

Witness The ARCTIC

Chronicles of the Arctic System Science Research Program

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Researchers and Residents Celebrate Long Collaboration

by Glenn Sheehan

The men of the first scientific expedition to Point Barrow spent two years trying to dig a hole to the bottom of the permafrost in 1881-1883. Sergeant Murdoch, who was tasked at that time with learning about Eskimo material culture, began by buying everything the Utqiagvikmiut brought to him. He observed, however, that people were selling him trash, beach debris, and fantastic conglomerations of bits and pieces sewn together. Thereafter, aware that he did not yet have the expertise to tell when people were misunderstanding or trying to fool him, Murdoch bought only one of any given type of artifact.

Since then, North Slope Natives and scientists have learned a great deal more about the permafrost—and about cooperating. Much of this has come about thanks to the presence of the Naval Arctic Research Laboratory (NARL). Founded by the Navy in 1947, NARL has been formally owned and operated since 1989 by the Barrow village corporation, Ukpeagvik Iñupiat Corporation (UIC).

In August 1997, the 50th Anniversary Celebration of NARL brought together old NARL hands from around the United States and the North Slope for scientific papers, reunions, and documentation of accomplishments.

The celebration was sponsored by the Barrow Arctic Science Consortium (BASC), a local not-for-profit organization founded in 1996 to bring scientists and the community together (see box page 2). The celebration's theme, "Science in the



NSF Director Neal Lane (left) speaks with former NARL Science Director Max Brewer (center) and Barrow resident and former ice station mechanic Frankie Akpik (right) during the NARL 50th Anniversary celebration. Brewer was honorary co-chair of the celebration (photo by Duncan Adams @ The Arctic Sounder 1997).

Community," highlighted the fact that much of the research staged out of NARL has been successful specifically because of collaboration between Native residents and scientists.

Former NARL Science Director Max Brewer told of a resupply plane that ran off the runway on an ice island research station supported out of NARL. Barrow Elder and former NARL Outside and Equipment Foreman Kenneth Toovak had little time to get the plane back on the runway, and help was not available. He commented that he had never done anything like this before. "Treat the plane as if it were a whale," he was told. With that in mind, he hitched up the plane and got it back on the runway and ready to go.

Toovak, honorary co-chair of the NARL celebration, affirmed that mutual respect and benefits have been present throughout the years. Barrow residents looked to NARL for cash incomes; they got scientific and technical educations at the same time, along with friendships that continue today. Scientists were looking for help and found that they, too, gained friends, colleagues, and educations. Sometimes their lives were saved, thanks to the traditional skills and knowledge of their Native cohorts.

John Kelley once tried to convince Toovak to take a boat from NARL to the tip of Point Barrow. Although the weather seemed favorable, Toovak told Kelley to

continued on next page

wait. When Kelley persisted, Toovak said, "If you go, you go alone, and don't think anyone can come to look for you." That dampened Kelley's fires just long enough for a major storm to arrive.

NARL air force, ground vehicles, and boats, often under Toovak's direction, have carried out many rescue missions. The spirit of working together has persisted over time. Almost all elders and middle-aged residents throughout the North Slope have worked with science projects and expeditions. Almost to a person, they state that they value and learned from the experience of working with researchers, and they want today's young people to have that experience as well.

The NARL celebration affirmed that UIC-NARL is an excellent platform from which to stage and support today's Arctic research projects. To emphasize the point, NSF Director Neal Lane announced the signing of a three-year Cooperative Agreement with the Barrow Arctic Science Consortium (see page 12). The agreement

is designed to help BASC better facilitate Arctic science, specifically by supporting the Barrow Environmental Observatory (BEO), the only long-term ecological



The 7,466-acre Barrow Environmental Observatory (BEO) east of Barrow, Alaska has been identified by the Ukpeagvik Inupiat Corporation as a permanently protected area in order to provide long-term access for terrestrial research purposes and monitoring (see box). The preliminary BEO area is rendered in blue (image courtesy of the North Slope Borough/GIS 1994).

research station ever established by Native villagers for scientific research (see box).

A former Navy commander of NARL, Brian Shoemaker, addressed UIC saying, "You are maintaining a first-rate scientific facility and doing a better job [than when the Navy ran NARL]."

Proceedings of the NARL 50th are tentatively scheduled for publication. BASC plans to make broadcast-quality videotapes of each talk, many interviews, and an overview available to the public. Audio tapes of the proceedings will form the basis for a syndicated science show of brief spots to be produced by KBRW, the North Slope's public (and only) radio station, in collaboration with BASC.

For more information, contact Glenn Sheehan at UIC-NARL in Barrow (888/NARL-SCI or 907/852-4881; fax 907/852-4882; basc@barrow.com). ■

Glenn Sheehan is Executive Director of the Barrow Arctic Science Consortium. He recently completed field work at Pingusugruk, Point Franklin on a three-year, NSF-funded archaeological project.

Barrow's Environmental Observatory and Arctic Science Consortium

Barrow's Inupiat Eskimos are the only Natives that have ever dedicated land specifically for scientific research. In 1992, the Barrow village corporation, Ukpeagvik Inupiat Corporation (UIC), established the 7,466-acre Barrow Environmental Observatory (BEO). UIC has asked the Barrow Arctic Science Consortium (BASC) to manage the site.

