individuals, communities and government entities will be able to build or provide high-quality log structures at reasonable costs using local materials. System can be expected to result in an increased use of local forest products in-state, a decrease of importation of logs, and improved marketability of a highly sought-after finished material for export.	1990 14 months	90,000*	60,000	150,000

* Exact amounts subject to negotiation.

Alaska Science and Technology Foundation Grant Awards

Project	Description	Alaska Benefits	Awarded/ Term	ASTF Funds	Matching Funds	Total Funds
	struct, and will meet building codes and lender requirements.					
29. Improved Permafrost Soil Detection by Electromagnetic Methods G. G. Walker K. Kawasaki Geophysical Institute University of Alaska–Fairbanks Fairbanks, Alaska	Redesign of electromagnetic induction method of detecting permafrost for commercial use. The resulting product will have increased flexibility to assess a greater variety of sites, and data interpretation will be made easier. Objective is a one-person portable system with digitized output and automated data interpretation, which will supplement and provide more complete information than drilling programs currently in use.	Permafrost is a major construction hazard in Alaska. Several recently developed geophysical methods for permafrost detection give greater coverage per unit cost and are less environmentally damaging than drilling. At the same time, they have proven cumbersome, less definitive and operationally complex. The redesigned system will provide a means to acquire more comprehensive permafrost information at a cost equal to or less than drilling. Alaska will benefit by reducing maintenance and redesign work now caused by undetected thaw-unstable permafrost.	1990 18 months	76,100*	105,581	181,681
30. Immunity Conferred on Premature Infants by Hepatitis B Vaccine Kenneth R. Kesler Alaska Neonatal / Perinatal Research Foundation, Inc. Anchorage, Alaska	Hepatitis B vaccine is a safe, efficient preventative measure for adults and healthy infants In high risk situations. Its effectiveness in prematurely born infants, however, has not been demonstrated. This project will evaluate the response of premature Alaska Native infants to hepatitis B vaccine.	Alaska Natives have the highest rate of hepatitis B and liver cancer in the U.S. One of the most important modes of transmitting hepatitis B virus is between a pregnant woman with hepatitis B and her newborn infant. If not properly treated, these infants carry enormous personal health risks, as well as serve as a reservoir of the virus which can infect siblings, other children and pregnant women.	1990 12 months	47,517*	107,350	154,867
			Totals	2,805,479	3,091,968	5,897,447

* Exact amounts subject to negotiation.

Genetic variation in the spruce complex of coastal Alaska (Project 5).

The Alaska Science and Engineering Advisory Commission

Commission members:

Dr. Brian Allee, fisheries biologist, Head, Fisheries Rehabilitation Enhancement Division, Department of Fish and Game, State of Alaska;

Dr. Henry Cole (Chairman), geophysicist, Member, Office of the Governor;

Dr. Aurora Hovland, plant physiologist;

Mr. Ervin Long, civil engineer, President, Arctic Foundations, Inc.;

Dr. William Mills, orthopedic surgeon;

Dr. Peter McRoy, marine scientist, University of Alaska–Fairbanks;

Dr. Paul Reichardt, chemist, Dean, College of Natural Sciences, University of Alaska–Fairbanks;

Dr. John Sibert, chemist, Executive Director, Alaska Science & Technology Foundation.

In 1986 the State Legislature established the Alaska Science and Engineering Advisory Commission in the Office of the Governor to promote Alaskan scientific and engineering research and develop State policy, to assist in identifying and solving important Alaskan problems, and to guide and advise the Governor and Legislature. ASEAC has now begun its fourth year of funded operation. It operates on resources of $100,000 per year plus the salary of the Chairman, who is also the Science Advisor within the Office of the Governor. To achieve its goals the Commission operates in several modes:

- It encourages the formation of networks and pathways for information and assistance within the State scientific community.
- It conducts public hearings and investigative technical symposia.
- It provides assistance and information to the Alaska Science and Technology Foundation for its proposal solicitation process.

The Commission funds projects and investigations which serve a community of scientists and which have long-term significance to Alaska. It does not fund research directly. Its activities and recommendations are described in an Annual Report, which is presented to the Governor on 30 September each year.

Products of Commission work include symposia, publications, recommendations, and general public meetings held throughout Alaska. The meetings have taken place in Anchorage, Fairbanks, Juneau, Homer, Seward and Sitka, and have heard public testimony on topics as diverse as economic development, inventions, agriculture, fisheries, forestry, and State energy development. The more significant findings and contributions are described below (see *Arctic Research of the United States*, Vol. 2, Spring 1988, p. 4).

Design and Construction in the Arctic

A symposium on Design and Construction in the Arctic was held on March 9 and 10, 1989, in Anchorage. Successful construction of remote Arctic sites such as villages, mining camps, or manufacturing sites could result in considerable benefits: more efficient use of rural energy, improvement in the lives of rural residents, and savings in State expenditures. Suitable design, appropriate materials, new technologies, and high quality construction must be encouraged, and they should be tailored to true and actual Arctic conditions, not be mere adaptations of southern practices. Regulations, codes, financing arrangements, supply and maintenance capability, and local participation are much more critical to success than they are in comparable projects further south. At remote sites and under harsh environmental conditions the penalties for failure may be disastrous, as the events of the winter of 1989 demonstrated. Successful solutions of these problems can also produce marketable Arctic engineering technology.

Report prepared by Henry Cole, Office of the Governor

The Status and Potential of Alaskan Coal: A White Paper

Alaska possesses half the coal in the United States, about 5 trillion tons, but currently exports only 750,000 tons per year. The coal from the south-central region is very low in sulfur and ash but exceedingly high in water content (27%). Expansion of the Pacific Rim markets for Alaskan coal depends on the development of economical techniques for drying and stabilizing these coals, and on new product development and transportation techniques. A report available this fall, which has extensively involved the university and industry over the past 12 months, addresses these and other critical issues.

Rare Earths in Alaska

A symposium on Rare Earths in Alaska was held August 17 and 18, 1988, in Fairbanks. The State is a potential supplier of all rare earth minerals. Some dozen or so sites in the southeast and interior portions of the State are known to have commercial deposits. Bokan Mountain on Prince of Wales Island, with extensive deposits of bastnazite, has been the most studied; placer mines and beaches contain black monazite, and many placer sites are abundant in elements in the "heavy" end of the rare earth series. Rare earths are employed in commercial products such as metal alloys, chemicals, petroleum catalysts, optics, electronics and television screens. The world market is growing slowly but steadily. Because of transportation distances and the current lack of Alaskan refining capacity,

considerable investment would be required for commercialization. Although the Commission makes no recommendation to proceed at this time, it believes that there will be important potential for Alaska, and world markets should be monitored. A report is expected in early 1991.

Ongoing ASEAC Projects

The Commission is currently supporting a joint program with the Science Council of Canada to conduct community case studies into what factors help bring about successful economic development in rural Native villages in Canada and Alaska. Canadian towns currently engaged in technical projects are Waskaganish and Kuujjuaq, Quebec, and Haines Junction, Inuvik and Nain, Labrador. The Alaskan choice is St. Paul Island. The practical result will be understanding of the process and potential of technological economic development in the Native bush villages. The deeper issue is to determine how a modern technological culture may effectively connect with Native cultural forms while blending the best of both.

The Commission is developing and reviewing strategies which the State must consider in order to respond to the economic or geophysical impacts of global climate change. The world price of oil, internal Alaskan energy use, and options for our own fossil and non-fossil fuels will determine our response. Additionally, Alaska is located where it can make a significant contribution to global change monitoring and research. A report will be submitted as a recommendation to the Governor.

The Commission is developing a long-range plan for applying science and technology to future State needs and policy. In the face of declining oil revenues from the North Slope a serious need is recognized within State government to diversify the economy. The importance of science and technology to State economic development is well recognized; but with limited funding sources, strategic funding choices will have to be made wisely. The full execution of this project will occupy at least a year and involve all sectors of State government and the private sector.

A cooperative program is underway between the State and the U.S. Department of Energy to examine the potential, decline, technical problems, environmental considerations, and economics of the several fossil fuel resources of Arctic Alaska (North Slope and offshore). This information will serve as the basis for comparing various development options for fossil energy. The final analysis will be used by DOE as input to the National Energy Strategy. The State and industry have contributed by making personnel and information available to the consultants performing the study. The Commission has supported and co-funded various phases of the study, which is to be completed this fall.

Publications

ASEAC publications which are available from the Office of the Science Advisor, Box AD, Juneau, Alaska 99811:

Research Sites in Alaska, 1989

Logistics Report

Design and Construction of Remote Sites Under Arctic Conditions

Rare Earths in Alaska

Annual Reports of the Alaska Science and Engineering Advisory Commission

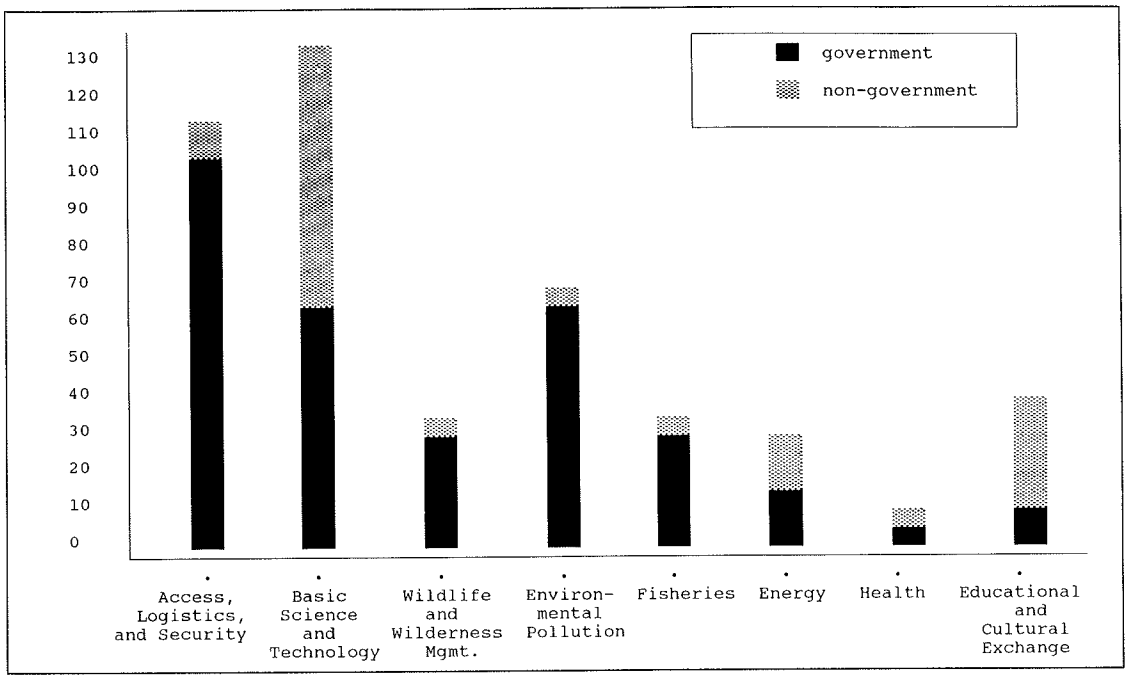
Selected Recommendations

Improved Bering Sea Oceanographic Systems Knowledge

A lack of comprehensive data and analysis regarding the interconnectedness of Bering Sea commercial fish species (i.e. their interrelationships within an integrated environmental system) prevents good scientific predictions of long-term maximum sustainable yields for these fisheries. This important aspect of species interdependence has not been studied in an adequate, comprehensive manner to date, and is an emerging and vital area for research. A range of important policy issues such as international political confrontation over species harvest and use and management of by-catch are dependent upon such studies. Because of the huge economic stake, previous mistakes with other species, and considerable Federal interest, the Commission strongly supports detailed comprehensive ecological and oceanographic studies of the entire Bering Sea.

Monitoring, Modeling and Predicting the Effects of Global Atmospheric Warming

Over 50% of Alaska's highways and much of its construction are located on permafrost. Given the indications of climatic warming in the permafrost record of the North Slope and elsewhere in Alaska, the possibility exists that the State and private sector could be facing significant engineering costs associated with ground thawing in the next decade. Global warming raises the prospect of impacts on agriculture, fisheries, glaciers, wetlands, and the weather. Since Alaska's high latitude also enables it to serve as an advance warning system for hemispheric changes (at least according to models), the Commission feels that it is crucial to establish a monitoring, modeling and research program on global warming's impact in Alaska, under the auspices of the University.



Subjects of active agreements.

- Wildlife and wilderness management
- Environmental pollution
- Fisheries
- Energy
- Health
- Educational and cultural exchange

Some general trends are evident. There has been a dramatic increase in activity in the science and technology category, particularly at the non-governmental level. The pace of developing new agreements has increased almost geometrically over the past few decades. The most active area overall is *basic science and technology*. Governmental agreements dominate the *access, logistics and security* category, while the majority of agreements in the *basic science and technology* and *educational and cultural exchange* categories are more informal. Generally, the most dramatic increase in any category is in agreements with the Soviet Union. Soviet preference for bilateral arrangements is evident in the expanding number of two-party agreements. On the other hand, participation by the Nordic countries is historically higher in multilateral arrangements. The high number of U.S./Canadian agreements is not surprising, as they are also the world's largest trading partners.

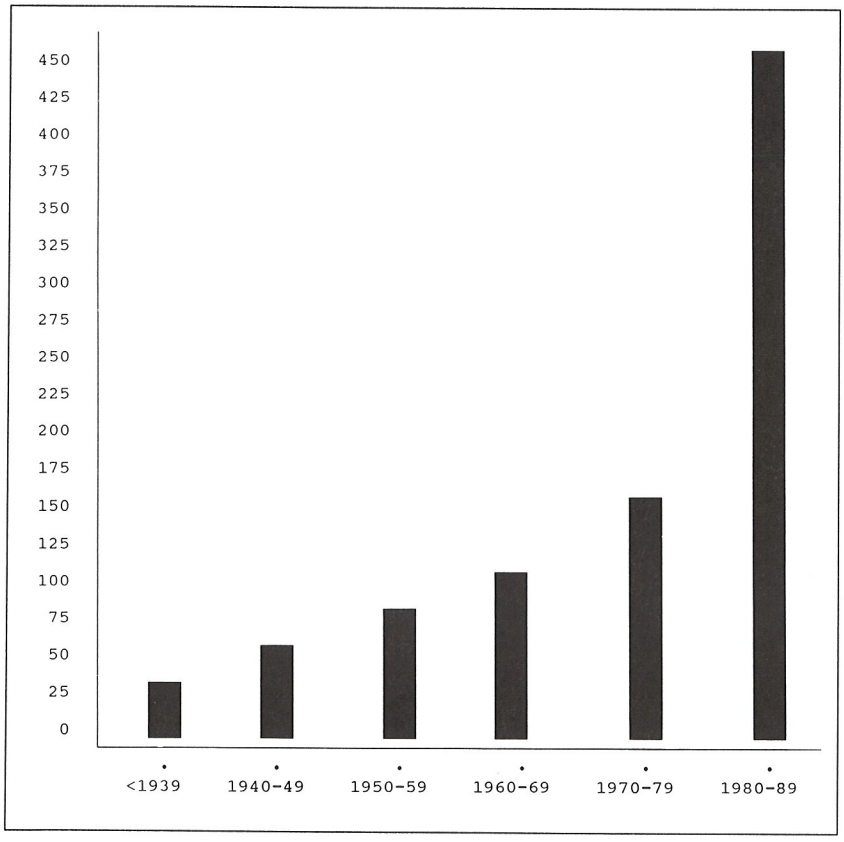
It is important to note that these signed agreements facilitate activity but do not ensure that research will take place. Some of the governmental agreements simply imply additional efforts but provide no new funding. For example, the Soviet science agreements may bring additional funding to the Soviet partner, but this is not uniform with all agreements.

The compilation (Background Report No. 1, May 1990) is available from the U.S. Arctic Research Commission, 6333 ICC Building, 12th and Constitution Ave., NW, Washington, D.C. 20423.

Introduction

The importance of the Arctic to the eight nations with territory above the Arctic Circle, as well as to the global community with resource, environmental, and scientific interests in the Arctic, has accelerated. All eight Arctic nations have reviewed and are strengthening their organizational structures for research in the Arctic. The question of establishing an international body to facilitate research, similar to the Antarctic Treaty organization (Scientific Committee for Antarctic Research), has been discussed for decades. In August 1990, after several years of planning, the International Arctic Science Committee (IASC) was formally established. The series of short reports which follow illustrate the current momentum of Arctic activity.

Number of active agreements over the years.



Introduction prepared by Philip L. Johnson, Executive Director, U.S. Arctic Research Commission, Washington, D.C.

International cooperation is an integral component of many scientific endeavors in the Arctic, linked to, and often inseparable from, the normal process of research planning and implementation. Essentially all U.S. government agencies involved in Arctic research participate in international agreements associated with their missions. The U.S. Arctic Research Commission, charged with advising the President and Congress on Arctic research policy and priorities, seeks to promote those international aspects of science that could be beneficial to U.S. Arctic research programs. As part of this mission, the Commission compiled and distributed a listing of cooperative agreements for the conduct of Arctic research, logistics support, and access to arctic sites. This compilation of approximately 450 agreements with (70%) and without (30%) U.S. involvement is not an exhaustive list of all current or proposed science and technology agreements between and among the U.S. and other countries, but merely an attempt to identify those international agreements with Arctic components. The information was collected by reviewing existing lists and contacting sources for verification. Sources were asked to comment on the accuracy of the draft, make corrections, and provide additional sources for new information.

Suddenly and somewhat unexpectedly the Arctic has become a focus of intense interest among those desiring to initiate and institutionalize cooperation in international society.

Oran Young
The Arctic in World Affairs, 1989

This list contains activities with non-governmental organizations and programs which are not included in the Science, Technology and American Diplomacy Report, published jointly by the Committees on Science, Space and Technology and Foreign Affairs, pursuant to Section 503(b) of Title V of Public Law 95-426 (July 1989). It conveys the breadth of Arctic programs currently being established at the non-governmental or informal level as well as the increasing global importance of the Arctic region at the formal international level. Although the list of government agreements is fairly complete, non-governmental agreements are likely more numerous than listed. The governmental and non-governmental agreements are listed by country as bilateral and multilateral agreements, treaties and conventions. Within these sections, agreements are then divided as appropriate by subject matter into eight categories:

- Access, logistics and security
- Basic science and technology

The International Arctic Science Committee
From Conception to Birth

Modified from remarks of Odd Rogne, Director, Norsk Polarinstitutt, and Chairman of the IASC Planning Group, at the official signing ceremony, Resolute Bay, N.W.T., Canada, August 28, 1990

Participants: International Arctic Science Committee, Resolute Meeting:

Ted DeLaca, National Science Foundation, U.S.A.;

David J. Drewry, British Antarctic Survey, U.K.;

Rainer Engelhardt, Department of Indian Affairs and Northern Development, Canada

J.E.G. Gibson, Department of External Affairs and International Trade, Canada

I.S. Gramberg, The U.S.S.R. Academy of Sciences, The Arctic Research Commission

Gotthilf Hempel, Alfred Wegener Institute for Polar and Marine Research, Germany

Douglas Heyland, Science Institute of the Northwest Territories, Canada

Takao Hoshiai, National Institute of Polar Research, Japan;

Bonni Hrycyk, Polar Continental Shelf Project, Canada;

Carl-Olof Jacobson, Royal Swedish Academy of Sciences, Sweden;

Anders Karlqvist, Swedish Polar Research Secretariat, Sweden

Y.B. Kazmin, State Commission of Arctic Affairs, U.S.S.R.;

Pierre Lapointe, Geological Survey of Canada, Canada;

Claude Lorius, Centre National de la Recherche Scientifique, France;

Magnus Magnusson, Icelandic Council of Science, Iceland;

Else-Ragnhild Neumann, University of Oslo, Norway;

Bruce Rigby, Canadian Parks Service, Canada;

Allan Poole, Department of External Affairs and International Trade, Canada;

L. Pudluk, Government of Northwest Territories, Canada;

The signing of the IASC Founding Articles on August 28, 1990 is an important milestone in the long history of progress in scientific cooperation in the Arctic. It is evidence of "the melting of the ice curtain." The wise words that "science knows no borders" should now be realized and implemented in the Arctic. Scientific knowledge should freely be exchanged across borders, and scientific cooperation should be enhanced.

However, although the agreed-upon Founding Articles are very important, they are only a foundation, and it is up to us all to create sensible scientific activities using these articles as a tool. For some the founding process has been the main concern; for the scientific communities, the real life of the IASC starts now. Looking back we can recall the major steps from conception to birth.

The San Diego Meeting

In June 1986, Dr. James Zumberge, then President of the Scientific Committee on Antarctic Research and Chairman of the U.S. Arctic Research Commission, invited participants to an informal meeting during the SCAR meetings in San Diego to discuss the possibility of establishing an international Arctic science organization. The general consensus at that meeting was very positive. Representatives from France, the Federal Republic of Germany, Japan, Poland, and the United Kingdom participated along with those from the Arctic countries.

The Oslo Meeting

Before the Oslo meeting the term "arctic countries" had to be defined. It was finally agreed that it would refer to those countries having territories north of the Arctic Circle, i.e. Canada, Denmark (Greenland), Finland, Iceland, Norway, Sweden, the U.S. and the U.S.S.R. People in key positions dealing with Arctic science, national science policy and international relations were invited to attend an informal meeting to discuss the feasibility of establishing a new international scientific organization for the Arctic. Fred Roots of Canada was asked to produce a discussion paper, and after some written exchanges he produced the paper "The Need for, Feasibility and Possible Role for an International Arctic Science Committee."

The meeting in Oslo was held on Friday, February 13, 1987. It was historic in the sense that for the first time senior people from all countries with territories north of the Arctic Circle had come together to discuss cooperation in Arctic science. There was a general consensus on the need for an international organization devoted to such cooperation. However, it was found to be premature to decide on a specific organization. A working group consisting of Rogne, Roots and Jorgen Taagholt of Denmark was appointed to draft a proposal on the needs and possible structure for a new organization. Sweden offered to host a subsequent meeting to discuss the proposal to be worked out by the working group (known as the RRT Group).