The BEO has been attractive to researchers in part because the immediate region has been the subject of research for 50 years. For instance, permafrost studies based out of NARL (see feature) in the 1970s gave the first inkling that global warming might be taking place. Arthur Lachenbruch and associates lowered thermistors down abandoned test bore holes in the Naval Petroleum Reserve—Alaska (NPR-A); the resulting data stimulated much of the current climate research throughout the world. Current projects on or adjacent to the BEO include:

- the Climate Monitoring and Diagnostics Laboratory (CMDL) of the National Oceanographic and Atmospheric Administration,
- the Atmospheric and Radiation Measurement (ARM) project of the U.S. Department of Energy (see *Witness* Spring 1997),
- the International Tundra Experiment (ITEX, see page 5),
- the annual BEO Snow Survey, and
- the Spectroradiometer Network (Ultraviolet Spectrophotometer Ground Station).

Local, state, and federal wildlife-management entities are conducting research on lands and waters adjacent to the BEO, and single-season scientific projects that take place throughout the year have included activities from the United States, Japan, and China.

BASC was founded in 1996 to bring scientists and the community together. Accordingly, BASC President Richard Glenn chaired the NARL 50th anniversary celebration, "Science in the Community." In addition to supplying technicians, students, and volunteers for research projects, BASC takes scientists into the community. BASC is also working with the local public radio station KBRW to develop a science series for statewide and national syndication.

To facilitate BEO research, BASC is recapturing and making available scientific data generated by previous investigations. With assistance and a grant from the North Slope Borough, the Consortium is providing Geographic Information System (GIS) mapping and overlay data for the BEO and vicinity. BASC provides logistics support (*e.g.*, laboratory space, cold and warm storage, computer hookups, all-terrain vehicles and snow mobiles, experienced guides, and technical assistants). BASC also provides background information to researchers who are in the proposal-writing stage.

For more information, contact Glenn Sheehan (888/NARL-SCI or 907/852-4881; fax 907/852-4882; basc@barrow.com). ■

ARCSS Research Opens New Areas for Inquiry

The NSF Arctic System Science (ARCSS) Program supports mostly large, long-term projects; it is especially important for this program to plan for the future. The ARCSS Committee (AC) has as part of its charge to advise the ARCSS Program about continuation of old and development of new projects in order to ensure long-term relevance and viability of the program. The AC will meet 3-4 October 1997 in Seattle, Washington to create an agenda for action over the next several years and to review science priorities.

The AC will focus on science issues that span programs and projects and that support synthesis and integration. The committee will identify science priorities and funding strategies, share these recommendations with the broader community, and take community ideas into account in recommendations made to NSF. Four themes stated in the ARCSS science plan (now in draft) will guide the identification of priorities:

- Arctic climate system and its variability,
- the role of the Arctic in global biogeochemical cycling,
- structure and stability of Arctic ecosystems, and
- links between environmental change and human activity.

At the October 1997 meeting, each major program of ARCSS will present information about predicted budget requirements (including logistics needs), relevance of proposed research to understanding the Arctic system, and the proposed start and duration of each project. AC members will recommend the phasing of new efforts within current budget realities and assess the overall priorities in the context of ARCSS Program goals.

The following key issues will provide an additional framework for discussions:

- Planning research on contemporary processes of relevance to both OAI and LAI (*e.g.*, regional climate changes, large river runoff).
- Planning additional research to gain a comprehensive understanding of past environmental variability, including regional variability, in the Arctic.
- Extrapolating global environmental

changes (*e.g.*, combined land-ocean feedbacks to global climate, including integration of Arctic processes in global climate models).

- Coupling paleoclimate and modern observational records to improve quantitative reconstructions of past conditions. Calibration of models with observations of past climate changes and with studies of processes that have large effects on climate feedbacks.
- Developing shared frameworks for integrated assessments of effects of environmental changes on Arctic peoples (*e.g.*, combined effects of marine and terrestrial changes on local food supplies).
- Reflecting global changes other than climate in predictions of Arctic environmental changes (*e.g.*, resource development, bioaccumulation of persistent organic compounds, fishing).
- Linking policy alternatives to Arctic environmental changes (*e.g.*, common scenarios for CO₂ change, energy costs).

- Including Native peoples in science planning, implementation, and interpretation (*e.g.*, Alaska Native Science Commission [see page 19], regional Native populations).
- Disseminating research results to policy and funding communities.
- Assessing implications of research results for ARCSS priorities.
- Coordinating timing of program initiatives to minimize competing budget demands.

The new plan, *Toward Prediction of the Arctic System*, will be posted for review after the meeting and will be published shortly thereafter.

For more information, contact ARCSS Program Director Mike Ledbetter (703/306-1029; fax 703/306-0648; mledbett@nsf.gov) or AC Chair Jack Kruse (413/367-2240; fax 413/367-0092; jkruse@geo.umass.edu), or see the ARCSS Web site (<http://arcss.colorado.edu>) or the ARCUS Web site (<http://arcus.polarnet.com>). ■

Russian and American Researchers Draft Guide for Arctic Shelf-Land Studies

Arctic researchers in the United States and Russia reviewed and submitted comments on the draft prospectus for the Russian-American Initiative on Shelf-Land Environments in the Arctic (RAISE) in April-June 1997. To promote bi-national evaluation of the initiative, colleagues at the Arctic and Antarctic Research Institute, in St. Petersburg translated the draft into Russian. The document will serve as a guide for American and Russian scientists to propose collaborative research to NSF and the Russia Foundation for Basic Research, respectively.