The report from the Oslo meeting, together with the RRT Group paper "International Communication and Coordination in Arctic Science—A Proposal for Action" (distributed in November 1987), created considerable scientific and political interest and concern.

The Stockholm Meeting

As a consequence of this increased interest and concern, the Stockholm meeting convened in March 1988 was attended by a wider group of people. Some of the major countries sent delegations that included government officials. The meeting discussed the working group report and "unanimously agreed that an International Arctic Science Committee should be established." However, the organization of IASC needed further consideration, and another working group was appointed to elucidate that question. In addition to the need for and how to organize IASC, the participants discussed themes and topics for Arctic research.

Several conclusions and issues derived from the Stockholm meeting:

- There was a genuine interest on the part of all to form IASC
- There was a need for further political discussion and consultation
- Divergent views existed on how to form an international science organization

Further information on the Stockholm meeting may be found in the official meeting report (see also *Arctic Research of the United States*, Vol. 2, Spring 1988, p. 46).

The U.S.S.R. offered to host the next meeting of the group, in conjunction with an Arctic science conference in Leningrad. The new working group

Odd Rogne, Norwegian Polar Research Institute, Norway;
Fred Roots, Department of Environment, Canada;
Karsten Secher, Danish Polar Centre, Denmark;
Mary Simon, Inuit Circumpolar Conference, Canada;
Philip M. Smith, National Academy of Sciences, U.S.A.;
Marianne Stenbaek, McGill University, Canada;
Paavo Tulkki, Finnish Institute of Marine Research, Finland;
Gunter E. Weller, University of Alaska, U.S.A.;
S. Maciej Zalewski, Polish Academy of Sciences, Poland

started its work shortly afterwards, and meetings were held in Moscow and Stockholm prior to the Leningrad meeting.

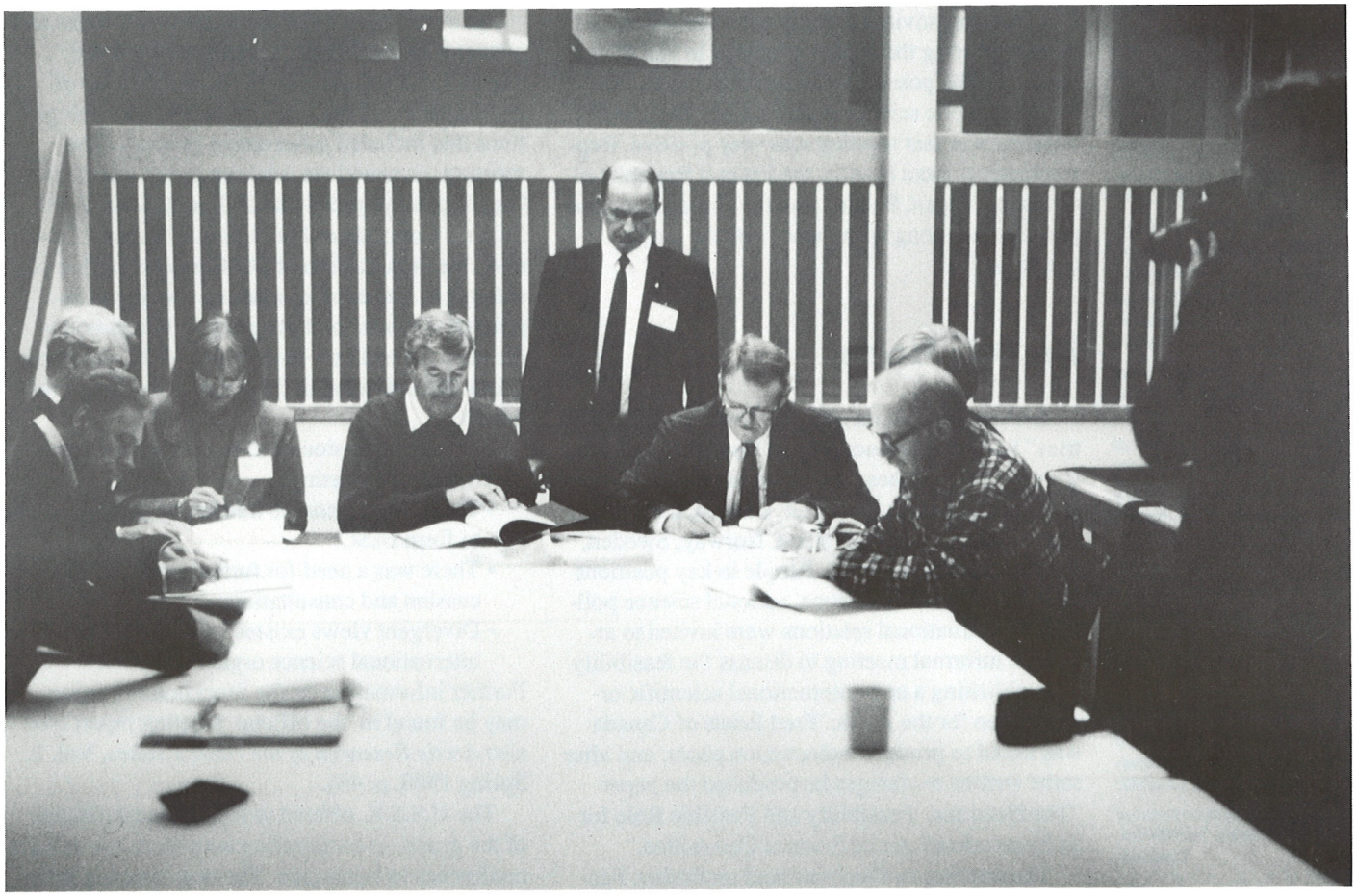
The Leningrad Meeting

The Leningrad meeting was held just prior to the Conference of Arctic and Nordic Countries on Coordination of Research in the Arctic (December 1988). These discussions resulted in an agreed-upon text, which was sent on for national reviews. Although a majority of the group was willing to found IASC based on the Leningrad text, the U.S. position was not fully supportive, and new discussions were initiated.

The Helsinki Meeting

A modified version of the text was produced in Helsinki in May 1989. However, since the key issue of representation was not fully resolved, representatives from Canada, the U.S. and the U.S.S.R. were requested to continue discussions as needed. It was not until March 1990 that a new text was agreed upon. This new text was sent for national comments in March, along with a strong recommendation to accept it. Comments received were only editorial and were resolved through written communication. The result was the final version of the Founding Articles, which appear in their entirety on the following pages.

Official signing of the Founding Articles of the IASC.



The International Arctic Science Committee

Founding Articles

IASC is a non-governmental scientific organization established to encourage and facilitate international consultation and cooperation for scientific research concerned with the Arctic. The committee covers all fields of Arctic science and provides a forum for discussion, exchange of information and cooperation.

The Arctic

There has been a growing national and international interest in the Arctic, stimulated largely by the recognition of the scientific and political importance as well as its economical potential.

The Arctic region is environmentally sensitive. The Arctic has a major influence on global systems of climate, weather, ocean circulation and other important environmental issues. It may respond more readily than other regions to global changes; processes that occur mainly in the Arctic region can induce significant effects over the entire globe.

There is an increasing need for scientific knowledge of the Arctic region. This is required for the wise development and management of that region and to ensure that Arctic research contributes fully to world science for the benefit of all mankind. This need comprises many fields of science, and is often of a multidisciplinary or interdisciplinary nature.

Some multilateral and bilateral cooperation with regard to scientific activities in the Arctic exists. But increased coordination and information exchange are seriously required.

The Proposal

This proposal is the result of many preliminary studies, policy statements and discussions within the scientific community and among representatives of science organizations in countries concerned with Arctic science and research.

A preliminary international meeting was held in San Diego, U.S.A., in June 1986. Another meeting took place in Oslo, Norway, in February 1987, involving participants from the eight Arctic countries—Canada, Denmark, Finland, Iceland, Norway, Sweden, U.S.A., and U.S.S.R. Subsequent meetings were held in Stockholm, Sweden, March 1988, in Leningrad, U.S.S.R., December 1988 and in Helsinki, Finland, in May 1989.

Many have contributed and helped in this process. The Planning Group is grateful for all support and constructive suggestions given to members of the Group.

The Planning Group, responsible for the text, has been composed of:

F.A. Mathys/A. Poole	Canada
I. Foighel	Denmark
E. Leppävuori	Finland
M. Magnusson	Iceland
O.R. Rogne	Norway, chairman
A. Karlqvist	Sweden
R.W. Corell	U.S.A.
V.M. Kotlyakov	U.S.S.R.

Preamble

REPRESENTATIVES of national scientific organizations of the Arctic countries—Canada, Denmark, Finland, Iceland, Norway, Sweden, Union of Soviet Socialist Republics and the United States of America;

RECOGNIZING the need to encourage and facilitate international consultation and cooperation for scientific research concerned with the Arctic;

RECOGNIZING the importance of the Arctic in advancing world science;

RECOGNIZING the special interests of the countries of the Arctic Region;

RECOGNIZING the important role of, and the need to work closely with, national scientific organizations from countries outside the Arctic regions which have an active and continuing Arctic research programme;

HAVE DECIDED to establish an International Arctic Science Committee, IASC.

A. General Principles

1. IASC is a non-governmental scientific organization established to encourage and facilitate international consultation and cooperation for scientific research concerned with the Arctic.
2. IASC, in carrying out its activities, will strive for the highest standards of excellence and be guided by the principle of scientific openness.
3. IASC endeavours to cover all subjects and fields of science for the advancement of world science and for the benefit of the Arctic regions.
4. IASC will take into account programmes and activities on Arctic research advanced by other scientific organizations and will cooperate with them whenever appropriate.
5. IASC will not interfere with the scientific activities of any country or group of countries carrying out research in the Arctic, nor commit governments to support or approve programmes or activities.
6. The activities of IASC should be consistent with the regional interests of the Arctic countries.

7. The activities of IASC will in no way affect the rights or obligations of countries under international law with respect to scientific research in areas within their jurisdiction.

B. Organization

The IASC is composed of:

- The Council
- The Regional Board
- Working Groups
- The Arctic Science Conference
- A Secretariat

C. The Council

1. **The Council** has as its responsibilities, *inter alia*, to:

i. Develop policies and guidelines for cooperative scientific research concerned with the Arctic.

ii. Establish Working Groups, as needed, and determine the terms of reference for and participation in such groups, and

iii. Endorse plans developed by Working Groups and recommend scientific programmes and projects.

iv. Recommend, in cooperation with the appropriate Working Groups, implementation plans for IASC programmes and activities.

v. Develop plans and facilitate the coordination of logistics and operations for IASC programmes, projects and activities.

vi. Decide on the participation of representatives of national scientific organizations from the non-Arctic countries.

vii. Organize Arctic Science Conferences.

2. **Participation in the Council** will be open to:

i. Representatives of the scientific organizations of the eight Arctic countries,

ii. Representatives of the scientific organizations of any other countries, during such time as those countries are engaged in significant Arctic research.

3. **The representatives on the Council** are appointed by their relevant national organization to represent the scientific community in their countries.

4. **The Council** will carry out its functions on the basis of consensus, taking into account the regional interests of the eight Arctic countries. In matters of special regional interest, the eight Arctic countries may pursue cooperative scientific programmes or projects directly, or using IASC as a forum.

D. The Regional Board

1. **The Regional Board** will consider general regional problems and other questions which affect the common interests of the Arctic countries. The purpose of the Board is to ensure that the activities of IASC are consistent with those interests.

2. **The representatives on the Regional Board** are appointed by the relevant national organizations of the eight Arctic countries to represent the scientific community in their countries.

3. **The Board** will normally hold its sessions concurrently with the sessions of the IASC Council.

4. **With respect to IASC proposals** for cooperative scientific research programmes and projects in Arctic areas within the jurisdiction of the Arctic countries that may affect economic, social, environmental and other major interests of the Arctic countries, actions taken by the IASC Council will take into account the recommendations of the Regional Board.

5. **The work of the Regional Board** will be carried out on the basis of consensus.

E. Working Groups

1. **Working Groups** provide the main fora for the IASC to develop programmes and activities. They are established by the Council to:

i. Exchange information,

ii. Discuss problems, methods and research directions,

iii. Identify opportunities for cooperation.

2. **Working Groups** will develop and recommend proposals for programmes, projects and activities to the Council.

3. **Working group** participants will be scientists with expertise in the central task of the Group. Each participating country may have one or more members of a Working Group. Working Groups may invite scientists or other experts from any country to assist them in their work, with the Council's approval.

F. The Arctic Science Conference

1. **An Arctic Science Conference** will be convened periodically by the IASC to identify key scientific questions and issues. The Conference will provide an international forum to:

i. Review the current status of Arctic Science,

ii. Provide scientific and technical advice,

iii. Promote cooperation and links with other national and international organizations, and

iv. Increase understanding and support for the work of the IASC.

2. **To meet these objectives**, the Conference will seek the participation of scientists from the broad international scientific community involved in Arctic research.

3. **The Conference** will be organized under guidelines and procedures established by the Council.

4. **The Conference** will produce a report and recommendations which will be reviewed by the Council.

G. Secretariat

1. **A Secretariat** will be established to serve the organizational needs of the IASC.
2. **The Secretariat** will be directed by an Executive Secretary responsible to the Council.
3. **The host country** will provide basic funding for the operation of the IASC Secretariat. Basic funding includes salaries for an Executive Secretary, office help, basic office expenses and some travel funds.
4. **The Secretariat** will be located in one of the Arctic countries.

H. Rules and Procedures

The Council may establish, as needed, Rules and Procedures to guide their work.

I. Review of Founding Articles

Five years after the entry into effect of the Founding Articles, a meeting will be held to review the activities and the organization of the IASC, and, if necessary, to revise the Founding Articles.

J. Entry into Effect of the Founding Articles

1. **The Founding Articles** will take effect when endorsed by the representatives of national scientific organizations of the eight Arctic Countries.
2. **Endorsement** will take the form of signatures by representatives of the national scientific organizations of the Arctic Countries, who have signed below.

Resolute Bay, August 28, 1990

National Scientific Organization:	*Signature*
Canada The Interdepartmental Committee on International Science and Technology Relations*	J.E.G. GIBSON
Denmark The Commission for Scientific Research in Greenland	KARSTEN SECHER
Finland The Academy of Finland	PAAVO TULKKI
Iceland The Icelandic Council of Science	MAGNUS MAGNUSSON
Norway The Norwegian Academy of Sciences and Letters	E.R. NEUMANN
Sweden The Royal Swedish Academy of Sciences	CARL-OLOF JACOBSON
U.S.A. The National Academy of Sciences	PHILIP M. SMITH
U.S.S.R. The U.S.S.R. Academy of Sciences The Arctic Research Commission	J.S. GRAMBERG

* Legislation has been introduced in Canada's Parliament to establish the Canadian Polar Commission, a non government body with a formal mandate to provide the focus for Arctic science in Canada. When the legislation is passed, the Canadian Polar Commission is expected to be designated as Canada's National Science Organization for IASC.

Protecting the Arctic Environment
Yellowknife Preparatory Meeting, 18–23 April 1990

Representatives of eight Arctic countries—Canada, Denmark, Finland, Iceland, Norway, Sweden, the Union of Soviet Socialist Republics and the United States—met at Yellowknife, Northwest Territories, at the invitation of the Government of Canada from April 18–23, 1990. This was an intergovernmental Preparatory Meeting on the Protection of the Arctic Environment held pursuant to the Consultative Meeting held in Rovaniemi, Finland, September 20–26, 1989. Representatives of the Federal Republic of Germany, the United Kingdom, and the Inuit Circumpolar Conference (ICC) were present as observers.

A Working Group on State of the Environment and Monitoring Activities considered draft reports in six areas: acids, heavy metals, oil, organic contaminants, radioactivity, as well as environmental monitoring. An additional report on noise pollution has been prepared. The group agreed on an outline and timetable for revision of these reports following scientific review within the participating countries by fall 1991.

Acidification in the Arctic Countries (Finland) deals with natural dynamics and environmental consequences of man-made acidification in the Arctic and discusses the influx of emissions to the region. The report also deals with the climatic, biological and geochemical conditions specific to the Arctic environment.

Chlorinated Organics (Canada) discusses the sources, pathways, and sinks of organochlorides affecting the Arctic environment. Trends in organochlorine data and ecosystem health are considered. The report further reviews the current knowledge of contamination of biota and also compares the Arctic with ecosystems in other regions.

Oil in the Arctic Environment (Norway) reports on oil inputs to the Arctic region. Marine, river, and atmospheric transport as well as direct discharges to the region are discussed. Hydrocarbon contents in the water column, the sediments and the biota are also taken into consideration, as are the ecological effects of hydrocarbon spills. Trends in oil inputs to the Arctic region are further described. One major source is accidental or illegal discharge and dumping of oil into the sea. It is reasonable to assume that discharges of oil due to the operations of vessels have decreased over the last decade due to the requirements of Annex I of the MARPOL convention. The importance of each single source and its pollution potential are not yet known. Monitoring as an active measure, issues relating to the oil and gas industry, transportation, and dumping need to be further discussed.

Radioactivity in the Arctic Region (Finland) presents a review of information concerning radioactivity into the Arctic environment. It reveals two main issues requiring international attention and cooperation: 1) the monitoring of external radiation and the measurement and analysis of the movement and deposition of radionuclides into and within the circumpolar Arctic, and 2) determination of the doses and effects of deposited and accumulated radioactivity in Arctic ecosystems, food chains, and human populations. Compared with the information concerning many other types of pollutants, the data on radioactive fallout and dispersion in Arctic regions over the past 30 years are quite extensive. There have been a number of national and international studies of the degree and effect of radioactive contamination in specified areas or at specific points of the Arctic ecosystem. However, the review has revealed some areas where monitoring of radioactive substances is incomplete or has been discontinued, and where improvements should be made in international compatibility of measurements and exchange of data.

Heavy Metals in the Arctic (U.S.S.R.) presents a compilation of available information about the concentration and distribution of heavy metals in the Arctic atmosphere, snow, glaciers, terrestrial biota, and seas. The problem of obtaining representative data that will show the effect of heavy metals deriving from human activities on the Arctic environment, and their trends over time in different regions of the Arctic, is very complex. This is because of wide variations in transport and distribution mechanisms, the differences in toxicity of the same substances in different chemical and biological forms due to different Arctic environmental processes, and the wide range of sampling and analysis techniques presently employed.

Noise (Denmark) reviews the sources of underwater noise, the nature of ambient noise in Arctic waters, and the nature of sound propagation. The biological acoustics and hearing of various marine mammals are reviewed, as are the reactions of marine mammals, especially whale species, to different kinds of natural and man-caused noise. Zones of noise effects are defined and possible mitigation measures discussed.

The importance of coordinated circumpolar monitoring to achieve adequate environmental protection was strongly emphasized. It was agreed that Norway would organize a follow-up report on the feasibility and most effective means of establishing

Prepared by Philip L. Johnson, Arctic Research Commission, and Elizabeth Leighton, Department of State

an international Arctic monitoring program. Norway has since organized a technical workshop for November 12–16, 1990 in Oslo.

Environmental Monitoring. A Working Group on Legal Instruments formed a list of bilateral and multilateral agreements relevant to control of pollution in the Arctic. It was agreed to update the list of agreements and consider whether new or extended agreements are needed as a result of problems defined by the "state of environment" reports. Possible protocols for international collaboration in response to emergency spills or pollutant emissions were also discussed, as was the need for uniformly defined pollution standards.

An *ad hoc* group discussed elements of an environmental protection strategy based on concepts of sustainable development. They produced a draft statement of concept, objectives and principles that might serve to guide an international strategy.

The need for emergency prevention, preparedness and response in the Arctic to pollution accidents was discussed, and a workshop to develop appropriate international cooperation was convened in Stockholm on November 16, 1990.

A working meeting is scheduled for Kiruna, Sweden, in January 1991 to prepare agreements for a ministerial meeting scheduled for Rovaniemi, Finland, in April 1991.

Working Group on Arctic International Relations

The Working Group on Arctic International Relations is a freestanding forum in which a mix of individuals from government agencies and the private sector participate in their personal capacities. Its purpose is to foster international cooperation in the Arctic by providing early warning of emerging Arctic issues, devising innovative policy options, and serving as a channel for informal communications among the Arctic states. While the Working Group as such does not take public positions on specific Arctic issues, individual members are free to make unattributed use of information or insights gained from participation in its discussions. The affairs of the Working Group are entrusted to the co-chairs, Dr. Franklyn Griffiths of Canada and Dr. Oran R. Young of the United States.

The Working Group held its third session in Moscow and Murmansk, U.S.S.R., during January 1990 and its fourth session in Prudhoe Bay and Kaktovik, Alaska, during September (see *Arctic Research of the United States*, Spring 1989, p. 44, for previous report).

Sixteen persons drawn from the eight Arctic states came together for the third session, whose theme was "Protecting the Arctic's Environment." Coming during the interval between the Rovaniemi consultative meeting on the Arctic environment in September 1989 and the Yellowknife consultative meeting in April 1990, this session offered an opportunity to reflect on the complex issues and hard choices to be faced enroute to the successful establishment of a multilateral Arctic environmental protection regime. In this connection, the group drew a distinction between Arctic-specific measures and Arctic provisions in broader international arrangements, offering a menu of possible initiatives that seem to make sense within the confines of the Arctic and exploring appropriate ways to incorporate Arctic concerns into broader environmental protection arrangements. The discussions focused in detail on the political, in contrast to the scientific and technical, issues that must be dealt with in any successful effort to protect the Arctic's environment.

The Working Group's fourth session, in Alaska, brought together 14 individuals. This session's theme was "Jurisdiction and the Management of Arctic Resources." The discussion centered on the management of resources that are shared because they are used by nationals of two or more states, migrate across boundaries, or straddle boundaries, or because they are integral parts of complex ecosystems that transcend national boundaries. In the course of the session, the group considered matters like the role of international law (and particularly various principles of delimitation) in dealing with resource management in the Arctic and the need to find new ways of bringing northern voices into the development and implementation of Arctic resource regimes. A recurrent theme was the power of different conceptual lenses to determine both the way we define issues of resource management and the sources we look to for inspiration in dealing with these issues.

A report on the Soviet session is available; a similar report on the Alaska session is in preparation. These reports, as well as other information about the activities of the group, can be obtained by writing to Working Group on Arctic International Relations, c/o Institute of Arctic Studies, Murdough Center, Dartmouth College, Hanover, New Hampshire 03755, U.S.A. (telephone 603-646-1278, Fax 603-646-1279, Telex 650-360-6870 MCI UW).

Participants in the third session included: Alexander Arikaynen, Soviet Academy of Sciences; Raymond V. Arnaudo, U.S. Department of State; Peter Burnet, Canadian Department of External Affairs; Pavel Dzubenko, Soviet Foreign Ministry; Thrainn Eggertsson, University of Iceland; Steen Gade, Danish Parliament; Franklyn Griffiths, University of Toronto; Marie Jacobsson, Swedish Foreign Ministry; Kari Mottola, Finnish Foreign Ministry; Willy Ostreng, Nansen Institute; Fred Roots, Environment Canada; Dalee Sambo, Inuit Circumpolar Conference; Kirsten Sander, Greenpeace Denmark; Vitaly Smaghin, Soviet Arctic and Antarctic Research Institute; Jan Thompson, Norwegian Environment Department; and Oran Young, Dartmouth College.

Participants in the fourth session included: Alexander Arikaynen; Pavel Dzubenko; Jan Flatla, Norwegian Foreign Ministry; Franklyn Griffiths; Marie Jacobsson; Kari Mottola; Ove Rosing Olsen, Mayor of Sisimiut, Greenland; Gail Osherenko and Oran Young, Dartmouth College; Willy Ostreng; Tony Penikett, Premier of Yukon Territory; Fred Roots; Dalee Sambo, Tufts University; and Jorgen Taagholt, Danish Commission for Scientific Research in Greenland.

Prepared by Oran R. Young, Institute of Arctic Studies, Dartmouth College

International Permafrost Association
June 1990 Council Meeting

The International Permafrost Association was founded in 1983 with the objectives of fostering the dissemination of knowledge concerning permafrost and promoting cooperation among persons and national or international organizations engaged in scientific investigation and engineering work on permafrost. Membership is through adhering national organizations. IPA is governed by a Council consisting of representatives from 18 countries having interest in some aspects of theoretical, basic and applied frozen ground research (permafrost, seasonal frost, artificial freezing, and periglacial phenomena). Working Groups organize and coordinate research activities. IPA became an Affiliated Organization of the International Union of Geological Sciences in July 1989.

The association's primary responsibility is the convening of the international permafrost conferences. The first conference was held in the U.S. in 1963; the second in Yakutsk, Siberia, in 1973; the third in Edmonton, Canada, in 1978; the fourth in Fairbanks, Alaska, in 1983; and the fifth in Trondheim, Norway, in 1988. The sixth conference is planned for China in 1993. Field excursions are an integral part of each conference, and are organized by the host country.

At its June 1990 meeting in Quebec City, Canada, the Council reviewed activities of the Working Groups and Standing Committee, which are:

Working Groups:

1) Mountain Permafrost
2) Terminology
3) Foundations
4) Present Global Change and Permafrost
5) Data and Information, and
6) Periglacial Environments

Standing Committees:

1) Editorial
2) Finance
3) Standing Committee

The Council approved a resolution for the preparation by IPA of a circumarctic permafrost map at a scale of about 1:7,500,000. The map, to be published by 1993, should be useful in depicting changes in the environments of the northern high latitudes. The Council also approved the semi-annual publication of *Frozen Ground: The News Bulletin of the IPA*. Copies of the bulletin are distributed through national adhering bodies. Further information can be obtained from Jerry Brown, Chairman, IPA Editorial Committee, and Editor, *Arctic Research of the United States*.

Arctic Ocean Sciences Board

The Arctic Ocean Sciences Board held its Ninth Session on January 15–17, 1990 at the Scott Polar Research Institute in Cambridge. A brief summary of this session and of other recent AOSB activities follows.

The Greenland Sea Program

The Board received reports on results of the first intensive field phase of the Greenland Sea Program which had been completed late in 1989 and on the meeting of the Scientific Steering Group for the GSP October 8–9, 1989 in The Hague.

The first intensive field study focused on physical and chemical oceanography complemented by phytoplankton and zooplankton studies. Scientists are now processing and analyzing the collected data and preparing results, combining the data from in situ observations with remotely sensed data and numerical modeling. Among the most noteworthy of the initial results is an analysis of convection during the consecutive winters of 1986–87, 1987–88 and 1988–89. The processing and analysis of data is expected to continue for another year or more.

The SSG/GSP decided to continue observations in the Greenland Sea on a long-term basis, especially to measure the transport of water and ice within the convective system of the European subarctic seas. This monitoring will include hydrographic sections, long-term moored arrays (current meters, upward-looking sonars, acoustic Doppler current profilers, etc.), and remote sensing systems. A major objective will be to improve understanding of convective processes in the Greenland Sea by obtaining regular high-quality measurements of stratification at key locations.

The SSG/GSP is now planning a second intensive field study for the period February–April 1993. Specialized groups will be set up to consider needs in physical oceanography, meteorology, glaciology, biology, geochemistry and remote sensing. These groups will present recommendations in these areas for inclusion in a comprehensive plan to be considered by the SSG/GSP.

Prepared by Lou Brown (Secretary, AOSB), National Science Foundation, for presentation to the International Council for the Exploration of the Sea, 78th Statutory Meeting (October 4–12, 1990, Copenhagen, Denmark), and to the Scientific Committee for Oceanic Research, 20th General Meeting (October 1–3, 1990, Rostock, Germany)

The International Arctic Polynya Program

The AOSB established a Scientific Coordinating Group for the IAPP. The Group's objectives are to:

- Establish and update an overall scientific mission statement for the IAPP
- Suggest a core program that should be carried out in each of the selected locations to identify and interpret the processes taking place
- Review the scientific plans produced for individual polynya research projects in comparison with the overall scientific mission statement
- Insure that the IAPP is developed in the context of other related national and international programs (e.g. the IGBP)
- Prepare recommendations to the AOSB on matters related to the IAPP

The SCG/IAPP is composed of scientists chosen by the AOSB for their interest and expertise and includes the chairpersons of the Northwater (NOW), North East Water (NEW), and St. Lawrence Island (SLIP) polynya projects. The Group met for the first time in May 1990 and developed a mission statement for the program. It is expected to meet at least once a year hereafter.

Other Activities

The Arctic Ocean Sciences Board reviewed the progress made in discussions of geoscience in the Arctic Basins, especially with respect to paleoceanography. The Board encouraged further scientific planning for marine geological and geophysical research in the Arctic Ocean and for development of technology (both coring and drilling) needed to support such research. The Board considered marine geology and geophysics a potential area for future AOSB emphasis.

The Board recognized that, while a significant portion of Arctic Ocean research in many countries is related to global change, little in the way of funding is allocated specifically to support of research under this umbrella. The Board concluded it would be useful if each country were to direct some funds specifically to Arctic Ocean research which is directly related to global change research.

The Board agreed that it would be useful to exchange information on activities of research vessels, including icebreakers, in the Arctic by arranging for the schedules of these vessels to be included in a new data base called "OCEANIC." This data base is being developed under the aegis of the International Ship Operators Group to track international research vessel activities.

The Board recognized that the expected conclusion and signing of an agreement to set up an International Arctic Science Committee (see page 65, this issue) could provide new impetus to Arctic research. However, it concluded that its recent experience, especially with respect to the Greenland Sea Program, had indicated that effective international cooperation in Arctic Ocean science is essential to the success of such science. Therefore, the Board decided it should continue to maintain and develop sound ocean science programs in the Arctic. The Board is also considering how it might best work with the International Arctic Science Committee over the next few years.

Dr. Eileen Buttle (U.K.) was elected Chairman, and Dr. Robert Corell (U.S.A.) was elected Vice-Chairman. The Board accepted an invitation extended to hold AOSB-10 in Copenhagen, Denmark, January 8–10, 1991. The Board expressed its appreciation to Professor Gotthilf Hempel, under whose very effective leadership it had developed.

UNESCO–MAB Northern Sciences Network

The UNESCO–MAB Northern Sciences Network met in Rovaniemi, Finland, September 25–27, 1990. The meeting was hosted by Dr. Veijo Ilmavirta, Director of the Arctic Centre of Lapland University. The Arctic Centre provides support for the Northern Sciences Network Secretariat.

Following a review of NSN history and objectives, the NSN meeting focused on four primary themes:

- Sustainable conservation and development;
- Research and monitoring in Biosphere Reserves and protected areas;
- High-latitude Biosphere Reserves; and
- Subarctic birch forests.

Working groups on sustainable development, research and monitoring, and northern Biosphere Reserves produced a number of resolutions.

Cooperative Activities on Sustainable Development: Each NSN member country is requested to forward to the NSN Secretariat a description of current or proposed northern sustainable development projects. The NSN Secretariat plans to produce a summary compilation of that information for wide distribution.

Prepared by Charles Slaughter, Institute of Northern Forestry, Fairbanks, Alaska

U.S. participants: *Patrick J. Webber, Kellogg Biological Station, Hickory Corners, Michigan; Dale Taylor, National Park Service, Anchorage, Alaska; and Charles Slaughter, Institute of Northern Forestry, Fairbanks, Alaska*

Long-Term Research, Monitoring and Global Change in Northern Biosphere Reserves: MAB–NSN could serve a coordinating role in circumpolar monitoring and research into change in northern ecosystems, as well as a conduit for information exchange through the NSN Newsletter. Monitoring and research, which should be addressed in the context of hypothesis formulation and testing related to underlying ecological theory and questions of environmental change, might address the five core research areas of the U.S. LTER program:

- Primary production;
- Population biology of representative organisms at important trophic levels;
- Biogeochemical cycling;
- Patterns and controls on organic matter accumulation; and
- Stability of ecosystems in relation to disturbances.

Methods for integrating social science issues into ecological and ecosystem studies should be developed and refined for common use by ecologists. The International Tundra Experiment (ITEX) advanced by the U.S. group is deemed an excellent pilot project for the MAB Northern Sciences Network and may represent an appropriate model for future collaborative high-latitude research and monitoring initiatives.

Recommendations for Strengthening the Biosphere Reserve Network in the North: Each country should provide to the NSN Secretariat a description of the ecological classification system(s) used to select Biosphere Reserves or other protected areas. An international Biosphere Reserve Managers workshop should be held in a northern Biosphere Reserve. The National MAB Committee should consider how to develop relevant action plans for such Biosphere Reserves.

Cooperative Research under the MAB–NSN Birch Forest Studies Theme: The inclusion of a human component to the study is recommended. The Finnish treeline monitoring project has potential circumpolar implications and may, in the future, be an area for cooperation under MAB–NSN. More consideration should be given to research studies with coastal or marine components, because many northern communities are located in coastal areas that are very productive biologically. Various Biosphere Reserves currently proposed or recently created could be used—the Finnish archipelago, the Danish Waddensee, the Canadian Isabella Bay proposal, the east coast of Greenland.

An International Advisory Group for the MAB Northern Sciences Network was established, pursuant to recommendations of the NSN meeting held in Helsinki 21–24 March 1988. The functions of the Advisory Group are:

- To advise on the progress or future directions for cooperative research activities identified by the MAB–NSN;
- To monitor the information flow of the network, especially through the newsletter, to ensure continued and improved exchanges of research results and expertise, etc.;
- To review implementation of the Action Plan for Biosphere Reserves in the Arctic region;
- To review and comment on possible relationships of MAB–NSN with other international programs and endeavors such as the International Hydrological Programme of UNESCO, the International Geosphere Biosphere Programme of ICSU, the International Arctic Science Committee and the International Arctic Social Sciences Association; and
- To advise MAB–NSN on new emerging research topics and on the relevance of ongoing MAB–NSN activities.

Advisory Group members are to be appointed by the respective MAB National Committee of NSN member states. Dr. Fred Roots (Canada) will serve as provisional chair. The International Advisory Board will meet at least annually, with the initial meeting to be scheduled in conjunction with the Euro-MAB in Strasbourg in September 1991.

A field trip was conducted to the underground iron ore mine at Kiruna, Sweden; the Tornetrask Biosphere Reserve, established in 1987 at 68°N in Sweden; and the Abisko Scientific Research Station, established in 1912 and operated by The Royal Swedish Academy of Sciences. Dr. Donesson, Director of the Station, provided briefings on the history of research in northern Sweden, covering both natural history and the history of man's use and occupation of the Abisko region since the 14th century. Field examinations were made of treeline birch stands, the influence of reindeer and moose foraging on birch, the survival and range extensions of Scotch pine, and local ecologic and hydrologic aspects of sporadic permafrost in palsa.

International Arctic Social Sciences Association

On 23 August 1990 the International Arctic Social Sciences Association was established and held its first general assembly at the 7th Inuit Studies Conference at the University of Alaska–Fairbanks.

The objectives of the association are to stimulate international cooperation and increase the participation of social scientists in national and international Arctic research, to increase public awareness of circumpolar issues and research results, to promote research and educational partnerships with the peoples of the North, and to adopt a statement of ethical principles for the conduct of research in the Arctic.

An *ad hoc* committee oversaw the establishment of the association and the drafting of by-laws. The draft by-laws were discussed, and an interim council, to serve no longer than August 1992, was elected by the general assembly. The interim council consists of Finn Breinholt Larsen (Greenland), Ludger Müller-Wille (Canada), Noel Broadbent (U.S.A.), Oscar Kawagley (Indigenous Peoples), Susanne Dybbroe (Nordic countries), Lise Lyck (alternate), U.S.S.R. (vacant), and five open elected seats: Edna McLean, Igor Krupnik, Nils Jernsletten, Hiroaki Okada and Bernard Saladin d'Anglure.

The association has proposed that the International Secretariat for the IASSA be affiliated with the Northern Sciences Network Secretariat at the University of Lapland in Rovaniemi, Finland.

The First IASSA International Congress will be held concurrently with the 8th Inuit Studies Conference in Quebec City, Canada, in 1992.

For information about membership in the association contact Dr. Ludger Müller-Wille, Department of Geography, McGill University, 805 Sherbrooke St. West, Montreal H3A 2K6, Canada. Phone: (514) 398-4960, Fax: (514) 398-7437.

Prepared by Dr. Ludger Müller-Wille, Department of Geography, McGill University, Montreal, Canada

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Alaska and Soviet Science

A Symbiotic Relationship

Development of Alaska–Soviet ties over the past two years has proceeded at a phenomenal pace, evolving into an ever closer and more productive relationship. The University of Alaska has participated in this process, and its scientific work has benefited immeasurably from these results of *perestroika* and *glasnost*. For scientists on both sides, this is an era of exciting, high-paced scientific activities. Soviet and Alaska scientists are today engaged in dozens of cooperative research projects, and more are created all the time. With the establishment of a joint Soviet–American scientific center in the Soviet Far East and the involvement of other U.S. institutions, the future looks highly promising for continued and expanded bilateral and circumpolar collaboration.

Alaska–Soviet Bonds

Scientific ties are occurring in the context of broad-scale interactions between Alaska and its Soviet neighbors. This interaction covers not just science but the full gamut of common interests: commerce and business management, transportation and communication, medicine and health, housing and construction, education, environmental protection, culture and art, sports and recreation, media, religion and others.

Alaska's bonds with the Soviet Union, particularly with the Far East and Siberia, are grounded on several factors:

- Close proximity: only some 50 miles separate the American and Eurasian land masses across the Bering Strait, and but three miles separate the two Diomede Islands in the U.S. and the U.S.S.R.
- Similar physical and biological characteristics of geology, flora and fauna, marine environments, climate, resources endowments and other natural conditions
- Common history and related cultures: indigenous peoples on both sides of the Bering Strait share family ties, language, lifestyles and values; Russians ruled Alaska until 1867; Russian Orthodox churches abound through parts of Alaska
- Comparable problems of human habitation, economic development and environmental protection in the North and in remote regions

In addition, Alaska has emerged as a direct and convenient bridge between the U.S. and U.S.S.R. No longer do Alaskans have to go around the globe through Europe to reach their neighbors across the Bering Strait. Regular air linkages have now been established via charters. Bering Air, a commuter carrier, in 1990 flew over a hundred charter flights between Nome and Provideniya, on the opposite side of the Bering Strait.

Prepared by Victor Fischer, Director, Office of Soviet Relations, University of Alaska, Anchorage, Alaska

Aeroflot, the Soviet airline, this year carried thousands of passengers between Alaska and the U.S.S.R., with flights originating not only in the Far East (Magadan, Anadyr and Khabarovsk) but also as far away as Moscow and Kiev. During the summer, Aeroflot charters averaged more than one a week, and on occasion three Soviet planes at a time could be seen at Anchorage International Airport. Fairbanks also had direct flights from Khabarovsk and Yakutsk. Under an agreement signed by Presidents Bush and Gorbachev, regular air service by Alaska Airlines and Aeroflot between Anchorage and Magadan/Khabarovsk will begin in 1991.

Professor Michael Krauss of Alaska Native Language Center explains the sound system of their Yupik language to Soviet Eskimo students at Hertsen Pedagogical Institute in Leningrad.

Ties have also been facilitated by establishment of direct telephone service from Alaska to Provideniya and Anadyr in the northeastern U.S.S.R. Alascom, the state's largest long-distance carrier, is scheduled to expand telecommunications connection next year through use of both U.S. and Soviet satellites.

These developments have been both a result of and a stimulant to interaction with Alaska's Soviet neighbors. The relationship now permeates the state's business, political and civic consciousness. From slow beginnings in early 1989, numerous joint business ventures have been established, dealing in import and export of goods, manufacturing, mining, tourism and other activities. They involve large and small businesses, Alaska Native corporations and petroleum and mining companies. Soviet guests are regular participants in various meetings, such as the annual judicial conference and the Alaska mining congress. Art exhibits and musical performances have become regular visitors across the border. State, local and federal officials are among the frequent travelers. Religious connections have been established; an ecumenical center is being jointly developed in Magadan. Students from school districts throughout Alaska have participated in exchanges with schools as far away as Moldavia in southwestern U.S.S.R. These are but examples of what is occurring between Alaska and the U.S.S.R.

The University of Alaska (UA) is among those actively engaged in Soviet activities. It is party to a student exchange agreement with the U.S.S.R. State Committee on Public Education and has individual agreements with institutions of higher learning. Soviet students are pursuing graduate as well as undergraduate studies at UA campuses in Anchorage, Fairbanks, and several rural communities and UA students are enrolled on the Soviet side. It is in the area of research, however, that the university is most thoroughly involved.

Foundation for Alaska–Soviet Research Cooperation

Since Alaska is the United States' only territory located in the Arctic and Subarctic, it is not surprising that the University of Alaska has a special focus on the unique environments and conditions of the North. Today, more than 20 UA research centers deal with the particular conditions and scientific opportunities found in the polar and circumpolar region. They include the Institute of Arctic Biology, the Geophysical Institute, the Institute of Marine Science, the Institute of Northern Engineering, the Institute of Social and Economic Research, the Institute for Circumpolar Health Studies, the Center for High Latitude Health Research, the Alaska Native Language Center, the Agricultural and Forestry Experiment Station, the Alaska

Center for International Business, the Alaska Cooperative Wildlife Research Unit and the Arctic Environmental Information and Data Center. These and other university centers have ongoing scientific collaboration with Soviet colleagues and institutions, as well as with individuals and organizations in the U.S. and other parts of the world.

Much of the Alaska–Soviet activity is carried on, or at least had its beginnings, under national agreements between the United States and the Soviet Union. Key among these are

- The agreement for scientific cooperation between the U.S. National Academy of Sciences and the U.S.S.R. Academy of Sciences, first signed in 1959
- The agreement on scientific research between the U.S. and U.S.S.R. governments, first executed in 1972 and now specifically providing for cooperation in Arctic issues, and this year for the first time including social sciences
- The environmental protection agreement, entered into in 1972 and renewed ever since, including Arctic and Subarctic ecosystems and other Arctic issues

Under these and related agreements, contacts were established with Soviet scientists and institutions that have continued or been renewed in the present. Examples include the two-decade relationships of the Institute of Arctic Biology (IAB), Fairbanks, with the Institute of Biological Problems of the North (IBPN), Magadan, and of the Institute of Social and Economic Research, Anchorage, with the Institute of Economics and Industrial Production, Novosibirsk.

Some of IAB's faculty have a 30-year record of work with the Soviets (e.g., Ken Philip), while others, such as David Klein and Stephen MacLean, have been at it for 15–20 years. Among those who have had long-term contacts with the Soviets is Michael Krauss, director of the University of Alaska's Alaska Native Language Center. He has worked over a period of 20 years with academic colleagues, institutions and Eskimos and other indigenous peoples in the Soviet Union. While he has worked both in Moscow and Leningrad, his present concentration is increasingly in the Soviet Far East. Krauss' collection and analysis of Russian publications and archival materials has been applied to the benefit of both Alaskan and Soviet Natives.

Most of the contemporary research cooperation has been born over the past few years. A pioneer in the rebirth of Alaska–Soviet ties was Ted Mala, who took advantage of the political changes begun by Mikhail Gorbachev and established contacts with the medical–health community in the U.S.S.R. This led to his initiation of an Alaska–Siberia medical program and the creation three years ago of the University of Alaska's Institute for Circumpolar Health Studies.