RAISE has been established to facilitate collaborative research between Russian and American scientists in order to understand processes and events in terrestrial, shelf, and ocean environments in northern Eurasia. The program focuses on the dynamics of the coupled Arctic land-shelf system in response to external forcing and internal variability on a variety of temporal and spatial scales.

Researchers aim to obtain new insights into the past and future role and response of the Eurasian Arctic to global change. They will be funded to collect data, analyze environmental responses across the land-shelf system, and develop models for predicting future change. The revised RAISE prospectus is now available through ARCUS (Internet and hard copy).

For more information, contact Steve Forman in Chicago, IL (312/413-9404; fax 312/413-2279; slf@uic.edu) or visit the University of Illinois at Chicago Department of Earth and Environmental Sciences Web site (<http://www.uic.edu/depts/geos/>). ■

OAI Launches the Year-Long SHEBA Field Experiment

Major activities for the Ocean/Atmosphere/Ice Interactions (OAI) program during the last several months include initiation of Surface Heat Budget of the Arctic Ocean (SHEBA) Phase II field work and collaborative projects, and the first OAI All Hands Meeting and Planning Workshop.

Surface Heat Budget of the Arctic Ocean (SHEBA) Phase II

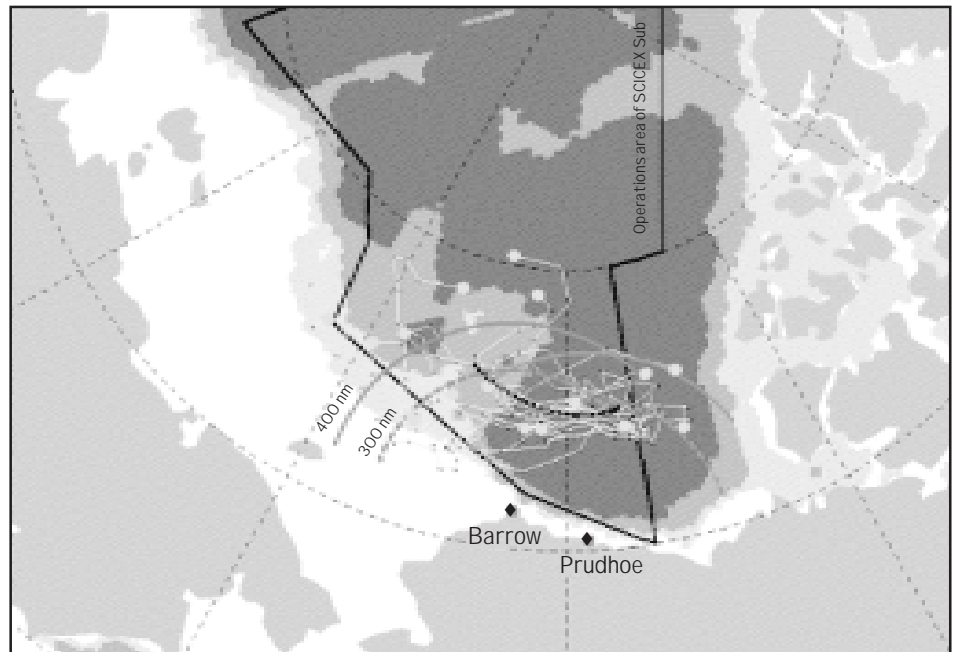
In September 1997, OAI will launch the SHEBA field experiment by mooring the Canadian heavy icebreaker *Des Groseilliers* into the pack ice of the Beaufort Sea (see *Witness Spring 1997*). The ship will drift with the ice through October 1998, collecting a series of key measurements. Automatic data buoys, satellites, and observations from the U.S. Navy Submarine Arctic Science Cruise (SCICEX) program (see *Witness Spring 1996*) and research aircraft will provide additional data. The Canadian icebreaker *Louis St. Laurent* will escort *Des Groseilliers* and will provide helicopter support during establishment of the ice station.

The ongoing SHEBA program is designed to enhance understanding of the thermodynamic coupling between the atmosphere, sea ice, and ocean. The program is focusing on key processes that determine ice albedo and cloud radiation feedback, and applying this knowledge to improve climate modeling.

The planned array of measurements represents the largest coordinated field experiment concerning the sea ice, the underlying ocean, and the atmosphere. The resulting data will be analyzed initially by individual principal investigators and teams of investigators, and will be organized into a coordinated SHEBA data set.

SHEBA has created important partnerships with other organizations including:

- the Department of Energy's Atmospheric Radiation Measurement Program (see *Witness Autumn 1994*),
- the National Aeronautics and Space Administration's First ISCCP Regional Experiment Phase III (FIRE-III) Program (see *Witness Autumn 1994*),



Projected ice drift from October 1997-1998. This figure shows the projected drift of the SHEBA camp (75°N, 143°W) using data from the Arctic Buoy Program from 1979-1996. The black dots show the mean drift of the camp from 1 October 1997 to 31 October 1998. Trajectories show the interannual variability of ice motion. If the camp had been deployed in any year from 1979 through 1995, the camp would have followed one of these trajectories (figure by Kay Runciman).

- the Office of Naval Research SCICEX Program (see *Witness Spring 1996*),
- the NASA RADARSAT Geophysical Processor System (RGPS),
- the Japan Marine Science and Technology Center (JAMSTEC), and
- the Canadian Department of Fisheries and Oceans.

For more information, including updates from the field experiment, visit the SHEBA Project Office Web site (<http://sheba.apl.washington.edu>).