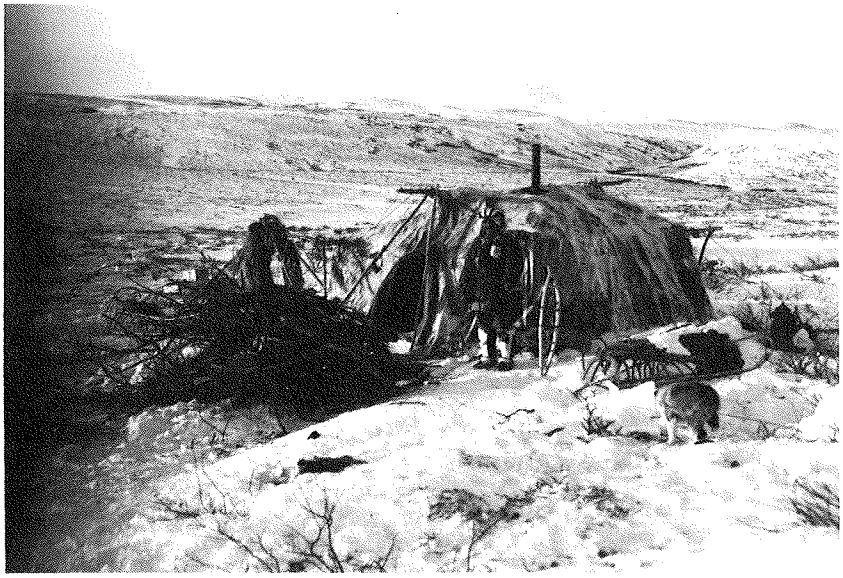
Over the past several years, direct contacts have multiplied and with them have come numerous proposals for scientific collaboration. They have resulted in a broad gamut of cooperative activities, covering subjects as diverse as anthropology, archeology, biology, oceanography, upper atmospheric physics, permafrost, vulcanology, economics and business, mineral engineering, alcohol addiction, aviation technology, and search and rescue activities.

Villagers listen to proposal for construction of new Soviet–American sausage plant.

Soviet-related research projects are carried out under a variety of sponsorships. Many fall under the aegis of Federal agencies and bilateral agreements, such as sea mammal research with the U.S. Fish and Wildlife Service and work with the National Park Service on the Beringian Heritage International Park. Occasionally projects evolve from direct personal relations and entrepreneurship. Most university work, however, falls under

agreements with branches of the U.S.S.R. Academy of Sciences and other Soviet institutions.

A computerized inventory of these research activities is being prepared and will be made available on an updated basis beginning in spring of 1991. The purpose of the following is to review some of UA's many formal arrangements with the Soviets and to briefly describe a few of the pertinent activities.



Reindeer herder's winter tent called a Iyranga.

Agreements with Soviet Institutions

Given their physical proximity and their focus on Arctic and Subarctic systems, Alaskan scientists have naturally been inclined to deal with Soviet scientists having similar interests in Siberia and the Far East. This commonality of interests has resulted in two umbrella agreements between the Siberian and Far Eastern branches of the U.S.S.R. Academy of Sciences and the University of Alaska state-wide system; additional agreements fall under individual university campuses (University of Alaska–Anchorage, University of Alaska–Fairbanks and University of Alaska – Southeast).

General Agreements

The purpose of the general agreements is to encourage and facilitate the establishment of collaborative research. Contained within the agreements are scheduled work programs and specific tasks outlined between scientists in a broad array of disciplines.

General Agreement for International Cooperation Between University of Alaska and Siberian Branch, U.S.S.R. Academy of Sciences

The agreement provides for cooperative efforts, information exchanges and contacts leading to cooperative scientific activities consisting of exchanges in literature, visits, field work, lectures, joint research projects and preparation of scientific articles and books. It delineates and schedules collaborative work in archeology–ethnography, economics, botanical research, animal genetics and other areas. Some of these involve field research studies, some of which were completed this past summer.

General Agreement for International Cooperation Between University of Alaska and Far Eastern Branch, U.S.S.R. Academy of Sciences

This agreement enumerates research institutes and centers and provides for the exchange of information and contacts leading to cooperative scientific activities and joint research. A series of exchange visits of research scientists and administrators has led to executed and pending agreements in economics, geology, marine biology and other areas. As discussed later, the two parties are jointly sponsoring the international research center in Magadan.

Biological Sciences

Agreement for Cooperation in Arctic Biology Between Institute of Arctic Biology, University of Alaska–Fairbanks, and Institute of Biological Problems of the North, Far Eastern Branch, U.S.S.R. Academy of Sciences

IAB and its faculty have a long record of work with Soviet colleagues. The current agreement between IAB and IBPN targets studies of biogeography and history of Beringian biota, productivity of northern ecosystems, principles and methods of environmental conservation in the Far North, and human ecology, and details topics under each subject. The program involves an exchange of students. IAB staff researchers also participate in programs with the medical and agricultural academies of the U.S.S.R.

Memorandum of Understanding Between Department of Biological Sciences, University of Alaska–Anchorage, and Institute of Biological Problems of the North, Far Eastern Branch, U.S.S.R. Academy of Sciences

The suggested research scope covers gene control during development, coronary physiology of mammalian smooth muscle, immunophysiology, tumor virology and molecular biology of proteins and DNA, secondary productivity of polychaetous annelids and shorebird predation, nutrient recycling and primary productivity of treeline habitats,

and biology of lichens relative to reindeer productivity. Exchanges have taken place and some of the research is ongoing. Department members are also participating in the Alaska–Siberia Medical Program discussed below.

Agreement to Conduct Joint Research in Botany Between University of Alaska Museum–Fairbanks, and Central Siberian Botanical Garden, U.S.S.R. Academy of Sciences

The current agreement continues a work program begun in 1983 on study of the origin and evolution of vascular flora of Asia and America. A binational database for plant collections, floristic analysis and mapping is being compiled in the publications of scientific papers and monographs, and there are annual expeditions for collecting plant specimens.

Botanical research demonstrates the value of Alaska-Soviet scientific collaboration. In this instance, understanding the northern environment entails studying historical geographical similarities and disparities. The University of Alaska Museum has developed an extensive herbarium collection in order to study geographical comparisons relating to the land bridge once connecting the two continents. David Murray, Professor of Botany and curator of the herbarium at the University Museum, began dried-plant exchanges with Soviet botanists in 1969. Today the museum's collection numbers close to 9000, pressed and mounted to form a permanent record. Murray has been classifying the collection, some of which he collected in remote regions of Siberia and the Far East. Some specimens are slightly different but are more closely related to plants in Alaska than are other plants in North America. For instance, Murray found members of the Senecio class of sunflowers in the Altai Mountains of Siberia. It is called by a different name but strongly resembles the Alaskan Senecio. The presence of the flower is a puzzle, Murray reports, as it raises questions about past land connections. "When were we in that close contact and what caused a wide separation? Why wouldn't there be more of this species in between Alaska and Siberia in the Far East?" Murray and others are working to find answers to such questions.

Domesticated reindeer outside of Anadyr.

Medical and Health Research

Broad scope and wide participation characterize cooperative studies of human activities in the North. Agreements involve several institutes on the Soviet side and bring together both biomedical scientists and health professionals.

Agreement for Alaska–Siberia Medical Research Program Between the University of Alaska–Anchorage, and Siberian Branch, U.S.S.R. Academy of Medical Sciences

This program is divided into a series of projects developed jointly by teams of interested scientists. On the AMS side, participants come from the Institutes of Cytology and Genetics, Internal Medicine, Physiology and others. U.S. participants include not only University of Alaska researchers from Anchorage and Fairbanks, but also professionals from the University of Washington, the Sleep Disorder Center of the Seattle Providence Medical Center, and other affiliations.

Components of the Alaska–Siberia Medical Program currently include a series of discrete projects, each conducted by a team of Soviet–American specialists: alcoholic behavior and genetic predisposition, nutrient intake of Chukotka and Alaska natives, seasonal affective disorder (SAD), chemical and structural studies on brain circuits and nerve fiber growth, comparative studies of lactoferrin from Alaska and Siberian Natives, influence of cold adaptation on chemical control of ventilation, and addictive behavior in Alaska and Siberia and implications for research in circumpolar nations. Papers presented in October 1990 at the Arctic Science Conference in Anchorage reported on several of these comparative studies.

Agreement on Circumpolar Health Studies Between Institute of Circumpolar Health Studies, University of Alaska–Anchorage, and Institute of Biological Problems of the North, Far Eastern Branch, U.S.S.R. Academy of Sciences

The agreement, which also includes the State of

Koryak woman at winter camp, –55°C.

Alaska and Magadan Oblast departments of health, is an ongoing program in which scheduled North-related topics cover physiological aspects of human adaptation, peculiarities of human nutrition and health, immune systems and mechanisms of immuno-deficiency, medical anthropology and human health, demographics and epidemiology of Northeast U.S.S.R. and Alaska, and social and psychological aspects of health. A major component of the program are the medical exchanges, which focus on areas of mutual concern, such as trauma and orthopedics, maternal and childhood care, crisis intervention, nontraditional health care techniques, delivery of rural health care services and treatment of alcoholism.

Social Science Research

Two principal agreements cover research on economic and social topics.

Agreement on Scientific Cooperation Between Institute of Social and Economic Research, University of Alaska–Anchorage, and Department of Comprehensive Research of Natural and Economic Systems, Far Eastern Branch, U.S.S.R. Academy of Sciences

University of Alaska and Institute of Economics and Industrial Production, Siberian Branch, U.S.S.R. Academy of Sciences

ISER's Alaska–Soviet activities began in the late 1960s with extensive literature and some faculty exchanges with institutes and universities in Novosibirsk, Moscow, Irkutsk, Leningrad, Khabarovsk and Magadan. The current program involves direct research collaboration as well as exchanges dealing with social and economic change, patterns of governance and administration, environmental protection and comparative area studies. Focusing on specific problems of developing Northern and Arctic regions, topics under the Siberian agreement cover methods of utilizing resources, development of production and enterprises, effects of economic decisions on land and people, management of economic policies, budgeting, interaction between government and enterprises, technological and economic problems of resource exploitation, provision of infrastructure, problems of social development on demography, migration and quality of life.

In an attempt to facilitate bilateral trade and investment, one case study by ISER's John Tichotsky is looking at how the Soviet economic system functions in a joint venture between the Soviet Agricultural Ministry and Indian Valley Meats of Alaska. He is studying three aspects: the Soviet economy in general, joint ventures between an American small business operation and the Soviet government, and how Alaskans in particular can do business with the Soviets. Indian Valley Meats struck one of the first Alaskan joint ventures after *glasnost*; it involved setting up a plant in Chieu-

kha, located in the Soviet Far East, for making reindeer sausage. The plant is built and in operation, and the study may provide insight on the barriers and successes involved in an early joint venture in a remote area of the Soviet Far East.

Geophysical Research

The Geophysical Institute, the university's largest research organization, has extensive ties with researchers around the world. Two agreements illustrate current involvements with the U.S.S.R.

Cooperative Agreement Between Geophysical Institute, University of Alaska–Fairbanks, and Polar Geophysical Institute, U.S.S.R. Academy of Sciences

The current agreement continues a program initiated in 1984. The program is directed at joint observation campaigns, standardization and exchange of instruments and data, exchange of visits and joint meetings. The two institutes are currently collaborating in the analysis of satellite data. The agreement also provides for cooperative participation in Geospace Environmental Monitoring, International Solar Terrestrial Program and other programs.

Cooperative Agreement Between Geophysical Institute, University of Alaska–Fairbanks, and Permafrost Institute, Siberian Branch, U.S.S.R. Academy of Sciences

This agreement addresses problems critical to all northern regions. It is directed toward developing and analyzing permafrost data bases, including mathematical modeling of geocryological processes by applying numerical and analytical methods to the solution of environmental and engineering problems; utilization and development of remote sensing techniques for geographic, environmental and geocryological photointerpretation of landscapes in permafrost zones from aerial and space photos; investigation of the physics and chemistry of frozen soils and permafrost; and problems of construction on permafrost.

Agricultural Research

The final example of University of Alaska interaction with Soviet science lies in the area of agriculture.

Agreement on Scientific and Technical Cooperation Between Agricultural and Forestry Experiment Station, University of Alaska–Fairbanks, and V.I. Lenin All-Union Academy of Agricultural Sciences, Siberian Branch

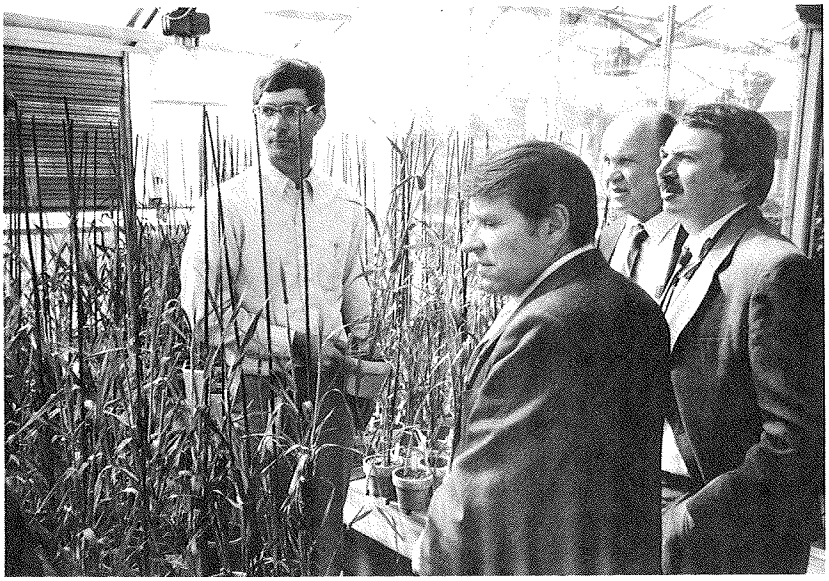
Cooperative agricultural research dates back to the 1960s and was quite active in the 1970s. The present agreement calls for joint research, trading of samples of agricultural crops, exchange of scientists and students, and other cooperation on intensive agricultural production in extreme natural and climatic conditions. The detailed program of

scientific and technical cooperation includes the topics of grasses and cereals, agricultural practices, reindeer and Yakut horses. Many of these activities underway include the exchange of seeds and other samples. An active cooperation program also exists between the Plant Materials Center, Alaska State Division of Agriculture, and the Institute of Biological Problems of the North.

Joint Soviet–American Research Center

There are many other agreements and activities that could be described, such as those of the university's Institute of Marine Science with the U.S.S.R. Academy of Sciences' Institute of Marine Biology of the Kola Scientific Centre in Murmansk and its Institute of Marine Biology of the Far Eastern Branch in Vladivostok. It is hoped,

however, that those listed above give a flavor of the variety and scope of interaction between the University of Alaska and Soviet institutions. One more agreement needs to be mentioned, for it provides promise of further strengthening U.S.–U.S.S.R. scientific relations: the Agreement for the Establishment of the Soviet–American Scientific Research Center in Magadan, U.S.S.R., between the University of Alaska and the Far Eastern Branch, U.S.S.R. Academy of Sciences.



Discussion of tests of early maturing varieties of barley from Siberia.

The newly created Joint Center is designed to provide a research support base and to facilitate scientific collaboration and coordination in the Soviet Far East and Siberia. It is located in Magadan, the major city in northeastern U.S.S.R. With existing flights to Anchorage and regular air service between the two cities scheduled for 1991, the center is strategically located to help link U.S. and U.S.S.R. researchers.

The Joint Center's facilities and support will be available to other institutions and scientists in both the United States and the Soviet Union. Laboratories, offices and meeting rooms, computer and communication facilities, and administrative support will serve groups and individuals conducting research there or using the center as a base of field operations. The center also will be used for education and training. An important element of the center will be direct satellite telecommunications connections to the University of Alaska in Anchorage and Fairbanks. Other research institutions may be given access to the U.S.S.R. through the university.

The Joint Center is initially being accommodated on two floors of the new Institute of Biological Problems of the North (IBPN) research complex being constructed in Magadan. The first stage, scheduled for completion in early 1991, will include a general laboratory, a computing and communications center, a computing instruction laboratory, a conference room, offices and storage facilities. The total IBPN complex will also provide dining rooms, an international conference hall, mechanical shops, a garage and other facilities.

The center is being developed on a shared basis. The U.S.S.R. Academy of Sciences is providing the building, utilities and other infrastructure, and support services. The U.S. side is assisting with interior finish (including wall panels, floor covering, dropped ceilings and lights) and equipment for the center, including computers, reproduction equipment and communications. Corporate donations of materials, supplies and equipment assist such participation by the University of Alaska. Alaska Pacific University, Anchorage, is helping to equip a visitors office suite and conference room with the aid of private donations.

While the physical facility is being developed in Magadan, the Alaska counterpart is located in the University of Alaska's Office of Soviet Relations (OSR) in Anchorage. The IBPN and OSR directors serve as codirectors of the Joint Center.

Even prior to completion of the physical plant, scientific cooperation is being facilitated through the Joint Center. Procedures have been established to expedite invitations, visa processing and transportation for groups and individuals traveling to the other country. Thus, invitation requests are routinely exchanged between IBPN for the Soviet side and OSR on the U.S. side. The latter also provides information services on flights to the U.S.S.R. and assists with travel and visa arrangements.

Both conceptually and in practice, the Joint Center is more than just an arrangement between regional partners. Policy and financial support is provided by the Presidium of the U.S.S.R. Academy of Sciences and the U.S.S.R. and Russian Republic governments in Moscow. Participation in its activities is anticipated by research institutes throughout the Soviet Far East and Siberia, as well as by some in European Russia. U.S. universities have already expressed an interest in utilizing the center. Contacts and travel assistance have been given to a number of researchers from other institutions.

The first formal agreement to use the center for U.S.–U.S.S.R. scientific cooperation was executed in November 1990 by the Institute of Arctic Studies and the School of Medicine of Dartmouth College, the International Health Institute of Brown University, the Institute of Biological Problems of the North, and the Joint Center. The University of

Alaska is expected to participate in the program, which will deal principally with human ecology and resource management.

The university has actively supported establishment of the Joint Center in the expectation that the center will evolve into an ever-more-useful communication, transportation and service base for American and Soviet scientists working in northern regions. It will likely, over time, become an integral part of a circumpolar network of northern centers. That, in turn, will strengthen the university's research capability and enhance its role in the North.

Conclusion

The University of Alaska is committed to U.S.–U.S.S.R. collaboration because it provides both scientific and social benefits to Alaska and its Soviet neighbors. Cooperative research programs already cover a wide range of subject matter, and the results of joint projects to date give promise of continuing productive relationships. It is, therefore, safe to expect that the university will play a continuing role in expanding interactions of Alaska and the United States scientists with colleagues and institutions in the Soviet Union.

U.S.–U.S.S.R. Joint Committee on Cooperation in Ocean Studies

Modified from a report by Ned A. Ostenso, Executive Secretary, U.S.–U.S.S.R. Ocean Studies Agreement, NOAA

The first meeting of the U.S.–U.S.S.R. Joint Committee on Cooperation in Ocean Studies was held in Moscow, September 14–17, 1990. This committee is responsible for management of the U.S.–U.S.S.R. Agreement on Cooperation in Ocean Studies, signed June 1, 1990 in Washington, D.C., during the presidential summit meeting.

The nine-person U.S. delegation was led by Dr. John A. Knauss, Under-Secretary of Commerce for Oceans and Atmosphere and Administrator of the National Oceanic and Atmospheric Administration (NOAA). The Soviet delegation was led by Academician L.M. Brekhovskikh, member of the Presidium of the U.S.S.R. Academy of Sciences, who also chaired the meeting.

The Joint Committee approved continuation of research projects on Southern Ocean dynamics, mid-Atlantic ridge crest processes, and geochemistry of marine sediments. It also approved projects on Arctic erosional processes and gas hydrates that had been further developed since its 1988 meeting under the predecessor World Ocean agreement. Finally, the Joint Committee approved new marine research projects on diving physiology and circulation of the Bering and Chukchi seas.

In the course of the meeting, Academician Gramberg reported on recent geological–geophysical work done by Soviet scientists under the following headings:

- Geological–geophysical atlas of the Bering Sea
- Geological structure of the Amerasian Basin
- Geology of the Chukchi and Beaufort shelves
- Geological history of the Arctic region with emphasis on its glacial history
- Geotransects in the World Ocean

Members of the Soviet delegation also presented new research proposals dealing with near-bottom oceanology, geological and geophysical transects, and orientation and communication of marine mammals.

The U.S. delegation visited several institutions having major Arctic interests.

An atlas of world ocean sediments is about to be published that will include a large section on Arctic geology. Researchers are studying suspended sediments in water, air and ice, as well as runoff from Siberia into the Arctic.

The Shirshov Institute has six submersibles, including the two new Mirs. The institute conducts research on hyperbarics, diving, submersibles, lock-out diving, and saturation diving, with facilities located in Moscow, Kaliningrad and Gelendzhik. Information on the institute's fleet of research vessels and a preliminary 1990–92 cruise schedule is available.

Scientists at the Arctic and Antarctic Research Institute, State Committee for Hydrometeorology, in Leningrad, work on ice forecasting, long-range weather prediction, oceanography, and estuaries. Some areas of current emphasis include Arctic and Antarctic meteorology, climate, ozone, air–sea interaction, and polar medicine (human adaptation to cold). The institute has a large department of ice and ocean physics which uses remote sensing. One ice tank has been in operation since 1955. The delegation visited a second one (30 m long × 5 m deep × 5 m wide) which is under construction and scheduled for completion in the near future. AARI supports drifting ice stations in the Arctic, two of which are occupied at this time. They have six research vessels; the *Federov* is the largest and the

Somov is ice-strengthened. About 2000 people work for AARI, 1000 of which are scientists. The institute regularly invites specialists from other Soviet laboratories and institutes to participate in its research.

The Joint Committee meeting concluded with a visit by the U.S. delegation with Academician Laverov, Chairman of the State Committee for Science and Technology.