All Hands Meeting

Approximately 100 researchers from as far away as Japan participated in the OAI All Hands Meeting in Virginia Beach in May 1997. OAI progress was summarized in 12 plenary talks, and research results from OAI and other Arctic programs were presented in more than 50 poster presentations. Working groups that planned for future research under the OAI aegis include:

- Surface Heat Budget, Atmospheric Radiation and Clouds,
- Circulation of the Arctic Ocean,

- Hydrologic Cycle of the Arctic,
- Productivity and Biogeochemical Cycles,
- Coupled Ocean-Atmosphere-Ice Modeling, and
- Paleoclimatology of the Arctic.

Each working group was charged with:

- identifying past accomplishments,
- determining the top two or three important issues in their field, and
- outlining a strategy for addressing these issues.

The groups were also encouraged to come up with possible collaborative efforts with other OAI, ARCSS, and international research programs.

The meeting report is near completion; its availability will be announced at the OAI Web site (<http://www.ccpo.edu.edu-arcss/>).

For more information, contact Lou Codispoti at the OAI Science Management Office (757/683-5770; fax 757/683-5550; lou@ccpo.edu.edu) or OAI Science Steering Committee Chair Jackie Grebmeier (423/974-2592; fax 423/974-3067; jgreb@utkux.utk.edu). ■

LAII Researchers Synthesizing Insights and Results

At the Land/Atmosphere/Ice Interactions (LAII) Synthesis Workshop held in June 1997 on Orcas Island in Washington, 25 LAII investigators worked to integrate and consolidate LAII results to date.

Writing sessions, discussions, and debates filled in details of draft papers, prepared in advance by key authors, on topics that had been determined at the March 1997 LAII Science Workshop held in Seattle. Papers based on the revised drafts will be submitted for publication before the end of the year.

The LAII synthesis papers are listed on the LAII Web site (see address below). A second, later phase of the synthesis effort will further consolidate the papers.

The new *LAII Plan for Action*, published in March 1997, is available on

the LAII Web site. The plan sets out the significant research priorities and overall LAII goal—to enhance our understanding of the land, atmosphere, and ice interactions in the Arctic system, the role that these processes play in the whole earth system, and the effect that global change may have on the Arctic. The new plan aims to advance LAII as a more integrated research program in the future (see *Witness* Autumn 1996).

Toward that end, NSF disseminated a new LAII Announcement of Opportunity in June 1997 addressing the four interdisciplinary themes of LAII:

- Detection and analysis of global change.
- Circumpolar extrapolation of climate feedbacks from Arctic terrestrial systems.

- Past and future changes within the Arctic system.
- Sustainability of the Arctic system under global change.

Proposals were due 15 September 1997. One subprogram, the International Tundra Experiment (ITEX), is currently supported (see article this page) and was not a part of this competition.

A new documentary highlighting LAII research, *The Changing Arctic*, has just been completed by the Public Broadcasting Service affiliate KUAC-TV in Fairbanks. NSF funded filming during the 1995 field season.

For more information, contact Patricia Anderson in Fairbanks, AK (907/474-5698; fax 907/474-6722; patricia@gi.alaska.edu) or visit the LAII Web site (<http://www-cg.ucfadm.alaska.edu/laii/>). ■

ITEX Extends Long-Term Research in the BEO

In June 1997, NSF awarded LAII funding to researchers participating in the International Tundra Experiment (ITEX) to continue monitoring the response of tundra vegetation on the Alaska Coastal Plain to climate warming.

The project continues and expands a tundra-warming experiment in the Barrow Environmental Observatory (BEO), located on the Arctic coastline just east of Barrow (see page 2), and at Atqasuk, 60 miles southwest of Barrow. This experiment has been in place in the BEO for three years and at Atqasuk for one year. The new grant funds the research at Barrow and Atqasuk for an additional five years, capitalizing on permanent plots established there 25 and 27 years ago. The long data record available from these Alaskan sites makes ongoing monitoring a highly valuable contribution to the international effort to detect long-term climate change.

ITEX sites are located at 26 sites in 11 countries including all the Arctic nations (see *Witness* Spring 1997). ITEX seeks to quantify and improve the understanding of short-term and long-term responses of

tundra vegetation to annual variation of and increase in temperature. The data generated will be used to improve prediction of the response of Arctic flora and vegetation, including some important

plant resources of the Alaskan Coastal Plain, to climate warming.

For more information, contact Patrick Webber in E. Lansing, MI (517/355-1284; fax 517/432-2150; webber@pilot.msu.edu). ■



Access to the ITEX chambers in the Barrow Environmental Observatory (see page 2) is designed to minimize any possible disturbance by the presence of researchers. The substantial boardwalk, built in August 1997, is necessitated by the heavy daily traffic of scientists, the very long-term nature of the experiment, and the sensitivity of the tundra to trampling (photo by Bob Hollister).

PALE Contributes to Circumpolar Data Sets

For the past several years, Paleoclimates from Arctic Lakes and Estuaries (PALE) has focused its field programs in two primary regions: Beringia and the northwest Atlantic Ocean. PALE has targeted the land, continental shelves, and marginal seas in these two regions in order to develop a density of sites adequate to enable meaningful data-model comparisons. At the same time, database and modeling efforts have advanced to capitalize on the new site-specific data being produced.