Additional information on the agreement and research institutions visited may be obtained from Ned A. Ostenso, Executive Secretary, U.S.–U.S.S.R. Ocean Studies Agreement, NOAA, Washington, D.C.

U.S.–U.S.S.R. Conference on Environmental Conservation for the 1990s

Prepared by U.S. conference organizer Steven G. Kohl, U.S. Fish and Wildlife Service, Washington, D.C.

Since the signing of a U.S.–U.S.S.R. Agreement on Cooperation in Environmental Protection in 1972, more than 200 Fish and Wildlife Service employees, under Area V of the agreement, have had opportunities to work with colleagues in the Soviet Union. They have engaged in joint conservation projects in the areas of rare and endangered fauna and flora, migratory birds, marine mammals, and fish husbandry which have contributed significantly to the protection and management of shared species (see *Arctic Research of the United States*, vol. 2, Spring 1988, p. 54). In recognition of this long-standing relationship and of recent political changes in the U.S.S.R. that have focused unprecedented attention on environmental issues, 35 Soviet and 35 American scientists took part in a Fish and Wildlife Service-sponsored U.S.–U.S.S.R. Conference on Environmental Conservation in the 1990s, held on the campus of Washington and Lee University in Lexington, Virginia, the week of June 18–22, 1990.

The purpose of the conference, the most ambitious ever convened under the FWS–Soviet program, was to examine bilateral and global conservation priorities and formulate a blueprint for U.S.–U.S.S.R. exchange activities over the coming decade. Participants, principally from government and academic institutions, were selected to represent a diversity of disciplines in the environmental and wildlife sciences, with emphasis on potential for future interaction with counterparts in the other country. The conference agenda centered on three major themes:

- Conservation research and management in the U.S. and U.S.S.R. today
- Balancing resource development with conservation needs

U.S. and Soviet conference attendees on campus of Washington and Lee University.

• Conservation planning for the 21st Century

Each theme was divided into six subtopics and examined over the course of one working day in a combination of plenary meetings and small (12-person) discussion groups. With interpreters on hand to provide rapid translation, the debates were spirited and fast-paced, and each group presented its findings to all the participants at the daily closing plenary sessions. Assistant Secretary for Fish and Wildlife and Parks Constance Harriman, Service Director John Turner, and Deputy Director Richard Smith also took part in the conference, delivering keynote addresses during the course of the week. The Soviet delegation was led by Dr. Aleksei V. Yablokov, Member, U.S.S.R. Congress of Peoples' Deputies.

The conference produced a set of resolutions in the form of recommendations to the governments of both countries:

- Encourage policies of environmental "glasnost" at all levels of government and society in both countries
- Promote preservation of biological diversity through improved research and management of rare and endangered fauna and flora
- Establish compatible conservation information banks, with standardized format and easy accessibility
- Further develop networks of protected territories, linked by protected "ecological corridors"
- Set up a "green line" for rapid communication between government environmental agencies to facilitate exchange of information about urgent conservation issues or impending crises
- Adopt mutually developed criteria for evaluating natural resources on the basis of their economic significance as well as their intrinsic importance
- Support ecologically responsible forms of natural resource use by native inhabitants of both countries

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Shared Living Resources of the Bering Sea

U.S.–Soviet Legal and Administrative Conservation Regimes

A city like Fairbanks, Alaska—ringed by boreal forests and tundra-covered mountains—seems like a more natural setting for discussions about the Bering Sea region than Washington or Moscow—cities ringed by beltways. But last June people in all three of those cities turned their attention to the future of "Beringia" almost simultaneously, at both the Bush–Gorbachev summit meeting and at the Conference on the Shared Living Resources of the Bering Sea in Fairbanks, June 5–7, 1990.

At the summit, Presidents Bush and Gorbachev declared their intention to create a Beringian international park (see p. 13), announced settlement of a long-standing boundary dispute, and expressed shared concern about overfishing in the Bering Sea's "doughnut hole," the area beyond both nations' 200-mile zones. At the Soviet embassy, in a toast to his counterpart, President Bush hailed the new specially protected area as "a new gateway to the Arctic and a new gateway to the future."

The Bering Conference focused on the specific regimes currently used to protect and manage fisheries resources, marine mammals, marine pollution, oil and gas development, and specially protected areas. Several of the conference participants, including Professor Oran Young of Dartmouth's Institute for Arctic Studies, suggested that the region's unique natural resources and heritages would be served better by creation of a comprehensive management mechanism—an approach patterned after either the U.S –Canadian joint commission or one of the several United Nations multilateral programs, for example. Other participants, including Clarence Pautzke, Executive Director of the Northwest Pacific Fisheries Management Council, believed it was more important to concentrate on resolving specific resource conflicts rather than investing the financial and political capital necessary to create a new institutional framework.

The conference took place under the auspices of Area XI (Legal and Administrative Measures for the Protection of Environmental Quality) of the U.S.–U.S.S.R. Agreement on Cooperation in the Area of Environmental Protection. It was sponsored by the President's Council on Environmental Quality (U.S.-side chair of Area XI), the U.S. Department of the Interior, the National Oceanic and Atmospheric Administration, the State of Alaska, and the Center for Marine Conservation.

U.S. participants included representatives of the Council on Environmental Quality, the Department of the Interior (National Park Service, Minerals Management Service, Fish and Wildlife Service), the Department of Justice, the National Oceanic and Atmospheric Administration, the Marine Mammal Commission, the Office of the Governor of Alaska, the Alaska Department of Environmental Conservation, the Alaska Department of Fish

Prepared by Jonathan Elkind, Council on Environmental Quality

and Game, coastal and fisheries management organizations, private attorneys, academic institutions, non-governmental environmental organizations, and industry groups.

Soviet participants included representatives of the U.S.S.R. State Committee on Environmental Protection (Goskompriroda), the Institute of State and Law, the Severtsov Institute of Evolutionary Animal Morphology, the "Priroda" Scientific Research Institute, the Institute of Biological Problems of the North (Magadan), Lvov State University, the Magadan Regional Committee on Environmental Protection, and the non-governmental Social–Ecological Union.

Prior to the conference, the Soviet delegates took part in site visits in northwest Alsaka. They visited National Park Service facilities in Nome, which administers the Bering Land Bridge National Preserve, and flew around Cape Kruesenstern National Monument, Noatak National Preserve, and Kobuk Valley National Park.

Soviet and American planners intend to hold a follow-up event in the Soviet Far East in August of next year to discuss:

- Legal and natural science topics relating to the organization and management of the Beringian international park
- Use of environmental impact assessment documents for proposed national government activities in the Bering Sea region
- Participation of Native peoples in the analysis of environmental effects of natural resources conservation and management in the Bering Sea region
- Comprehensive protection of the environment and natural resources of the Bering Sea region

U.S.–U.S.S.R. Study of Beringian Paleoclimates

In August 1990, a team of four Soviet and five American researchers completed a second summer of cooperative field research to examine the climate and vegetation history of Beringia.

Two sites were cored in the north-central Alaska Range: Wonder Lake in Denali National Park and Tenmile Lake in the Tangle Lakes region. Another two localities, Salmon and Glacial Lakes in the Kigluaik Mountains of southern Seward Peninsula, were also sampled. With the exception of Salmon Lake, which had an unusually short record, these cores should date at least to late glacial times. The Quaternary geology around each lake was examined to gain insight into the origin and sedimentation history of the lake basins. The records from Wonder and Tenmile Lakes, currently located in forest and tundra, respectively, should better define possible early- to mid-Holocene fluctuations in spruce populations in interior Alaska. Glacial and Salmon Lakes will provide the first vegetation histories for southern Seward Peninsula. Lowered water levels were observed in numerous kettle lakes, with some having dried completely. Near-shore vegetation and comparison to air photos indicate this change probably occurred in the past 15–25 years. Both an observed expanded range of alder and lowered lake levels may result from recent climate changes associated with greenhouse warming.

Following last summer's precedent, each laboratory will have primary responsibility for pollen analysis of a specific core: Wonder Lake (North East Institute), Tenmile and Salmon Lakes (Ohio State), and Glacial Lake (Washington). Geochemical and tephra analysis of all cores will be done at the Magadan laboratory.

During the course of field work and visits to the American laboratories, the palynological and geochemical data extracted from the Kolyma cores collected in August 1989 were discussed. Further discussions on standardizing laboratory and analytical techniques, begun last year, were continued. The need to establish a regional tephrachronology was emphasized.

Preliminary pollen counts were made on four Soviet cores collected in summer 1989 during the Kolyma expedition. These counts provided the opportunity to discuss regional differences in Beringian climate and vegetation history. Two of these cores encompass at least late-glacial times to the present and display a basal herb zone similar to that found in Alaskan lakes. The Holocene records from the Jack London and Elikchan areas of the upper Kolyma drainage differ from one another, reflecting variations in the composition and development of shrub-tundra and forest. These differences may relate to long-term summer temperature and winter precipitation gradients. The synchrony of Beringian climate change and development of the modern Arctic and Subarctic flora can be better evaluated as radiocarbon dates become available.

Tephra analysis was completed at the North East Interdisciplinary Research Institute. These results indicate that the tephra in the Jack London and Elikchan Lakes represents the same ash fall. Additional samples are being analyzed at the University of Alaska tephra laboratory for comparative purposes. The results of the pollen analyses from Elikchan Lake have been published by Lozhkin and Federova (1989). Comparative analyses of

Participants in the joint program include: P.M. Anderson and L.B. Brubaker, University of Washington; P.A. Colinvaux and W.R. Eisner, Ohio State University; D.M. Hopkins, University of Alaska; A.V. Lozhkin, L.N. Kotova and A.I. Polujan, North East Interdisciplinary Research Institute, U.S.S.R. Academy of Science, Far East Branch; and V.V. Davydov, Foreign Cooperation Department, U.S.S.R. Academy of Science

the two regions were discussed at the June 1990 International Conference on the Role of the Polar Regions in Global Change in the Arctic (Fairbanks, Alaska).

Results from the 1989 Kolyma expedition indicate that the vegetational and climatic history of the Soviet Northeast is complex and will likely require a sampling design similar to that employed in Alaska, i.e. a dense grid of sites instead of a single latitudinal transect. Because data are fewer in western than in eastern Beringia, it is likely that a three-year project will yield only a very general sense of paleoclimatic changes in the Soviet Northeast. However, it is thought that this collaborative work will provide a strong framework for addressing future research questions.

Besides data collection, a second concern of this project is the development of consistent methods of analysis and interpretation between Soviet and American workers. The two teams have been fortunate to meet every six months since the inception of the project. Improved communications and frequent exchange of project personnel will enhance interpretation of the paleoenvironments of Beringia (see article on p. 13, this issue).

Cooperative Arctic Coastal Research

Processes, Permafrost and Hydrates, and Stratigraphy

Prepared by the workshop conveners: Robert Taylor, Atlantic Geoscience Center, Dartmouth, Nova Scotia, and Peter Barnes, U.S. Geological Survey, Menlo Park, California

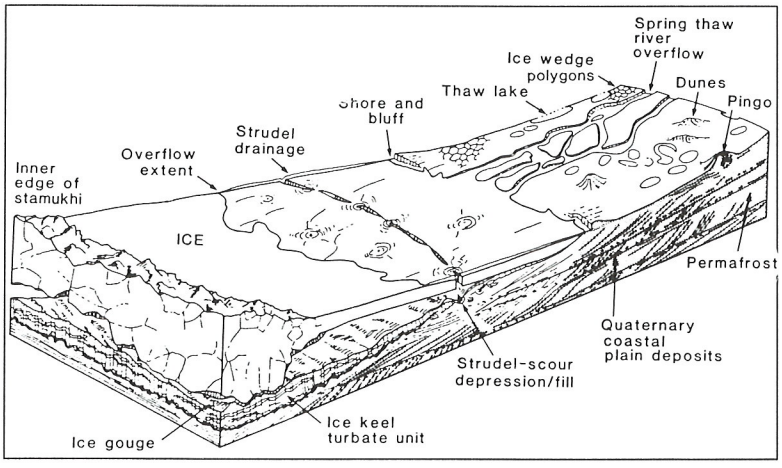
Arctic scientists attended an informal workshop at Boulder, Colorado, in March 1990 to discuss Arctic coastal processes and their prominence among national concerns. The Arctic coast is relevant for its emphasized role in climate and global change and its unexplored and developing resource potential. The coast stands out as a clear mirror of local and regional environmental change, a major technological boundary for engineering and development activity, a diverse and critical ecologic environment, and, where preserved, a varied and informative indicator of past geologic environments. The broad political and scientific interest in the Arctic stresses its key role in understanding global problems and as a resource warehouse. The new potential for international collaborative efforts and significant advances in surveying and sampling technology all suggest that now is a propitious time to implement a coordinated program of cooperative geologic studies. The U.S. and Canadian Geological Surveys are currently the leading national agencies with expertise and interest in this research area.

Workshop discussion focused on successful past and existing joint programs, and exploration of expanded, mutually beneficial present and future research. Increased management support and funding will be required to effect improvement in both existing programs and proposed joint studies. Discussions determined that future USGS/GSC cooperative research should proceed and/or develop along three paths:

- Coastal processes, focusing on ice as a unique geologic agent but recognizing the need for companion hydrologic studies
- Coastal permafrost and hydrates, with emphasis on the character and distribution of hydrates and the thaw stability of coastal permafrost
- Coastal and nearshore stratigraphy, aimed at understanding the present and past signature of coastal climate and processes

The geographic focus initially should be the coasts of the Alaskan and Canadian Beaufort Sea, although expansion of the effort to the Chukchi Sea and Canadian Arctic islands is required to meet the program goals.

Agreement was reached that the expeditious approach would focus coastal studies on a series of onshore–offshore corridors in varying coastal environments, extending and supplementing an already productive but limited set of corridors along the Beaufort coast. The proposed corridor sites would extend from the coast of the Chukchi Sea to the coast of the Arctic islands and serve as cornerstones against which to measure past and present conditions, to study processes, and to assess short- and long-term change. Efforts are going forward to identify and synthesize data on existing and planned corridor sites, with selection to be made at a meeting planned for late 1990. It was further agreed that plans for an international symposium on Arctic coastal processes should proceed. A workshop report is available from Robert Taylor.



U.S.–Canada Joint Ice Working Group

For several decades the U.S. has enjoyed excellent cooperation with Canada in the area of ice programs, working together in addressing common problems, and developing compatible formats and standards for the collection, analysis, archival and dissemination of ice data and data products. These collaborative efforts have been conducted through the International Great Lakes–St. Lawrence Ice Information Working Group, which was established in 1972. They have been particularly useful and economical in addressing common interests in the Great Lakes–St. Lawrence region.

In late 1984, the U.S. National Oceanic and Atmospheric Administration and the Canadian Atmospheric Environment Service began to discuss broadening their scope of cooperation to include the Arctic areas and the Labrador Sea, recognizing the growing interest in the use of these areas by both countries and the value and economics of cooperative activities in operational ice services. Through letters of agreement, the U.S.–Canada Joint Ice Working Group was established in 1986, incorporating into it the International Great Lakes–St. Lawrence Ice Information Working Group. This new and expanded cooperative program provides a forum by which the research and operational ice communities of both countries can informally exchange information on ice services. From these exchanges, the Working Group seeks to have better coordination of ice information and data exchange and to avoid duplication of effort in various ice activities.

The Working Group offers recommendations to senior management in the areas of improved communication arrangements for exchanging and collecting ice and related data, particularly satellite-derived data, and efficient methods or systems for disseminating ice data, forecast products, etc. The Working Group encourages and helps facilitate efforts in the research and development of ice analysis and forecasting capabilities—numerical ice prediction models, remote sensing interpretation and applications, digital image processing capabilities. It also encourages the exchange of technical knowledge through reciprocal training and staff exchange programs. Through its ties and discussions with the marine community in both countries, the Working Group defines the needs and sets priorities for providing ice information services.

Eight standing committees and three *ad hoc* groups have been formed:

Standing Committees

- Terminology and Map Standards
- Operations/Center Cooperation
- Training and Personnel Exchanges
- Great Lakes Issues
- Data Archival Problems
- Icebergs
- Communication Issues
- Research and Technology

Ad Hoc Groups

- Application Software and Products
- Digital Communication Protocols
- Global Climate Change Ice Activities

The Working Group has been instrumental in developing a plan for exchanging products and maintaining communications to back up each country's ice center in case of a natural or man-made disaster. A major endeavor currently being undertaken by the Working Group is the establishment of a high-speed communications data link between the NOAA/ Navy Joint Ice Center in Suitland, Maryland, and the AES Ice Center in Ottawa, Ontario. This line would transmit and receive real-time ice data, analyses, forecasts and bulletins and serve as a backup in the event of operational failure. Implementation of the data link is scheduled for fall 1991. With the expectation of an onslaught of ice data coming from several satellites due to be launched in the near future, the Working Group is addressing critical issues such as the current and future capability to receive, effectively archive and manage the data, establishment of formats for data exchange, etc.

The Working Group is managed by the National Ocean Service of NOAA and the Central Services Directorate of AES under the leadership of two Co-Chairmen: Mr. John Carey, Deputy Assistant Administrator, National Ocean Service, NOAA, and Mr. Phil Aber, Director-General, Central Services Directorate, AES. At the present time Working Group membership is limited to government agencies, with U.S. participants representing NOAA, Navy, NOAA/Navy Joint Ice Center, U.S. Coast Guard, Army Corps of Engineers, and NASA. Canadian representation is from the AES of Environment Canada.

Meetings have been held annually for the past four years, with the U.S. and Canada alternating as hosts. The next meeting is tentatively scheduled to be held in Canada in May 1991. Copies of minutes or additional information may be obtained by writing to the National Ocean Service, NOAA, International Affairs Staff, N/IA, 1825 Connecticut Ave. NW, Suite 607, Washington, D.C. 20235.

Prepared by John J. Carey, Deputy Assistant Administrator, National Ocean Service, NOAA

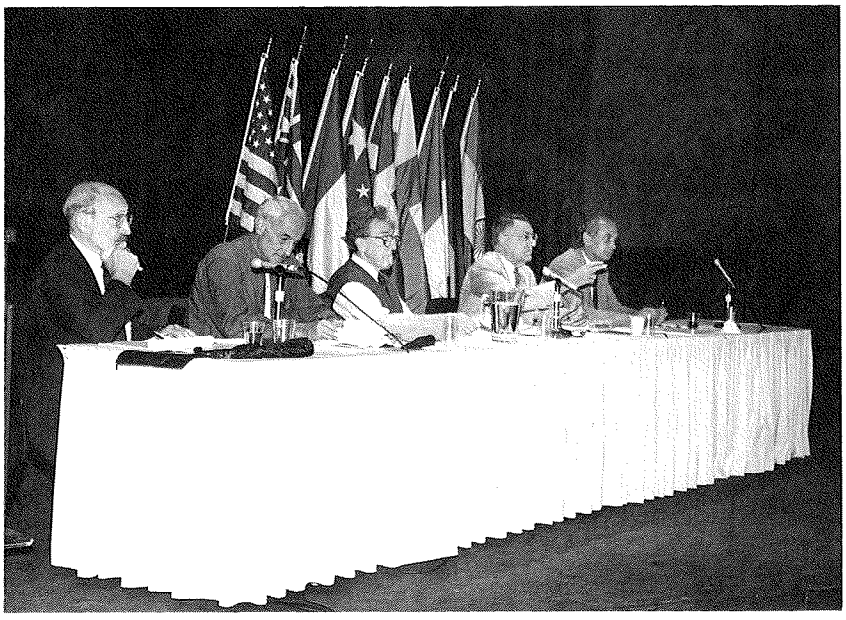
Conferences

The Role of the Polar Regions in Global Change

The International Conference on the Role of the Polar Regions in Global Change took place at the University of Alaska–Fairbanks (UAF) on 11–15 June 1990. The goal of the conference was to define and summarize the state of knowledge of the role of the polar regions in global change, and to identify gaps in knowledge. To this purpose, experts in a wide variety of relevant disciplines were invited to present papers and hold panel discussions. Both disciplinary papers and interdisciplinary ones linking global change to atmospheric, oceanographic, cryospheric, or biological and social processes were presented. While there are numerous conferences on global change, this one dealt specifically with the important role that the polar regions play.

Over 400 scientists from 15 different countries attended and presented 200 papers on research in the Arctic and Antarctic. The papers were distributed among seven major themes and sessions, each having about three invited papers, a dozen contributed papers, and 15–20 poster presentations. The topics were:

- Detection and Monitoring of Change
- Climate Variability and Climate Forcing
- Ocean–Sea Ice–Atmosphere Interactions and Processes
- Effects on Biota, and Biological Feedbacks
- Ice Sheet, Glacier and Permafrost Responses and Feedbacks
- Paleoenvironmental Studies
- Aerosols and Trace Gases



Francis Bretherton from the University of Wisconsin set the stage by describing the scientific and political challenges posed to researchers by global change. Most of the papers that followed pointed out and illustrated the importance of the polar regions in global change, including the following:

- Early detection of climate change
- Permafrost sources of CO_2 and CH_4
- Ozone holes and their biological effects
- Arctic haze effects on biota and climate
- Snow and ice feedbacks
- Deep-water formation and CO_2 sinks
- Glaciers, ice sheets and sea level
- Socio-economic impacts
- Paleoclimatic data from the polar regions

On detection, for example, many polar parameters, including an apparent global reduction in sea ice cover, earlier onset of snow melting in Alaska, higher permafrost temperatures, and negative mass balances of alpine glaciers, seem to indicate a continuing warming trend. This cannot, however, be unambiguously identified as due to the global greenhouse effect. The presentation by Peter Wadhams of the Scott Polar Research Institute in the U.K., describing changes in Arctic sea ice thickness derived from upward-looking sonar measurements on nuclear submarines cruising under the ice, was one of many papers making this point.

Climate analysis and diagnostic studies indicated the patchy regional nature of global temperature increases and decreases over the past few decades. Alaska currently appears to be one of the hot spots, and Tom Royer of the University of Alaska–Fairbanks found interesting correlations between Alaskan atmospheric and oceanic temperatures and the 18.6-year lunar tidal fluctuations. The large uncertainties, including clouds and their effects on the Earth's climate, were discussed by Graham Stephens of Colorado State University.

Ice in its many forms, both as an indicator of climate change and as an active component in climate-affecting interactions and feedbacks, was a major topic in many of the sessions. Norbert Untersteiner of the University of Washington drew a distinction between the frequently quoted positive snow albedo feedback and a negative sea ice feedback of thin, growing ice in which latent heat is involved. There were also several papers on the mass balance of Greenland and Antarctica, including those of Bill Budd of the University of Melbourne and Charles Bentley of the University of

Wisconsin. Studies of snow accumulation rates and ice volume fluxes around the coastline of Antarctica seem to indicate that the Antarctic ice sheet is getting thicker due to increased snowfall. Satellite altimetry over Greenland also appears to indicate a growing ice sheet.

The paleoclimatic session included papers on pollen, tree rings, ice cores and ocean sediments. Claude Lorius from France discussed the latest data and analyses of the Vostok deep ice core, including its temperature and CO_2, methane and dust content. The extraordinary correlation between temperature and CO_2 still requires a satisfactory explanation, particularly in terms of causes and effects.

On the final day of the conference three panels met to discuss problems and priorities in polar research. Panel 1, dealing with research coordination, identified better international cooperation involving all polar scientists; establishment of joint observational systems and networks, including satellites; information exchange through a common clearinghouse; addressing education and manpower needs; and closer ties between Arctic and Antarctic researchers, as top priorities.

Panel 2, addressing societal problems of global change, recommended the establishment of an international program of social sciences in global change (perhaps under the International Arctic Science Committee); a reexamination of the scenarios of climate change in the polar regions; the inclusion of social scientists to a greater extent in future global change planning efforts; and the development of suitable curricula on global change at all educational levels.

Panel 3, addressing polar data and information problems, recommended the establishment of a well-organized polar data directory building on present efforts, including those of the U.S.; free exchange of data with other countries having polar data sets; use of improved technologies, e.g. CD-ROM; retrieval of endangered data sets of retiring scientists through funding of sabbaticals to the latter; and improving data set quality.

The conference was co-hosted by several national and international scientific organizations, including the American Association for the Advancement of Science, American Geophysical Union, American Meteorological Society, Arctic Institute of North America, U.S. Arctic Research Commission, Arctic Research Consortium of the United States, International Glaciological Society, Oceanography Society, and Scientific Committee on Antarctic Research of ICSU. The local host institutions were the Geophysical Institute and the Center for Global Change and Arctic System Research, both at UAF.

Prepared by Gunter Weller, Conference Organizer, University of Alaska–Fairbanks

Third Northern Regions Conference

Hundreds of international leaders from 11 nations gathered in Anchorage September 16–20, 1990 to map out strategies for cooperation among the Arctic regions and establish a permanent secretariat to give regional leaders a collective voice.

The gathering—the Third Northern Regions Conference—offered political leaders, businessmen and others the opportunity to pull the region's diverse and often antagonistic voices together on issues ranging from trade ties to security concerns to indigenous peoples' rights. It also offered a chance for the "wise men of Arctic affairs," Terrence Armstrong, George Rogers and Graham Rowley, to connect with the younger, emerging leaders from the Soviet Union, Japan and other Arctic nations.

The conference, organized by the Northern Regions Conference Non-Profit Corporation, attracted 552 national and international guests. The distinguished group included 23 regional governors attending a two-day summit on "Models for Environmental Cooperation" and 165 international business leaders, who issued a list of recommendations for developing trade relations in the Arctic through use of Asian and European capital. Some 200 participants also joined the political and social workshop sections.

Ideally, a conference is a forum that allows people to explore topics of mutual interest. This conference offered such an opportunity, particularly given the nature of the Soviet delegation. The caliber of individuals brought together for the Anchorage venue represented the highest-ranking group of Soviets to visit the West Coast of the United States since Alaskans and Soviets began gingerly testing the limits of *perestroika* in 1988.

Alexander Khomyakov, First Deputy of Economic Ties for the Russian Federation, led a 63-member Soviet delegation that included governors from six Soviet territories, including the market-oriented governor of Sakhalin Island, Mr. Federov, as well as a top KGB administrator responsible for border guards on the edges of Soviet territory. Soviet interest in the conference focused predominantly on the International Business Forum and the establishment of a permanent Northern Regions Forum. The Russian Federation was especially interested in the regional cooperative orientation of the conference. The gathering allowed Soviet participants time to discuss deals, sign protocols and meet with fellow northerners and Asians with an eye toward absorbing information on market economics and democratic systems.

The impressive Soviet delegation was complemented by an equally distinguished gathering of

Chinese leaders from Heilongjiang Province and Beijing and Japanese leaders from Hokkaido Island. Canadian leaders from the northern provinces and Ottawa joined old Arctic hands from the U.S. and Scandinavia.

"Whatever else was accomplished at the Northern Regions Conference in Anchorage . . ., one message should ring out clearly: Alaska is fully capable of hosting a complicated, multinational assembly."
Howard Weaver, Editor, Anchorage Daily News

As Governor Steve Cowper noted in his welcoming address, only time will tell whether the conference was successful in helping participants view one another more as partners and friends in regional cooperation and less as pawns in a diplomatic game of chess. Some successes are already apparent and noteworthy:

- The establishment of a permanent secretariat for the Northern Regions Conference. The secretariat, agreed to by the key government leaders attending the conference, is to conduct ongoing advocacy and research work on northern models of cooperation in economics, science and technology.
- A statement of intent signed by the governors in attendance that calls on the Arctic nations to move beyond traditional bilateral efforts and push for true regional cooperation on issues of shared importance. As part of the statement notes: "The states, provinces, territories, countries and autonomous regions of the North share common concerns regarding environmental protection, economic well-being and the appropriate role of regional governments in decision-making which affects the North."
- The signing of protocols and memorandums of understanding. Ainu leaders from Japan wishing to return to Soviet-controlled Sakhalin Island signed a Memorandum of Understanding with Soviet leaders that aims to facilitate the reunification of the Ainu people. As well, eight business people from the U.S. and Soviet Union negotiated a protocol that agrees to assess the technical and economic feasibility of using Soviet icebreakers to punch a northern sea route for Pacific-to-Atlantic trade.

Northern Regions Conference staff are currently compiling a summary of conference proceedings. The NRC office in Anchorage may be reached at 907-561-2260.

Prepared by Ginna Brelsford, Alaska Governor's Office of International Trade, Anchorage, Alaska

13th Polar Libraries Colloquy

One-hundred-thirty librarians, information specialists and researchers interested in polar information participated in the 13th Polar Libraries Colloquy, June 10–14 in Rovaniemi, Finland. Fifteen countries were represented at the colloquy, which was officially opened by the Secretary General of the Finnish Ministry of Education, Mr. Jaakko Numminen, and the Director of the Arctic Centre at the University of Lapland, Mr. Veijo Ilmavirta.

Problems of procurement and storage of Arctic and Antarctic knowledge were discussed during the first session. Representatives from Alaska, Norway and the Soviet Union presented reports.

The second day, sessions started with "Collection of Polar Literature on CD-ROM." A new CD-ROM called "PolarPac" was described by librarians from the University of Alaska–Fairbanks. The colloquy participants generally had favorable impressions of this comprehensive polar regions data base. "Arctic and Antarctic Regions CD-ROM" was also available for demonstration.

In the afternoon the sessions continued with "Procurement and Storage of Arctic and Antarctic Knowledge" and "Research Institutes of the Arctic." Representatives from Alaska, Canada, Finland, Norway, Sweden and the United States presented papers on several interesting themes.

During the course of the colloquy, an excursion was made to the gallery of the northern artist Reidar Särestöniemi in Kittilä, 120 kilometres north of Rovaniemi. A second excursion, to Finnish Lapland, included visits to a nature park, guide centre and the Gold Prospectors' museum. A paper session was presented at the Museum Auditorium. A photographic exhibition by Anatoli Burykin from the Soviet Union called "West Siberian Reindeer Herders" opened during the week in the city center. On the last day, the Soviet delegation presented a session on economical and environmental problems and situations in the Soviet Arctic.

The administrative meeting of the Polar Libraries Colloquy is traditionally a forum for discussion of business matters. The meeting was chaired by Mrs. Martha Andrews, Institute of Arctic and Alpine Research, University of Colorado.

Members of the University of Alaska–Fairbanks Library presented copies of PolarPac to the Arctic Centre. Copies were also offered to those willing to evaluate the product.

Nita Cooke explained the reorganization of the Boreal Institute for Northern Studies in Canada. It will now be called the Canadian Circumpolar Institute, and the holdings of the Boreal Institute will be a separate collection of the University Library of Alberta.

The participants discussed the idea of formalizing a Colloquy Group, and eventually organizing an association. A more formal structure would benefit colloquy activities, including preparation and distribution of a directory, newsletters and proceedings. An organization committee was formed to examine this idea and report back to the group at the next colloquy. Current Arctic newsletters (*Man and the Biosphere, Northern Sciences Network* and the *International Permafrost Association News Bulletin*) will be listed in a future issue of *Polar Libraries Bulletin* .

A proposal was accepted that the colloquy endorse an agreement on resource sharing for the *Antarctic Bibliography*.

A volume entitled *Proceedings of the 13th Polar Libraries Colloquy* is to be published in the Arctic Centre's series.

An invitation to hold the 14th Polar Libraries Colloquy at Byrd Polar Research Center, Columbus, Ohio, was accepted. Invitations to attend will be extended to the editors of the major polar scientific and social science journals.

Prepared by Liisa Kurppa, Arctic Centre, University of Lapland, Rovaniemi, Finland

The 8th International Congress on Circumpolar Health

Approximately 750 delegates from 15 countries attended the 8th International Congress on Circumpolar Health in Whitehorse, Yukon, during the week of May 21–25, 1990. Dr. Brian Postl, President of the Canadian Society for Circumpolar Health, presided. The Scientific Program Committee was chaired by Dr. Kue Young, Winnipeg, Manitoba.

The international congress is held: 1) to bring together medical scientists, health care delivery specialists, health administrators and health consumers to discuss the state of the art in their respective fields; 2) to allow national and international participants to observe and discuss the health situation in their own countries; and 3) to relate solutions to health problems in other parts of the world to the unique problems of circumpolar regions. Symposia on circumpolar health have been held in Fairbanks, Alaska (1967), Oulu, Finland (1971), Yellowknife, N.W.T. (1974), Novosibirsk, U.S.S.R. (1978), Copenhagen, Denmark (1981), Anchorage, Alaska (1984), Umeä, Sweden (1987), and Whitehorse, Yukon (1990). The next two congresses are planned for Novisibirsk, U.S.S.R., in 1993 and Anchorage, Alaska, in 1996.

Officers of the International Union for Circumpolar Health elected on the last day of the congress were: J.P. Hart Hansen, President; Carl Hild, Vice-President; and Kue Young, Secretary

Some 420 papers and posters were presented in the following categories: mental health, infectious disease, oral health, nutrition, chronic diseases, injury, environmental, health care of mothers and children and of the elderly and disabled, occupational health, cold physiology and human biology, and health care delivery.

The Congress was broadened this year to include sessions on the health needs of indigenous peoples and presentations by Native health practitioners. The topics ranged from traditional Native medicine and indigenous control of health services to health education in the villages and professional development.

Six workshops or meetings of working groups were held:

- Circumpolar Cancer Study Group
- U.S.S.R.–Canada Transarctic Skitrek
- SCAR (Scientific Committee on Antarctic Research) Working Group on Human Biology and Medicine
- SCAR *Ad Hoc* Group on Antarctic Space-Related Human Factors Research
- Viral Hepatitis Workshop
- Otitis Media and Hearing Loss Workshop

At the closing banquet, the Jack Hildes Memorial Award was given to five individuals to honor their long-standing contributions to health research in the circumpolar regions: Dr. Frederick Milan, Professor Emeritus at the University of Alaska–Fairbanks, for his work in cold physiology among Eskimos; Dr. Henri Torsius from Finland; Dr. Otto Schaeffer from Edmonton, Canada; Dr. Yuri Nikitin from Novosibirsk, U.S.S.R.; and Evelyn Campbell, a nurse from Labrador, Canada.

7th Inuit Studies Conference

The 7th Inuit Studies Conference was held August 19–24, 1990 at the Universitv of Alaska–Fairbanks. It was the first time for this conference to be held in the United States. Three-hundred-ninety-two participants from 14 countries and a large number of local residents, governmental agency personnel and students attended.

One-hundred-twenty papers were presented in five plenary sessions and 13 symposia, of which four were devoted to Eskaleut linguistics, Inuit bilingualism and language use in education in Inuit communities. A day-long symposium was devoted to new findings in the archaeology of the Siberian Northeast. Eminent archaeologists representing the Academy of Sciences of the U.S.S.R., Far East and Siberian Sectors (from Kemerovo, Vladivostok, Krasnoyarsk, Novosibirsk and Magadan), discussed recent advances in their fields. The symposium generated a great deal of interest in the light

of the proposed international park and wildlife refuge in the area of "Beringia" which will span U.S. and U.S.S.R. territories.

Soviet participation was extraordinary. In addition to specialist scholars, academicians, university professors and museum workers from Moscow, Leningrad and other centers of learning in the U.S.S.R., a 32-person delegation represented the Association of the Peoples of the Russian North and the Native Association of the Chukotka and Kolyma. Among this group were the National Association President, Vladimir Sangi, well-known poet, author and bi-cultural educator, a Nivkh from the Amur-Sakhalin region; A. Ompyrkir, President of the Regional Association, a Chukchi; and Semeon Gorokhov, a member of the National Association Council and Head of the Department of History of Yakutia and Peoples of the North at the University of Yakutia in Yakutsk.

The Eskaleut communities and organizations of Alaska rendered material support, and the level of participation, both as presenters and attenders, was very high. The Siberian Yup'ik community of St. Lawrence Island was extremely supportive, and several Yup'ik representatives assisted as interpreters for the Soviet visitors, Yup'ik being the common language.

In association with the conference, the University of Alaska Museum and the Institute of Alaska Native Arts opened the exhibit, "The Bending Tradition," and sponsored a workshop conducted by a noted Alaskan Native artist on revival of the wood-bending craft. The Fairbanks public television station (KUAC) produced a TV film festival, airing such films as the widely acclaimed *Uksuum Cuyai: The Drums of Winter* by the University of Alaska Museum Native Heritage Film Project; *Super Shamoo* by the Inuit Broadcasting Corporation; *Traditional Inupiat Healing* by Northwest Television Center (the two last-mentioned produced in Canada); *Following The Star*, produced by Alexei Isaac, KYYK-TV, Bethel, Alaska; and the award-winning *A Legacy of Faith* by KUAC.

The conference dinner speaker, Major General John W. Schaeffer, Alaska National Guard, an Inupiaq, addressed the need for interaction between scholars and the indigenous peoples, the need to recognize problems the Inuit face, their need for assurance in land tenure and use and self-governance, and the need for assistance in coping with the major social ill, alcohol addiction. The dinner concluded with the presentation of traditional Yup'ik songs and dances by the Nunamta ensemble, led by the young and gifted founder, Chuna MacIntyre of Eek, Alaska. Members of the ensemble were joined by Siberian Yup'ik in impromptu shared dances. As a special sign of their appreciation for the conference, the Siberian Yup'ik, representing three major Native ensembles from the Sireniki, Novoe Chaplino and Naukan communities in the U.S.S.R., gave a special performance which was open to the public.

The Rasmuson Library of the University of Alaska–Fairbanks welcomed the visitors to Special Collections, mini-lectures and an exhibit of watercolors by the late St. Lawrence artist, Florence Naapaq. A cold weather photography and film-making workshop organized by Lael Morgan, a noted Alaskan journalist and faculty member of the Department of Journalism and Broadcasting of the University of Alaska–Fairbanks, was well attended.

The conference provided the forum for the formation of an International Arctic Social Sciences Association (see p. 73, this issue).

Proceedings of the conference will be available in computerized form and hard copies will be available upon request. In addition, proceedings of specific plenary sessions and symposia will be published as special issues of the international journal *Études/Inuit/Studies* (Francois Therien, editor).

The next Inuit Studies Conference will be held in 1992 in Quebec City, Quebec, Canada, with Laval University serving as host.

Prepared by Lydia Black, conference organizer, University of Alaska–Fairbanks

Sixth International Conference on Hunting and Gathering Societies

The Sixth International Conference on Hunting and Gathering Societies (CHAGS 6), hosted by the Department of Anthropology and College of Liberal Arts, University of Alaska, and chaired by Linda Ellanna, was held 27 May through 1 June 1990. It attracted approximately 300 participants from more than 30 countries. For the first time in the 24-year history of CHAGS, Soviet scholars participated—20 from academic institutions in Moscow, Leningrad and elsewhere. This was the first known case of participation by Ainu people as well. Over 20 individuals from what the Wenner Gren Foundation classified as "third world countries" were also partially sponsored and in attendance. An effort was made to include indigenous peoples from North America and elsewhere in the world where funding permitted.

The U.S. and Alaska organizing committees and symposia chairs and associate chairs were responsible for the academic program, which included both formal papers and visual presentations or poster sessions. Titles included:

• Economic, Political, and Ideological Dimen-

sions of Gender, chaired by Jane Goodale, University of Wisconsin, and Catharine McClellen, Bryn Mawr College.
- "Original Affluence" Revisited: Reproductive Strategies, Work Effort, and Resource Utilization, chaired by Eric Smith, University of Washington, and Elizabeth Cashdan, University of Utah
- Past and Present Health and Nutrition Patterns, chaired by George Armelagos, University of Florida, and Patricia Draper, The Pennsylvania State University
- Recent Soviet Hunter-Gatherer Research, chaired by Roger Powers, University of Alaska–Fairbanks
- Contemporary Issues and Indigenous Peoples, chaired by Linda Ellanna and M.E. Colleen Lazenby, University of Alaska–Fairbanks
- Ethnoarchaeology, chaired by John Yellen, National Science Foundation, and Pauline Wiessner, Forschungsstelle für Humanethologie in der Max Planck Gesellschaft
- Education and Language Policy Toward Hunter and Gatherer Societies in the Context of Modern Nation States, chaired by Phyllis Morrow, University of Alaska–Fairbanks, and J.V. (Jay) Powell, University of British Columbia
- Land Use and Land Rights: Indigenous and Contemporary Patterns, chaired by Ernest S. (Tiger) Burch, Jr., Smithsonian Institution, and Ann Fienup-Riordan, Anchorage

In addition, the organizing committees sponsored three distinguished speakers: Richard B. Lee, University of Toronto (who was awarded an honorary doctorate from UAF); Betty Meehan, The National Museum of Australia; and Illarion (Larry) Merculieff, Alaska Department of Commerce and Economic Development.

The conference was embellished by an opening reception sponsored by UAF Chancellor Patrick O'Rourke and convener Dean Anne Shinkwin, College of Liberal Arts; an opening dinner, during which Meehan delivered her address and a Yup'ik (Eskimo) group from Alaska, the Nunampta Dancers, performed; a luncheon, during which Merculieff, a Pribilof Island Aleut, delivered his dynamic speech; a presentation by the Greenlandic Tukak Theater of Denmark; a visual anthropological series chaired by Leonard Kamerling of the Alaska Native Heritage Film Project; exhibits of Okiek African ethnographic photographs by Corrine Kratz and Alaskan mainland Yup'ik photographs by James Barker; an exhibit of Ainu material culture from Hokkaido; several less formal receptions; a closing dinner and dance, during which Lee gave his distinguished presentation and received his honorary degree; and several post-conference anthropological and archaeological field trips.

It should be noted that included among several "firsts" for CHAGS conferences, in addition to Soviet and Ainu participation, was the formation of an interim committee to ensure the existence and location of CHAGS 7. The committee is composed of the chairs of CHAGS 6 and the previous five CHAGS conferences and "Man the Hunter." Namibia was the first choice for location and the University of Hawaii at Honolulu the second, but no decision was made during the conference and the U.S.S.R. has become another possible location. The interim committee also will make certain that information useful to CHAGS 6 organizers regarding funding and many other matters will be transferred systematically to organizers of CHAGS 7, thereby eliminating repetitive efforts. All resolutions passed by the plenary session were mailed to participants in CHAGS 4, 5 and 6.

Major financial supporters of the conference included the National Science Foundation, Wenner-Gren Foundation, Soros Foundation, Alaska Humanities Forum, Alaska State Department of Commerce and Economic Development, and the University of Alaska Statewide and Fairbanks systems. There were many other financial supporters too numerous to mention here; to all of them the organizers owe their thanks.

In summary, a general assessment of this conference by participants was that it was immensely successful in bringing together academics with common and related interests from throughout the world. Ellanna and Ernest S. Burch, Jr. are planning to edit a two-volume work of selected papers from this conference with preliminary titles of *Hunters and Gatherers in the Modern World* (Ellanna) and *The Operation of Hunter and Gatherer Societies* (Burch). A two-volume set of preliminary papers went to all participants prior to the conference. For more general information about CHAGS 6, contact Linda Ellanna at the Department of Anthropology, University of Alaska–Fairbanks, Alaska 99775 (Phone 907-474-6751, Fax 907-474-7720).