To evaluate the role of the entire Arctic in the global climate system, PALE joined forces with the international Arctic paleoscience community to create Circum-Arctic PaleoEnvironments (CAPE) in 1995 (see *Witness* Autumn 1996). CAPE's pilot project, the interactive *Paleoenvironmental Atlas of Beringia*, became available for use on the Internet in Spring 1997 (<http://www.ngdc.noaa.gov/paleo/paleo/atlas.html>) (see *Witness* Spring 1997). An updated and more complete version is due in Winter 1998.

CAPE is currently examining the spatial and temporal patterns of environmental change in the Arctic during the Holocene. This work began in Lammi, Finland in April 1997 at the first meeting of the CAPE Holocene Project. Nearly 40 Arctic researchers from Canada, Denmark,

Finland, Germany, Iceland, Norway, Russia, Sweden, United Kingdom, and the United States attended the meeting.

The group evaluated the spatial patterns of vegetation reconstructions and inferred summer temperatures in 1,000-year time slices, concentrating on 6,000 and 10,000 years ago. Comparable marine reconstructions were hampered by the limited distribution of well dated cores, the diversity of the proxies used, and the difficulty in differentiating polar water masses outside the area of Atlantic water influence.

Color maps indicating relative magnitude and directions of change in summer temperatures at 6,000 and 10,000 years ago were compiled from approximately 400 sites. Strong spatial patterns emerged that are largely concordant with trends described by the AGCM simulations. For more information, visit the CAPE Web site (<http://www.ngdc.noaa.gov/paleo/cape/TOC.htm>).

PALE and the NSF Office of Polar Programs are sponsoring a workshop on Paleoenvironments of Beringia, 20-23 September 1997 in Florissant, Colorado. The interdisciplinary meeting involves geologists, biologists, climatologists, paleontologists, archaeologists, paleoecologists, and paleoceanographers from the United

States, Canada, and Russia. The purpose of the workshop is to examine and synthesize the current state of knowledge of late-Cenozoic paleoenvironments of Beringia. These findings will be used to suggest an agenda for future Beringian research, focusing on the suitability of new techniques to answer ongoing research questions, and pinpointing potentially important aspects of research that have been lacking or under-represented in Beringia. Proceedings will be published in a special issue of *Quaternary Science Reviews*.

For more information about the workshop, contact Scott Elias in Boulder, CO (303/492-5158; fax 303/492-6388; saelias@culter.colorado.edu) or Julie Brigham-Grette in Amherst, MA (413/545-4840; fax 413/545-1200; brigham-grette@geo.umass.edu).

The annual PALE principal investigators meeting will be held in early February 1998 in Boulder, Colorado.

For more information, visit the PALE Web site (<http://www.ngdc.noaa.gov/paleo/paleo/index.html>), or contact Randy Mrugala at the PALE Science Management Office (303/492-0246; fax 303/492-6388; moorej@spot.colorado.edu). ■

GISP2 Community Sets Sights on New Arctic Cores

In December 1996, the Greenland Ice Sheet Project 2 (GISP2) held its final formal GISP2 workshop in Napa, California. This meeting brought together investigators who have been working on the GISP2 project since the first drilling season in 1989 (see *Witness* Spring 1997). More than 130 scientific papers have been published as a result of GISP2.

Although the GISP2 field project is winding down, investigators are continuing to sample the ice core at the National Ice Core Laboratory in Denver. More than 5,000 samples have been analyzed in the past year and several projects have been funded to further investigation of the

GISP2 core to enhance our understanding of the climate system.

In November 1997, the Joint *Journal of Geophysical Research (JGR)-Atmosphere/Oceans* Special Issue on the Greenland Ice Cores will be published. This issue will contain 47 articles on GISP2 and the European Greenland Ice Core Project (GRIP). At the release of the *JGR* Special Issue, the National Snow and Ice Data Center (NSIDC) and the National Geophysical Data Center (NGDC), along with GISP2 and GRIP, will be releasing a CD-ROM containing data and information about the two drilling projects.

With GISP2 nearing completion,

the glaciological community is now considering other sites for ice-core records. GISP2 representatives to the ARCSS Committee (see page 3) will submit a proposal at the October 1997 meeting to change the name "GISP2" to "Arctic Ice Cores," to better represent the future interest of the glaciological community.

For more information, see the GISP2 Web site (<http://www.gisp2.sr.umh.edu/GISP2>) or contact Mark Twickler, Associate Director of the GISP2 Science Management Office in Durham, NH (603/862-1991; fax 603/862-2124; gisp2.smo@unh.edu). ■

NSF Acquisitions Support Year-Round Access in Greenland

In July 1997, NSF acquired equipment and building space at Thule Air Base in northwest Greenland. The move upgrades the site so that it can serve as a solid logistic center for year-round, high-Arctic studies in northern Greenland and on the Arctic Ocean ice cap. NSF will maintain the new capability at Thule only if the Arctic research community can make good use of the investment.

Thule Air Base

Thule Air Base (TAB) is a relatively large military installation on the northwest coast of Greenland (77°N) with extensive year-round housing and storage facilities. A large road network supports the old missile launch sites left over from the Cold War. Logistical and technical support is available from contractors, a helicopter, the Polar Ice Coring Office (PICO), and Greenland Air.

TAB is located on a peninsula between Baffin Bay and the Greenland Ice Sheet. Large tracts of the surrounding landscape are undisturbed polar desert, semi-desert, species-rich polar oases, and wet sedge ecosystems adjacent to freshwater lakes.