Prepared by Linda J. Ellanna, Associate Professor, Department of Anthropology, University of Alaska–Fairbanks

Interagency Arctic Data

Prepared by Mary Jones and Douglas Posson, U.S. Geological Survey

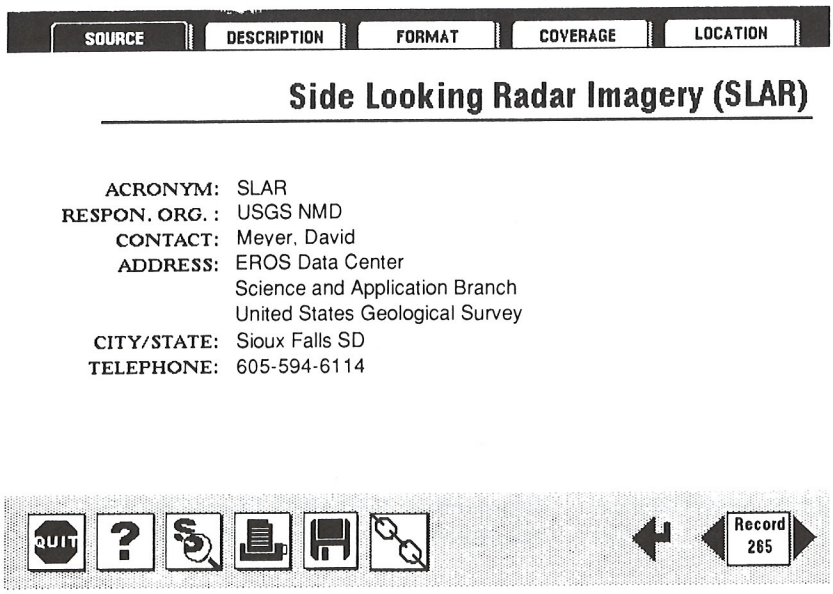
The Arctic Environmental Data Directory Working Group was formed in summer 1988 through the Interagency Arctic Research Policy Committee and the Interagency Working Group on Data Management for Global Change to guide the development of a data directory for the Arctic. AEDDWG, with representatives from United States and Canadian agencies and academia, is providing a catalyst for data management in the Arctic. Its goal is to identify and describe key Arctic data sets of government agencies, universities and private sector. Approximately 330 descriptions of Arctic data sets (including about ten from other Arctic countries) have been catalogued into the Arctic Environmental Data Directory, a subset of the Earth Science Data Directory maintained by the U.S. Geological Survey. The AEDD is linked to the Global Change Master Data Directory in order to improve access to and use of Arctic data by global change scientists, and of global change data by Arctic scientists.

In addition to identifying major data holdings, one of the goals of the Interagency Arctic Research Policy Committee is to encourage activities that facilitate the exchange and use of Arctic information. AEDDWG is developing a prototype electronic publication series known as the Arctic Data Interactive. The ADI, based on multimedia and compact disc technologies, is aimed at enhancing the dissemination and use of the AEDD, and is designed for use by research scientists, policy makers and educators. The data directory is packaged on the ADI along with other bibliographic information and selected numeric, image, textual and tabular data sets selected from Federal, State and local agencies and the U.S. National Snow and Ice Data Center. Full texts of scientific articles with illustrations are included where they provide documentation on salient features of the data sets. The project emphasizes both interagency information dissemination and interdisciplinary Arctic research. The prototype ADI contains selected data and information on global change studies, environmental interaction, social sciences, policy and management, and scientific literature. It includes the complete text of the first biennial revision of the U.S. Arctic Research Plan, which can be easily searched using hypermedia tools. The CD ROM is being developed on an Apple Macintosh computer and will also be made compatible with MS-DOS (IBM-compatible) personal computers.

Preliminary versions of the ADI have been demonstrated extensively by AEDDWG to potential users in academic, agency, and international groups, including the IARPC Seniors (June 28, 1990) and staff and the Conference on the Role of the Polar Regions in Global Change. Comments from those people were incorporated into the current working version. Publication and distribution of the final CD ROM version of the prototype ADI is planned for the first quarter of fiscal year 1991. Comments from users of about 500 copies of the prototype will be incorporated into future issues.

At the June 1990 IARPC Seniors meeting, agreement was reached for interagency funding support from IARPC member agencies to expand and enhance the AEDD and to continue development of the ADI. During fiscal years 1991 and 1992, AEDDWG will expand the AEDD to include descriptions of additional Arctic data sets, especially those maintained by organizations in the State of Alaska and Canada. To populate the AEDD, AEDDWG will identify major research projects in the United States and other Arctic countries, meet with program managers and scientists to encourage participation, and reach out to the academic and government research communities. AEDDWG is also developing procedures to ensure the quality of the data directory.

Further information can be obtained from Mary Jones, USGS, Reston, Virginia 22092, or Paul Brooks. U.S. Geological Survey, 4320 University Drive, Anchorage, Alaska 99508-4664.



Screen from ADI showing data directory information and link icons (bottom) for related material.

Electronically Accessible Polar Bibliographic Information
An Update

Polar bibliographic information is accessible through a variety of electronic media or computer-based services. Remote access is achieved through the personal computer (PC), which can now also access information on CD-ROM.

Online access to polar bibliographic information has been available in some degree since the early 1970s through subject-oriented reference databases such as GEOREF and BIOSIS, from DIALOG and ORBIT. In the late 1970s some Arctic and cold regions databases became available online—COLD through ORBIT, ASTIS and BNT on QL Systems, and BOREAL through CAN/OLE. However, the need for special searching skills and the high cost of accessing these databases resulted in limited use, especially among academic users.

With the advent of the PC in the 1980s, access to commercial online databases became easier, and the PC with modem also opened the door to "free" use of some very large libraries' online public access catalogs (OPACs). The PC also allows access to computer networks and electronic mail services, such as OMNET/SCIENCEnet, which provide gateways to bibliographic databases.

Information services now available on CD-ROM, online or through computer networks and electronic mail, are providing several reference and cataloging databases oriented toward polar and cold regions literature covering all subjects. The bibliographic utilities, or cataloging databases [OCLC, Inc., Research Libraries Information Network (RLIN), WLN, and University of Toronto Library Automation System (UTLAS)], contain several thousand polar regions monograph holdings and relevant serials title holdings.

Some half million bibliographic records are now available electronically to serve researchers, managers, and policy makers concerned with polar areas.

These databases are described below, followed by an outline of the services through which they are provided.

Databases

COLD: File description/subject coverage: All aspects of snow, ice and frozen ground. Construction of buildings, railroads and hydraulic structures, drilling operations and other engineering tasks in cold regions. Ice breakers and ice navigation. Arctic ecology, especially its disturbance by human activities. All disciplines dealing with Antarctica, the Antarctic Ocean and Subantarctic islands. Sources are Library of Congress, Cold Regions Research and Engineering Laboratory, the National Science Foundation and others. Monographs, technical reports, journal articles, conference papers, patents and maps produced worldwide. Wide coverage of Russian and other foreign material; Antarctic records have English abstracts. Inclusive dates: 1951–current. Updated frequency: for CD-ROM—twice yearly; for ORBIT—quarterly. File size: 147,000. Origin: prepared by the Science and Technology Division of the Library of Congress.

Boreal Northern Titles (BNT): File description/subject coverage: A comprehensive collection of indexes to articles covering the Arctic and Antarctic regions and the North American north including Alaska and Canada, as well as Scandinavian countries, Iceland and Siberia. Emphasis is on Native peoples and the Canadian north. Sources are: KWIC (Key Word in Context) index to all periodical articles, government documents and newspaper headlines from the library's subscription holdings. Inclusive dates: January 1972–current. Update frequency: Irregular. File size: 182,100. Origin: Canadian Circumpolar Institute, University of Alberta, Edmonton, Alberta, T6G 2G1, Canada.

BOREAL: File description/subject coverage: The collection is area-oriented, covering primarily the Canadian Western Arctic and Alaska, with secondary emphasis on the Canadian Eastern Arctic and the mid-Canada corridor and other circumpolar regions. Sources: Online catalog of the Boreal Institute Library. Monographs, theses, atlases, consultant reports, curriculum materials and grey literature. Inclusive dates: 1977–current. File size: 43,000. Origin: Canadian Circumpolar Institute, University of Alberta, Edmonton, Alberta, T6G 2G1, Canada.

ASTIS: File description/subject coverage: multi-disciplinary Arctic bibliographic and research project database. The oceanographic emphasis of ASTIS is on the Canadian Arctic and Canadian Arctic waters, but relevant material from other Arctic regions is also included. All subjects are included. Sources: Arctic Institute library collection; the University of Calgary Libraries, Pallister Resource Management Ltd., Northern Oil and Gas Action Program of Indian and Northern Affairs, Canada. Research project descriptions from the Science Institute of the NWT, the NWT Department of Renewable Resources and the Northern Heritage Center. Inclusive dates: 1980–

Prepared by Martha Andrews, Institute of Arctic and Alpine Research, University of Colorado, CB 450, Boulder, Colorado 80309

current. File size: 29,400. Includes abstracts (usually by author). Origin: Arctic Institute of North America, University of Calgary, Calgary, Alberta, T2N 1N4, Canada.

SPRI: File description/subject coverage: Multidisciplinary subject coverage reflecting that of current international polar and glaciological research. Specific strengths: anthropology, atmospheric chemistry and physics, climate change, cold regions engineering, exploration, geology, natural resources, oceanography, snow and ice issues, zoology. Sources: coverage, over 900 series, relevant books, reports and theses will also be listed. Inclusive dates: 1988–current. Update frequency: Quarterly? File size: 27,000. Origin: The Library, Scott Polar Research Institute, University of Cambridge, Cambridge CB2 1ER, England.

Services

OMNET/SCIENCEnet: Electronic Communications Network. Provides gateway service, on a subscription basis, to COLD, ARCTIC (aka ASTIS), and BOREAL. Complete descriptions and access instructions are available through "Compose manual." These surcharged databases require prior authorization. The NSIDC catalog of cryospheric data sets does not require a subscription. A bulletin board, POLAR.LIT, has been established for communication between providers and users of polar information. Several other bulletin boards of interest to the polar community are also provided. SNOW.ICE.DATA details data services of the National Snow & Ice Data Center, World Data Center for Glaciology. ICE.OCEAN reports on meetings related to sea ice or polar oceanography. ARCTIC.LOGISTICS for information on current logistics capabilities and availability.

QL Systems Ltd.: Kingston, Ontario, K7L 1G1, Canada. With global database search capability researchers may combine databases and use one search strategy on ASTIS, BNT, SPRI (and also YKB—abstracts, articles, periodicals, theses and other publications pertaining to the Yukon, 5,247 records).

Arctic and Antarctic Regions CD-ROM: National Information Services Corporation, Suite 6, Wyman Towers, 3100 St. Paul Street, Baltimore, Md. 21218. At present includes the following databases: COLD, ASTIS, SPRI, CITATION (the online catalog of the WDC-A, Glaciology, Boulder, Colo.) and C-CORE (the online index from the Centre for Cold Oceans Resources Engineering, St. John's, Newfoundland.

POLARPAC CD-ROM: The CD-ROM product mastered by WLN contains a single file comprising both monographic and serial records. It was demonstrated at the 13th Polar Libraries Colloquy in June 1990. The monographic component is downloaded from WLN (with components from OCLC and RLIN) and contains polar collections and/or entire library holdings of major Alaskan libraries, Dartmouth College Library and the Institute of Arctic and Alpine Research at the University of Colorado. The serials component contains several thousand titles with holdings from 38 polar-oriented libraries worldwide. Future updates will expand the serials holdings, and will also add monographic records from World Data Center–A for Glaciology, University of Colorado, Arctic Environmental Information and Data Center, University of Alaska–Anchorage, and the Goldthwait Polar Library, Byrd Polar Research Center, The Ohio State University.

Japanese Firms Fund Faculty Chair at UAF

To support teaching and research related to mounting global environmental concerns, 11 Japanese corporations have agreed to establish an academic chair at the Geophysical Institute, University of Alaska–Fairbanks. Chair funds will support two professors whose work relates to the global environment. The chair will be named in honor of Dr. Kyoo Wadati, a noted Japanese geophysicist who discovered earthquakes at depths greater than 300 kilometers, a pioneering contribution to the concept of plate tectonics. Dr. Wadati, who was awarded the Order of Culture in 1985, is the former director general of the Japanese Meteorological Agency, president of the Japanese Academy, and an honorary citizen of Tokyo. The gift, valued at more than one million dollars over five years, was promoted by the Committee for Energy Policy Promotion of Japan. The work of scientists supported by the Wadati Chair will focus on climate change and other geophysical issues, and will enhance development of the Center for Global Change and Arctic System Research which was established at UAF this year. "The chair professors at the Geophysical Institute will play a pivotal role in integrating global change studies at UAF and they will contribute to the important questions we face about the Earth as a system," said Syun-Ichi Akasofu, Geophysical Institute Director.

New Publications

Northern Notes

Dartmouth College and its Institute of Arctic Studies and Institute on Canada and the United States announced the inaugural issue of *Northern Notes* on May 1, 1990. This Occasional Publication of the John Sloan Dickey Endowment for International Understanding will be published once or twice a year and is available to interested readers at no cost. In a sense, the new publication is the successor to *Polar Notes*, which appeared in 14 volumes between 1959 and 1975. *Northern Notes* will, for the most part, comprise papers prepared by scholars in some way associated with Dartmouth College. Contact Jean L. Hennessey, Director of the Institute on Canada and the United States, or Oran R. Young, Director of the Institute of Arctic Studies, Dartmouth College, Hanover, New Hampshire 03755 for more information.

Polar and Glaciological Abstracts

Cambridge University Press has announced the publication of *Polar and Glaciological Abstracts*, the first specialist abstracting publication to offer comprehensive coverage of the literature of the polar regions. Produced by Scott Polar Research Institute, Cambridge, it provides convenient access to the rapidly growing research and scholarship of all relevant disciplines. Readership includes research institutes, government departments, university and college libraries, general readers with an interest in polar regions, and specialists in polar research. *Abstracts* is published in January, April, July and October. For further information contact Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge CB2 2RU, England. Phone (0223) 312393, Fax (0223) 315052, Telex 817256.

Proceedings, Circumpolar Ecosystems in Winter

The February 1991 issue of *Arctic and Alpine Research* (vol. 23, no. 1), will be devoted to the Proceedings of the Symposium on Circumpolar Ecosystems in Winter, a conference held in Churchill, Manitoba, February 16–21, 1991. Single copies will be available for $22.50 (U.S.) to libraries and $13.00 to individuals. Order from Editor, *Arctic and Alpine Research*, Campus Box 450, INSTAAR, University of Colorado, Boulder, Colorado 80309. Phone (303) 492-3765, Fax (303) 492-6388.

Science in Northwest Alaska

Science in Northwest Alaska: Research Needs and Opportunities on Federally Protected Lands, Alaska Quaternary Center Occasional Paper No. 3, June 1990, is available from the Alaska Quaternary Center, University of Alaska–Fairbanks, Alaska 99775, phone (907) 474-7817, Fax (907) 474-7969, $5.00 plus $3.50 shipping and handling in U.S. and Canada (see *Arctic Research of the United States*, Vol. 2, Spring 1988, p. 60–61).

Arctic and Global Change

A 160-page book, *Arctic and Global Change*, based on the symposium of the same name held in Ottawa in October 1989 is available. Editor of the proceedings is James A.W. McCulloch, retired Director General of the Canadian Climate Center. This publication may be ordered from the Climate Institute, Suite 402, Pennsylvania Ave. SE, Washington, D.C. 20003 ($25 U.S. plus $2 for postage and handling).

Interagency Arctic Research Policy Committee

Eighth Meeting: June 28, 1990

Committee Members or Agency Representatives Present: *Erich Bloch, Frederick Bernthal, National Science Foundation; Tom Hamilton, Department of Agriculture; Ned Ostenso, Department of Commerce; Ted Cress, Department of Defense; Phil Stone, Department of Energy; Robert Singyke, Department of Health and Human Services; Harlan Watson, Department of Interior; Ambassador Edward Wolfe, Deputy Assistant Secretary, OES, Department of State; Robert Knisely, Department of Transportation; Robert Worrest, Environmental Protection Agency; Dixon Butler, National Aeronautics and Space Administration; Nancy Maynard, Office of Science and Technology Policy; Jack Fellows, Office of Management and Budget; Robert Hoffmann, Smithsonian Institution*

Chairman Erich Bloch convened the meeting in closed session. He noted the increasing importance of the Arctic and the increasing opportunities for research. He called for a discussion of the Federal agency role and asked agencies to consider how to take advantage of the new opportunities.

Jack Fellows of the Office of Management and Budget discussed the process used in developing the global change research budgets and suggested that IARPC consider a similar planning process. (At this point, Dr. Frederick Bernthal, Deputy Director of NSF, assumed the chair so that Mr. Bloch could attend a Congressional hearing.)

Dr. Bernthal asked the agencies to consider a statement on interagency cooperation. The statement would set forth the sense of IARPC that interagency programs should be developed, beginning in FY 1992. After some discussion, the agencies approved a revised statement of IARPC principles as follows:

"IARPC agrees that a more comprehensive approach to funding of research and baseline programs is required to insure a long-term viable research and development presence in the Arctic. This presence will insure support of the national needs, which include renewable and non-renewable resource development, environmental protection, and partnerships with the private sector and residents of the Arctic. It will complement other national and international scientific programs such as global change. To this end the IARPC agencies, in concert with OMB policy, agree to develop, starting in 1992, an integrated interagency program sufficient for meeting national needs."

Dr. Bernthal then turned to a discussion of interagency funding of the proposed Arctic data management system. Mr. Douglas Posson of the U.S. Geological Survey demonstrated the data system, known as Arctic Data Interactive (ADI). Harlan Watson of the Department of the Interior then proposed that agencies jointly support the cost of developing the Arctic Environmental Data Directory (AEDD) and the prototype system. The cost is estimated at $400,000 per year. Response was favorable. It was agreed that a formal request would be sent out from IARPC to each agency requesting that agencies provide appropriate contributions to the data management system for both FY 1991 and 1992.

Dr. Bernthal then adjourned the closed session and reconvened the meeting in open session. He called on Robert Hoffmann, Smithsonian Institution, to report on the Social Science Task Force. Dr. Hoffmann reported that the task force had formulated its terms of reference and prepared a principles statement for the conduct of Arctic research. After discussion, the Committee approved both the statement of principles and the terms of reference for the task force. The principles statement was subsequently published in the Spring 1990 issue of *Arctic Research of the United States*, p.110 and reprinted in this issue (see page 105). The task force will operate for an initial period of two years; its major objectives will be to:

- Facilitate coordination among social science, health and medical research in the Arctic
- Prepare research and budget cross-cuts for Arctic social science and health research
- Facilitate implementation of Arctic social science research policies among Federal agencies and among Federal, State and other institutional organizations
- Promote educational and training opportunities in the Arctic
- Advance public understanding of Arctic social science research
- Encourage the development of international cooperation in Arctic research
- Prepare a statement of principles for the conduct of research in the Arctic applicable to all scientists working in northern regions

Dr. Bernthal next turned to Arctic data management activities. Mr. Posson again demonstrated the ADI system for the benefit of the people attending the open session.

Edward Wolfe of the Department of State reported on recent international activities related to the Arctic (see p. 65, this issue). The International Arctic Science Committee is to be formally established in late August at a signing ceremony in Resolute, Canada. IASC will develop guidelines

Prepared by Charles E. Myers, National Science Foundation

for cooperative scientific research in the Arctic. Participation will be open to all countries engaged in significant Arctic scientific research. Mr. Wolfe then reported on the second consultative meeting on the Protection of the Arctic Environment, held at Yellowknife, Canada, in April 1990. A seven-person delegation led by the Department of State represented the U.S. and participated in the development of a strategy for Arctic environment protection. The issue of Arctic monitoring emerged as one with great potential for future cooperation.

Dr. Bernthal then turned to the next agenda item, the Arctic Oceans Research strategy. He noted that the Arctic Oceans strategy had been published as a formal IARPC document. He then called on Leonard Johnson of the Office of Naval Research to report on a proposal for a coordinated international Arctic research program. The program, provisionally known as the Arctic International Science Year, would have the goal of coordinating a series of proposed multinational projects during the period April 1993 to September 1994, encompassing research from the ionosphere to the Earth's crustal processes. The Committee suggested that this proposal be discussed at a future meeting of the International Arctic Science Committee.

Dr. Bernthal then called on Philip Johnson to report on behalf of Chairman Juan Roederer of the Arctic Research Commission. Dr. Johnson noted that the Commission had published several reports since the last IARPC meeting, including the Annual Report, the report on Recommendations for Improvement of the Scientific Content of Environmental Impact Statements, and the report on Recommendations for Arctic Engineering Research. Dr. Johnson also noted Erich Bloch's departure as chairman of IARPC and read two letters addressed to Mr. Bloch—one from the current chairman of the Commission, Dr. Roederer, and one from the Commission's first chairman, James Zumberge.

United States Arctic Research Commission

Twenty-first Meeting: April 10–11, 1990

Commission Members Present: *Juan G. Roederer, Chairman; Ben C. Gerwick, Elmer E. Rasmuson, John H. Steele, and Jerry Brown and Jack Talmadge representing Erich Bloch.*
Staff: *Philip L. Johnson, Executive Director; Lyle D. Perrigo, Staff Officer*

Commission Advisory Group: *George B. Newton, Analysis and Technology, Inc.; David Hofmann, University of Wyoming*

Visitors: *Shere Abbott, Polar Research Board, NRC; Lawson Brigham, Craig Dorman, Susumu Hunjo and James Lynch, WHOI; Jack Clark, Memorial University of Newfoundland, Canada; Henry Cole, Governor's Office, Alaska; Ira Dyer, Massachusetts Institute of Technology; Rainer Englehardt, Department of Indian and Northern Affairs, Canada; Bruce Evans, Senator Murkowski's Office; John Hobbie, Marine Biological Laboratory, Woods Hole; Lewis E. Link, CRREL; Marianne Stenbaek, Association of Canadian Universities for Northern Studies; and Neal Thayer, U.S. Coast Guard*

The Arctic Research Commission held its 21st meeting on April 10-11, 1990, at Woods Hole Oceanographic Institution in Woods Hole, Massachusetts.