NSF would like to hear about potential applications of the Thule logistics hub, so that a decision can be made whether to maintain support at this northern site, or to transfer equipment to the PICO logistics facility in southern Greenland. PICO provides administrative, engineering, and logistics support for ice-coring projects worldwide. Its U.S. offices are located in Lincoln, Nebraska; its logistics facility is based at the Kangerlussuaq International Science Support facility (KISS, see *Witness* Spring 1997), formerly the Sondstrom Air Base, in southern Greenland.

Greenland as an Arctic Research Base

The perennially frozen and seasonally ice-free regions of Greenland and its neighboring seas have attracted growing attention as a prime base for study of the earth's biological, geophysical, chemical, and sociocultural processes and the interactions of ocean, land, atmospheric, biological, and human systems.



NSF Arctic System Science Program Director Mike Ledbetter and Imants Virsnieks of the Space and Naval Warfare Systems Command during the transfer of equipment and building space at Thule Air Base in Greenland (photo by Tom Pyle).

Greenland and its seas are characteristically either permanently frozen or significantly chilled by the currents that link the Arctic to the North Atlantic Oceans. The ice-covered inland area, where the ice reaches thicknesses of up to two miles, stretches 1500 miles north-to-south and 600 miles east-to-west. The ice-free coastal region, which is at times as wide as 120 miles, spans 131,900 square miles. This region is intersected by deep fjords that connect the inland ice area with the sea.

Enhancing Logistical Support

Since its establishment in 1979, the Greenland Home Rule Government has worked with the Commission for Scientific Research in Greenland, granting U.S. scientists permission to conduct research in many areas in Greenland (see *Witness* Spring 1997). In early June 1997, representatives of the Greenland Home Rule Government, Danish Polar Center, and NSF met to discuss current projects and future scientific collaboration in Greenland.

Encouraged by these discussions, NSF moved to improve logistical support for scientific research in northern Greenland and on the drifting ice of the Arctic Ocean

by acquiring from the U.S. Navy equipment sufficient to support four or five remote camps of up to 20 people (*e.g.*, Weatherport buildings, heaters, generators, snow machines, sleds). The equipment was used by the Navy to support ice camps; it will now be used to support NSF-funded terrestrial/icecap field programs. Part of the equipment is being used by the Surface Heat Budget of the Arctic Ocean (SHEBA, see page 4) program. PICO administers the equipment pool with guidance from NSF.

NSF has also collaborated with the Office of Naval Research (ONR) to lease a storage, maintenance, and staging facility at TAB. NSF has requested additional buildings there for office and laboratory space.

These recent developments at Thule, together with NSF's long-standing cooperation with the Air National Guard for heavy airlift and the PICO base at the KISS facility, are designed to provide a solid base of support for Arctic research in Greenland.

For more information, contact Simona Gilbert at NSF (703/306-1029; fax 703/306-0648; sgilbert@nsf.gov). ■

NSF Seeks GLOBE Proposals Engaging Students in Science

NSF is seeking proposals from scientist-educator teams to participate in the Global Learning and Observations to Benefit the Environment (GLOBE) program. Proposals are due by 15 October 1997.

The GLOBE program supports projects designed to increase:

- scientific understanding of the earth,
- student achievement in science and mathematics, and
- environmental awareness.

The program currently involves K-12 students at over 1,500 schools who make environmental observations following established research protocols and then report their data via the Internet to the GLOBE Student Data Archive.

As its name suggests, GLOBE is designed to fund collaboration around the world. U.S. institutions, researchers, educators, and students are encouraged to form teams with their counterparts in

other countries. NSF will fund the participating U.S. institutions for up to four years beginning in May 1998.

For scientific involvement in GLOBE, teams must propose to:

- conduct environmental research using GLOBE student data, and
- assume responsibility for one or more existing or new GLOBE measurement protocols.

Teams will be expected to help maintain and improve the science, education, and evaluation activities of the program.

Proposals should include objectives to:

- develop learning activities in support of GLOBE measurements,
- develop U.S. student-assessment tools for optional use by teachers,
- develop and integrate educational materials, and
- evaluate the program.

GLOBE is an interagency program involving the National Oceanic and

Atmospheric Administration (NOAA) and the National Aeronautics and Space Administration (NASA), as well as NSF.

Data collected through GLOBE are available to the public. GLOBE also offers training to teachers and teacher-trainers in implementing this program, taking its measurements, and using the learning activities that complement the hands-on process of collecting the measurements. Information resources available on-line include graphic displays of some data and GLOBEMail, a web-based mail system that allows program participants around the world to communicate with one another.

For more information, contact GLOBE (globe@dalek.arc.nasa.gov; <http://www.globe.gov>) or visit NSF's online information service (<http://www.nsf.gov/cgi-bin/getpub?nsf97129>). ■

John Hunt Becomes Acting Director of NSF Office of Polar Programs

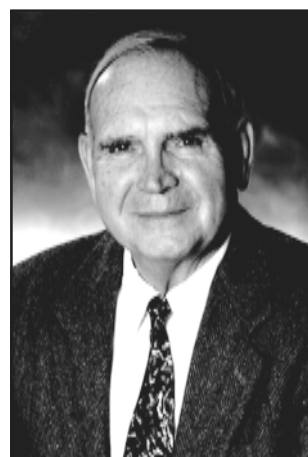
In early September 1997, John B. Hunt became Acting Director of the Office of Polar Programs (OPP). He comes to this interim position from the Directorate for Mathematical and Physical Sciences (MPS) at NSF, where he has held positions of increasing responsibility as Program Director, Executive Officer of MPS, Executive Officer of the Division of Chemistry (1990-1995), Acting Division Director (1993-1994), and Acting Assistant Director for MPS (1996-1997).

Prior to joining the NSF Chemistry Division as a visiting scientist in 1983, Hunt was Professor of Chemistry at the Catholic University of America, where he had served as a faculty member since 1962. His research at Catholic University dealt largely with mechanisms of reactions of transition metal complexes. Following a sabbatical at the National Institutes of Health (NIH) in 1971-72, Hunt also collaborated with NIH researchers on metal ion-protein interactions. The most recent paper from this collaboration, published in 1990, dealt with zinc ion binding to the regulatory subunit of aspartate transcarbamoylase.

Hunt served as a consultant to the Electrochemistry Division of the Naval Ordnance Laboratory from 1966-1972 in the area of fused salt batteries. He was a consultant to the Red Cross Blood Services Laboratory from 1973-1983 on research related to blood platelets. For seven years, he was a member of the Board of Directors of the Marine Science Consortium at Wallops Island, Virginia, where he also taught courses in chemical oceanography. Hunt has also served as a member of the Strategic Advisory Committee of the Council for Chemical Research.

Hunt received his undergraduate education at Tulane University (B.S. in Chemistry, 1955), an M.S. degree in inorganic chemistry from Georgetown University (1960), and a Ph.D. in inorganic chemistry from the University of Chicago (1962). His four years as a naval officer included two years on the *USS Iowa* and two years teaching chemistry at the U.S. Naval Academy.

Hunt can be reached at NSF/OPP in Arlington, VA (703/306-1030; fax 703/306-0645; jbhunt@nsf.gov). ■



John B. Hunt

NSF Adopts New Proposal-Review Criteria

In March 1997, the National Science Board (NSB) approved new criteria for reviewing proposals to NSF, effective 1 October 1997. The NSB adopted the following two criteria in place of the four criteria that were used before:

(1) What is the intellectual merit of the proposed activity?

- How important is the proposed activity to advancing knowledge and understanding within its own field and across different fields?
- How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, please comment on the quality of prior work.)

- To what extent does the proposed activity suggest and explore creative and original concepts?
 - How well conceived and organized is the proposed activity?
 - Is there sufficient access to resources?
- ### (2) What are the broader impacts of the proposed activity?
- How well does the activity advance discovery and understanding while promoting teaching, training, and learning?
 - How well does the proposed activity broaden the participation of underrepresented groups (*e.g.*, gender, ethnicity, geographic)?

- To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships?
 - Will the results be disseminated broadly to enhance scientific and technological understanding?
 - What may be the benefits of the proposed activity to society?
- Reviewers will now be asked to:
- address a given proposal's strengths and weaknesses as they relate to any or all of the considerations listed under each criterion,
 - provide an overall rating, and
 - provide a brief summary statement that includes comments on the relative importance of the two criteria to their rating.

Additional background information about this change, including the NSB's resolution and the report on which it is based, can be found at (<http://www.nsf.gov/home/nsb/document.htm>).

Proposals received by the NSF Proposal Processing Unit are assigned to the appropriate NSF program for acknowledgment. All proposals that meet NSF requirements are carefully reviewed by a scientist, engineer, or educator serving as an NSF Program Officer, and usually by three to ten other persons outside NSF who are experts in the particular field represented by the proposal.

Proposers are invited to suggest names of persons they believe are especially well qualified to review the proposal or persons whom they would prefer not review the proposal. These suggestions may serve as one source in the reviewer-selection process at the Program Officer's discretion. Program Officers may obtain comments from assembled review panels or from site visits before recommending final action on proposals. Recommendations for awards are further reviewed by senior NSF staff.

For more information, consult the NSF Web site (<http://www.nsf.gov/>) or contact the appropriate Arctic Section program manager in Arlington, VA (703/306-1029; fax 703/306-0648; _____@nsf.gov). ■

New Dates for Arctic Program Proposals

The recently revised *Guidelines for Submission of Proposals* for the Arctic Science Program has not yet been officially approved for release. When it appears, it will contain new target dates for proposals: 1 February and 1 August. During the 1997-98 transition, general target dates will be 15 December 1997 and 1 February 1998; the Social Sciences Program, however, will not have a February 1998 target.

The change is being made to accommodate improved Arctic logistics capabilities (see pages 7 and 14) and to better coordinate with other NSF programs. Proposers should meet the February target date for the year before the proposed field work, if they are requesting:

- ship time on University-National Oceanographic Laboratory System (UNOLS) ships,
- ship time on the new research icebreaker USCGC *Healy*, or
- access to Greenland sites needing heavy airlift capability of the Air National Guard.

For more information, contact the appropriate Arctic Section program manager in Arlington, VA (703/306-1029; fax 703/306-0648; _____@nsf.gov). ■

New NSF Proposal Guidelines Published

In August 1997, NSF announced publication of an updated *Grant Proposal Guide* (GPG) and *Proposal Forms Kit* that incorporate changes in the proposal-review criteria (see article this page, and Publications page 23). The new version of the GPG becomes effective 1 October 1997. The complete text, including all forms, is available at the NSF web site (<http://www.nsf.gov/>).