Chairman Roederer reported on the publication in January of the Annual Report of the Commission, titled *Arctic Research: A Focus of International Cooperation*, and in April of the fifth report of the "Findings and Recommendations" series, *Arctic Engineering Research: Initial Findings and Recommendations*. Responses to previous sets of recommendations by the Commission have been received from the Council on Environmental Quality and the Department of Health and Human Services. The Chairman of CEQ suggested that the Commission recommendations in the report *Improvements to the Scientific Content of the Environmental Impact Statement (EIS) Process* be tried on an initial example which the Commission might identify. HHS's response to the Commission's letter indicated a willingness to consider and continue discussions on its recommendations. These recommendations were to expand the scope of the Arctic Investigations Laboratory in Anchorage and to consider an "Arctic Desk" as a focus of coordination within HHS.

Philip Johnson reported that a summary of the Commission's report on the EIS process was published in the *MAB Newsletter* and in the *American Society of Civil Engineers News*. The Commission was distributing *A Preliminary List of International Agreements for Research, Logistics, and Access Concerning the Arctic* as Background Report No. 1. A second report, *Corrosion of the Trans-Alaska Pipeline System*, is being prepared by Lyle Perrigo as Background Report No. 2.

The Chairman also reported that Alaska State Senator Drue Pearce had asked the Commission for advice regarding the report of the Alaska Oil Spill Commission, and that the Japanese have formed an Arctic Science Committee.

Interagency Arctic Research Policy Committee (IARPC)

Jack Talmadge, Division of Polar Programs, reported that Director (and ex-officio Commission member) Erich Bloch would be leaving NSF in August 1990; he urged the Commission to brief the new Director on Arctic science.

Jerry Brown, reporting for the IARPC, indicated that total interagency Arctic research expenditures for FY 1989 were $105 million, the increase due mainly to further identification of Arctic programs. An Arctic oceans research cross-cut document was issued in January, and continuing coordination is being undertaken by the five agencies involved (NSF, DOD, DOI, DOC/NOAA, and NASA). An expanded cross-cut covering the entire Arctic program is underway. Dr. Brown also reported that the Social Science Task Force of IARPC is preparing guidelines for the conduct of research in the Arctic.

Alaska Congressional Delegation

Bruce Evans reported that Senator Murkowski's office continues to request White House action on Commission appointments. Senate committee action on amendments to the Arctic Research and Policy Act of 1984 is underway.

Alaska Governor's Office

Henry Cole noted the formation of a Center for Global Change and Arctic System Research at the University of Alaska–Fairbanks. He also reported that a major international conference on the Role of the Polar Regions in Global Change would be held in June in Fairbanks and that Governor Cowper's office is hosting the Third Northern Regions Conference in September in Anchorage. Dr. Cole added that 21 projects have been funded by the Alaska Science and Technology Foundation from its endowment, which now totals $66 million (see page 54, this issue, for further details). He thanked the Commission for its support of the Foundation. Elmer Rasmuson complimented the State for the excellent report and recommendations of the Alaska Oil Spill Commission.

Status of International Activities

Philip Johnson summarized the status of the Founding Articles of the proposed International Arctic Science Committee and reported that the U.S., Canada and the Soviet Union had reached agreement on remaining issues. Formal review within each of the eight countries is progressing,

Prepared by Philip L. Johnson, Executive Director, Arctic Research Commission

and the signing and organizational meeting is anticipated by the fall of 1990. The U.S. delegation was discussed, and the Commissioners agreed that the Commission should have a continuing role in monitoring IASC.

Dr. Johnson summarized the background leading to the Consultative Meeting on the Protection of the Arctic Environment to be held in Yellowknife, N.W.T., in April 1990. Dr. Johnson is to attend as a member of the U.S. delegation.

Rainer Englehardt, Director General for Circumpolar Affairs, Department of Indian Affairs and Northern Development, summarized the status of the proposed Canadian Polar Commission. The geographic definition of Arctic would be "north of 60 degrees latitude or the southern limit of permafrost." Funding is already budgeted and a list of nominations has been prepared. The proposal has been endorsed by the Canadian Government, and enabling legislation is pending in Parliament.

Goals and Objectives Report 1990

Chairman Roederer emphasized the importance of this next report to the new Chairmen of IARPC and the Commission. Concepts for the report suggested by Commissioners included emphasis on international cooperation, establishment of an Arctic health desk to identify regional needs and help coordinate Federal and State agencies, advocation of close liaison with industry, consideration of long-term monitoring, better understanding of the central Arctic, and distinction between Federal and State priorities in Arctic science. It was agreed that the Commission should, in response to its mandate, support the oceans cross-cut component in the President's budget in a letter to Congress.

The Commission also agreed to request a report on the status of technical capability to contain and clean up oil spills in ice-infested waters and research needs from appropriate agencies.

Other Business

The Commission discussed the proposed July trip to Greenland research sites.

The Commission approved in concept the statement of principles for the conduct of research in the Arctic developed by the Social Science Task Force of IARPC based on guidelines in practice in Alaska, Canada and Sweden.

Philip Johnson introduced for discussion a draft prospectus for an Arctic Geophysical Year prepared by a subcommittee of IARPC. It was agreed that the Commission should suggest a broadened prospectus.

George Newton provided information about Congressional interest in sea ice data from submarines.

Executive Session

In executive session the Commission discussed its budget request for FY 1992 and administrative support options with the General Services Administration and the University of Alaska. New nominations for advisors were requested for the next meeting. The status of amendments to ARPA was discussed, and it was agreed that the Commission would support the amendments pending before the Senate Committee on Governmental Affairs. Dr. Johnson noted the Commission's intent to comply with the Rehabilitation Act of 1973.

Public Meeting

A public meeting was convened in Woods Hole on April 10; Craig Dorman, Director, Woods Hole Oceanographic Institution, welcomed the Commission and emphasized the importance which he assigned Arctic research at WHOI. The Commission received presentations on research activities in the eastern Arctic for its consideration when reviewing future research priorities. Marianne Stenbaek presented information on the purpose and activities of the Association of Canadian Universities for Northern Studies (ACUNS). Jack Clark reported on the Center for Cold Ocean Resources Engineering activities and cooperation with industry. Ed Link reported on research and engineering activities at the U.S. Army Cold Regions Research and Engineering Laboratory. WHOI research activities in the areas of ocean engineering, geology and geophysics, and marine policy were presented.

Forthcoming Meetings

Listed here is a compilation of forthcoming meetings, workshops and conferences on Arctic or northern topics and activities. Readers are invited to submit information on upcoming meetings, as well as reports on national or international meetings attended, to J. Brown, Arctic Research, *National Science Foundation, Room 620, 1800 G St., NW, Washington, D.C. 20550.*

1990

Third Northern Regions Conference: Cooperation in a Changing World
16–20 September 1990, Anchorage, Alaska
Contact: Ginna Brelsford, Governor's Office of International Trade, 3601 C Street, Suite 798, Anchorage, Alaska 99503
Phone: (907) 561-2260
Fax: (907) 561-4577
Telex: 25-278 SOAGOIT AHG

Second International Conference on Ice Technology
18–20 September 1990, Cambridge, United Kingdom
Contact: C.A. Brebbia, Computational Mechanics Institute, Ashurst Lodge, Ashurst, Southampton SO4 2AA, United Kingdom
Phone: 0 42129 3223
Telex: 47388 ATTN COMPMECH
Fax: 042129 2853

International Symposium on Interaction of Glaciers with the Oceans and Atmosphere, Leningrad, U.S.S.R.
23–29 September 1990
Contact: V.M. Kotlyakov, Institute of Geography, U.S.S.R. Academy of Sciences, Staromonetry per 29, Moscow 109017, U.S.S.R.
Phone: 238-1845
Telex: 411781 GLOBESU

41st AAAS Arctic Science Conference—Circumarctic Perspectives
8–10 October 1990, Anchorage, Alaska
Contact: UAA/CCCE Conferences and Institutes, Bldg. K, 3211 Providence Drive, Anchorage, Alaska 99508
Phone: (907) 786-1858

IWAIS 90: 5th International Workshop on Atmospheric Icing of Structures
29–31 October 1990, Tokyo, Japan
Contact: Japanese Society of Snow and Ice (IWAIS '90), c/o Inter Group Corporation, Akasaka Yamakatsu Bldg., 8-5-32, Akasaka Minato-ku, Tokyo 107, Japan

1991

Nordic Conference on Cold
30 January–2 February 1991, Trömso, Norway
Contact: Nordic Council for Arctic Medical Research, Aapistie 3, SF90220, Oulu, Finland
Phone: 358-81-334202
Fax: 358-81-334765

Okhotsk Sea and Sea Ice: 6th International Symposium on Okhotsk Sea and Sea Ice
3–5 February 1991, Hokkaido, Japan
Contact: Masaaki Aota/Kunio Shirasawa, Secretariat, Scientific Program Committee, Okhotsk Sea and Cold Ocean Research Association, Sea Ice Research Laboratory, Hokkaido University, Minamigaoka 6-4-10, Mombetsu, Hokkaido 094 Japan
Phone: 01582-3-3722
Fax: 01582-3-5319

Cold Weather '91—Exposition and Conference
12–13 February 1991, Arlington (Crystal City), Virginia
Contact: Coordinator, Cold Weather '91, 25 South Quaker Lane, Suite 24, Alexandria, Virginia 22314
Phone: (703) 823-2333
Fax: (703) 823-2813

Sixth International Conference on Cold Regions: Cold Regions Engineering Technology in the 21st Century
26–28 February 1991, Hanover, New Hampshire
Contact: Devinder Sodhi, USACRREL, 72 Lyme Road, Hanover, NH 03755-1290
Phone: (603) 646-4100
Fax: (603) 646-4278

Seventh International Hypoxia Symposium
26 February–2 March 1991, Lake Louise, Alberta, Canada
Contact: Conference Coordinator 1M10, McMaster University, 1200 Main Street West, Hamilton, Ontario, Canada L8N 3Z5
Phone: (416) 525-9140, ext. 2182

20th Arctic Workshop—Mesoscale Modeling
16–18 May 1991, Fairbanks, Alaska
Contact: Craig Gerlach, Alaska Quaternary Center, University of Alaska, Fairbanks, Alaska 99775-1200
Phone: (907) 474-7817
Fax: (907) 474-5469
Binet: FYAQC@ALASKA

42nd AAAS Arctic Science Conference—Circumpolar Modeling
22–24 May 1991, Fairbanks, Alaska
Contact: Neal Brown, Geophysical Institute, University of Alaska, Fairbanks, Alaska 99775
Phone: (907) 474-7999

International Arctic Technology Conference
29–31 May 1991, Anchorage, Alaska
Contact: Society of Petroleum Engineers, P.O. Box 833836, Richardson, Texas 75083-3836
Phone: (214) 669-3377
Fax: (214) 669-0135
Telex: 730989 SPEDAL

Circumpolar Sustainable Development Conference
3–8 June 1991, Surgut, Siberia
Contact: Dr. Marianne Stenbaek, Director, Centre for Northern Studies and Research, McGill University, 805 Sherbrooke St. W., Montreal, Quebec, Canada H3A2K6
Phone: (514) 398-6052

Third International Symposium on Cold Regions Heat Transfer
12–14 June 1991, Fairbanks, Alaska
Contact: Stephanie Faussett, Institute of Northern Engineering, University of Alaska, Fairbanks, Alaska 99775-0660
Phone: (907) 474-6113
Fax: (907) 474-6087

ISCORD 91, International Symposium on Cold Region Development
16–21 June 1991, Edmonton, Alberta, Canada
Contact: ISCORD 91, P.O. Box 8330, Postal station 'F,' Edmonton, Alberta, Canada T6H 5X2
Phone: (403) 450-5218
Fax: (403) 450-5198
Telex: 0372147

Tenth International Conference on Offshore Mechanics and Arctic Engineering
23–28 June 1991, Stavanger, Norway
Contact: Nirmalk Sinha, OMAE/ASME, National Research Council of Canada, Ottawa, Ontario, Canada K1A 0R6

Industrial Development of the North and the Problem of Biological Recultivation
July 1991, Syktyvkar, Komi Republic, U.S.S.R.
Contact: Inna B. Archegova, Institute of Biology, Komi Scientific Centre, Ural Division of the U.S.S.R. Academy of Sciences, 28 Kommunisticheskaya St., Syktyvkar 167610, Komi S.S.R., U.S.S.R.
Phone: 124-60-00

XIII INQUA Congress
2–9 August 1991, Beijing, China
Contact: Secretariat, XIII INQUA Congress, Chinese Academy of Sciences, 52 Sanlike, Beijing 100864, China
Phone: 863062, 868361-336,568
Cable: Beijing SINICADEMY
Telex: 22474 ASCHICN
Fax: 8011095

International Offshore and Polar Engineering Conference
11–15 August 1991, Edinburgh, United Kingdom
Contact: ISOPE-91, 4 Frederick Sanger Road, Surrey Research Park, Guildford Surrey, GU2 5YJ, United Kingdom
Phone: 44-483-301219
Fax: 44-483-302184

XX General Assembly IUGG
11–24 August 1991, Vienna, Austria
Contact: F. Nobilis, Hydrographisches Zentralburo, Marxergrasse 2, A-1030 Vienna, Austria
Phone +43 222 71100 Ext. 6944
Fax: +43 222 7139311

Glaciology Relating to Human Activities
26–30 August 1991, Lanzhou, China
Contact: Secretary General, International Glaciological Society, Lensfield Road, Cambridge CB2 1ER, United Kingdom
Phone: +223 355974
Fax: +223 336543

Symposium on the Physics and Chemistry of Ice
1–6 September 1991, Sapporo, Japan
Contact: Norikazu Maeno, Institute of Low Temperature Science, Hokkaido University, Sapporo, 060, Japan

6th International Symposium on Ground Freezing
September 1991, Beijing, China
Contact: ISGF 91, Central Coal Mining Research Institute, Hepingli, Beijing 100013, Peoples Republic of China
Phone: 421 4931
Fax: 421 9234
Telex: 22504 CCMRI CN

POAC '91, 11th Conference on Port and Ocean Engineering Under Arctic Conditions
23–27 September, St. John's, Newfoundland
Contact: Dr. Derek B. Muggeridge, Director, Ocean Engineering Research, Faculty of Engineering and Applied Science, Memorial University of Newfoundland, St. John's, Newfoundland, Canada A1B 3X5
Phone: (907) 737-8804
Fax: (709) 737-4042
Telex: 016-4101

1992

Symposium on Remote Sensing in Glaciology III
17–22 May 1992, Boulder, Colorado
Contact: Secretary General, International Glaciological Society, Lensfield Road, Cambridge CB2 1ER, United Kingdom
Phone: +223 355974
Fax: +223 336543

27th Congress of the International Geographical Union
9–14 August 1992, Washington, D.C.
Contact: IGU Congress Secretariat, 17th and M Street, NW, Washington, D.C. 20036
Phone: (202) 828-6688

29th International Geological Congress
24 August–3 September 1992
Contact: Secretary General, IGC-92, P.O. Box 65, Tsukuba, Ibaraki 305, Japan
Phone: 81-298-54-3627
Fax: 81-298-54-3629

3rd International Muskox Symposium
3–8 September 1991, Nuuk, Greenland
Contact: Danish Polar Center, 3 Hausergrade DK-1128, Copenhagen K, Denmark
Phone: 45-33-158666
Fax: 45-33-134976

Symposium on Snow and Snow-Related Problems (part of an International Forum on Snow Areas)
14–18 September 1992, Nagaoka, Japan
Contact: Secretary General, International Glaciological Society, Lensfield Road, Cambridge CB2 1ER, United Kingdom
Phone: +223 355974
Fax: +223 336543

1993

VI International Conference on Permafrost
5–9 July 1993, Beijing, China
Contact: G.D. Cheng, Lanzhou Institute of Glaciology and Geocryology, Academia Sinica, Lanzhou, China
Phone: 26726-385
Telex: 72008 IGGAS CN

Principles for the Conduct of Research in the Arctic

Introduction

All researchers working in the North have an ethical responsibility toward the people of the North, their cultures, and the environment. The following principles have been formulated to provide guidance for researchers in the physical, biological, behavioral, health, economic, political, and social sciences and in the humanities. These principles are to be observed when carrying out or sponsoring research in Arctic and northern regions or when applying the results of this research.

This statement addresses the need to promote mutual respect and communication between scientists and northern residents. Cooperation is needed at all stages of research planning and implementation in projects that directly affect northern people. Cooperation will contribute to a better understanding of the potential benefits of Arctic research for northern residents and will contribute to the development of northern science through traditional knowledge and experience.

These "Principles for the Conduct of Research in the Arctic" were prepared by the Interagency Social Science Task Force in response to a recommendation by the Polar Research Board of the National Academy of Sciences and at the direction of the Interagency Arctic Research Policy Committee. This statement is not intended to replace other existing Federal, State, or professional guidelines, but rather to emphasize their relevance for the whole scientific community. Examples of similar guidelines used by professional organizations and agencies in the United States and in other countries are listed in the publications.

These principles are to be observed when carrying out or sponsoring research in Arctic and northern regions or when applying the results of this research.

Implementation

All scientific investigations in the Arctic should be assessed in terms of potential human impact and interest. Social science research, particularly studies of human subjects, requires special consideration, as do studies of resources of economic, cultural, and social value to Native people. In all instances, it is the responsibility of the principal investigator on each project to implement the following recommendations.

1. The researcher should inform appropriate community authorities of planned research on lands, waters, or territories used or occupied by them. Research directly involving northern people or communities should not proceed without their clear and informed consent. When informing the community and/or obtaining informed consent, the researcher should identify—

a. all sponsors and sources of financial support;

b. the person in charge and all investigators involved in the research, as well as any anticipated need for consultants, guides, or interpreters;

c. the purposes, goals, and time frame of the research;

d. data-gathering techniques (tape and video recordings, photographs, physiological measurements, and so on) and the uses to which they will be put; and

e. foreseeable positive and negative implications and impacts of the research.

2. The duty of researchers to inform communities continues after approval has been obtained. Ongoing projects should be explained in terms understandable to the local community.

3. Researchers should consult with and, where applicable, include northern communities in project planning and implementation. Reasonable opportunities should be provided for the communities to express their interests and to participate in the research.

4. Research results should be explained in nontechnical terms and, where feasible, should be communicated by means of study materials that can be used by local teachers or displays that can be shown in local community centers or museums.

5. Copies of research reports, data descriptions, and other relevant materials should be provided to the local community. Special efforts must be made to communicate results that are responsive to local concerns.

6. Subject to the requirements for anonymity, publications should always refer to the informed consent of participants and give credit to those contributing to the research project.

7. The researcher must respect local cultural traditions, languages, and values. The researcher should, where practicable, incorporate the following elements in the research design:

a. Use of local and traditional knowledge and experience.

Prepared by the Social Science Task Force of the U.S. Interagency Arctic Research Policy Committee

b. Use of the languages of the local people.

c. Translation of research results, particularly those of local concern, into the languages of the people affected by the research.

8. When possible, research projects should anticipate and provide meaningful experience and training for young people.

9. In cases where individuals or groups provide information of a confidential nature, their anonymity must be guaranteed in both the original use of data and in its deposition for future use.

10. Research on humans should only be undertaken in a manner that respects their privacy and dignity:

a. Research subjects must remain anonymous unless they have agreed to be identified. If anonymity cannot be guaranteed, the subjects must be informed of the possible consequences of becoming involved in the research.

b. In cases where individuals or groups provide information of a confidential or personal nature, this confidentiality must be guaranteed in both the original use of data and in its deposition for future use.

c. The rights of children must be respected. All research involving children must be fully justified in terms of goals and objectives and never undertaken without the consent of the children and their parents or legal guardians.

d. Participation of subjects, including the use of photography in research, should always be based on informed consent.

e. The use and disposition of human tissue samples should always be based on the informed consent of the subjects or next of kin.

11. The researcher is accountable for all project decisions that affect the community, including decisions made by subordinates.

12. All relevant Federal, State, and local regulations and policies pertaining to cultural, environmental, and health protection must be strictly observed.

13. Sacred sites, cultural materials, and cultural property cannot be disturbed or removed without community and/or individual consent and in accordance with Federal and State laws and regulations.

In implementing these principles, researchers may find additional guidance in the publications listed below. In addition, a number of Alaska Native and municipal organizations can be contacted for general information, obtaining informed consent, and matters relating to research proposals and coordination with Native and local interests. A separate list is available from NSF's Division of Polar Programs.

Publications

Arctic Social Science: An Agenda for Action. National Academy of Sciences, Washington, D.C., 1989.

Draft Principles for an Arctic Policy. Inuit Circumpolar Conference, Kotzebue, 1986.

Ethics. Social Sciences and Humanities Research Council of Canada, Ottawa, 1977.

Nordic Statement of Principles and Priorities in Arctic Research. Center for Arctic Cultural Research, Umea, Sweden, 1989.

Policy on Research Ethics. Alaska Department of Fish and Game, Juneau, 1984.

Principles of Professional Responsibility. Council of the American Anthropological Association, Washington, D.C., 1971, rev. 1989.

The Ethical Principles for the Conduct of Research in the North. The Canadian Universities for Northern Studies, Ottawa, 1982.

The National Arctic Health Science Policy. American Public Health Association, Washington, D.C., 1984.

Protocol for Centers for Disease Control/Indian Health Service Serum Bank. Prepared by Arctic Investigations Program (CDC) and Alaska Area Native Health Service, 1990. (Available through Alaska Area Native Health Service, 255 Gambell Street, Anchorage, AK 99501.)

Indian Health Manual. Indian Health Service, U.S. Public Health Service, Rockville, Maryland, 1987.

Human Experimentation. Code of Ethics of the World Medical Association (Declaration of Helsinki). Published in *British Medical Journal,* 2:177, 1964.

Protection of Human Subjects. Code of Federal Regulations 45 CFR 46, 1974, rev. 1983.

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Back Cover

R/V Alpha Helix, *which is operated by the University of Alaska's Institute of Marine Science for the National Science Foundation, is shown on station in the Bering Sea ice edge zone. (Photograph courtesy of Institute of Marine Science, University of Alaska.)*

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

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NSF 90-151