For more information, contact the NSF Policy Office, Division of Contracts, Policy and Oversight (703/306-1243; fax 703/306-0280; policy@nsf.gov). ■

NSF Offers Interdisciplinary Funding Opportunities

The Office of Polar Programs' (OPP) Arctic Sciences Section is participating in two new NSF-wide initiatives, Life in Extreme Environments and Knowledge and Distributed Intelligence.

Life in Extreme Environments (LEExEN) emphasizes the study of how life survives in extreme conditions on earth. The program will support research on fundamental biological processes important to understanding evolution of life on earth and, perhaps, other planets. LEExEN hopes to award approximately \$6 million each year.

Knowledge and Distributed Intelligence (KDI) is an even broader initiative that hopes to achieve the next generation of human capability to:

- gather and represent more complex and cross-disciplinary scientific data and information from new sources, and at enormously larger scales;
- transform this information into knowledge by combining, classifying, and analyzing it in new ways; and
- collaborate in groups and organizations, sharing this knowledge and working together interactively across space, time, disciplines, and scientific cultures to multiply results.

KDI supports research that:

- generates greater understanding of phenomena of distributed intelligence and collective behavior, automated and natural systems;
- creates the next generation of mathematical, computational, data-oriented, and organizational methods and infrastructure, which will exploit multidisciplinary distributed intelligence to advance science and engineering;
- enhances human ability to use knowledge in groups, organizations, and communities through advances in human infrastructure, technology, and education.

This initiative is an intellectual focus for collaborative, multidisciplinary thinking on three complementary aspects of knowledge and distributed intelligence:

- increasing interaction, knowledge/tool integration, collaboration, and understanding within communities

and across disciplines through Knowledge Networking (KN);

- extending the power of tools, models, and simulations to present and manage complex systems through New Challenges in Computation (NCC); and
- extending our ability to learn and create through Learning and Intelligent Systems (LIS).

The need for improved communications and sharing of information among federal, state, and local scientific institutions, Native and non-Native, operating in the Arctic, as well as the requirement for numerous smart, autonomous scientific instruments and networks would seem to foretell a large interest in the KDI program.

Established NSF Funding Programs

The OPP Arctic Sciences Section also participates in several other programs that should be of interest to Arctic researchers and inhabitants.

Faculty Early Career Development (CAREER) is an NSF-wide activity that supports junior faculty within the context of their overall career development. It combines in a single program the support of research and education of the highest quality and in the broadest sense.

Integrative Graduate Education and Research Training (IGERT) is directed at developing graduate training programs that focus on a multidisciplinary research theme. The research theme may draw upon investigators from one or more departments within an individual institution or from more than one institution.

Professional Opportunities for Women in Research and Education (POWRE) supports activities designed to promote the development of scholarly and institutional leaders in research and education. POWRE is designed to increase women's prominence in science and engineering and to enhance their professional advancement by providing women with funding opportunities not ordinarily available through regular research and education grants. NSF is particularly interested in increasing the participation of minority women, women

with disabilities, and women whose careers have been interrupted. Proposals from members of these groups are especially encouraged.

Small Business Innovation Research (SBIR) offers an opportunity and incentive for small, creative, science-and-technology-oriented firms. They may conduct innovative, high-risk research on important science, engineering, or related education projects that could have significant public benefit if the research is successful.

Major Research Instrumentation (MRI) is designed to improve the condition of research equipment in U.S. academic institutions by supporting acquisition or development of major research instrumentation. The initiative responds to needs identified by the academic science and engineering community for research instrumentation that is, in general, more expensive than that supported through other NSF programs and for improving U.S. research and research-training capabilities.

Graduate Fellowships and Minority Graduate Fellowships (Division of Graduate Education-DGE) offer recognition and three years of support for advanced study to approximately 1,000 outstanding graduate students in the mathematical, physical, biological, engineering, and behavioral and social sciences, including the history of science and the philosophy of science, and to research-based Ph.D. degrees in science education.

NSF has also recently increased its funding limits on **Small Grants for Exploratory Research** (SGER) "sugar grants" from \$50,000 to \$100,000. The Arctic Section encourages wider use of this vehicle as one way to test new ideas and help invigorate the field with new investigators.

For more information, see the NSF Web site (<http://www.nsf.gov>) or contact Tom Pyle at the Arctic Sciences Section, NSF (703/306-1029; fax 703/306-0648; tpyle@nsf.gov). ■

USARC Conducts Science Planning for International Center

The U.S. Arctic Research Commission (USARC) has continued to support U.S. and Japanese efforts to establish the International Arctic Research Center (IARC, see page 22) in Fairbanks, Alaska. USARC Executive Director Garry Brass is the U.S. Co-Chair of the IARC Implementation Committee and the *ad hoc* Science Planning Committee. The Commission hosted meetings of the IARC Science Planning Committee in May 1997 in Honolulu, Hawaii and in July 1997 in Seattle, Washington.

The draft *Science Plan for the IARC* is now available on the Internet for review and comment (<http://www-cgc.uafadm.alaska.edu/iarc>); submit comments to Brass (g.brass@arctic.gov). A program of IARC affiliates is being designed to facilitate participation by Arctic researchers from the United States, Japan, and the international research community; details will be posted as they become available.

USARC Commissioners met in June 1997 at the Marine Biological Laboratory in Woods Hole, Massachusetts, where they heard presentations on circumpolar Arctic terrestrial ecosystems. They met again in August 1997 in Barrow, Alaska in conjunction with the NARL 50th anniversary celebration (see feature). The USARC meets each year in Alaska so that its Commissioners have an opportunity to meet with residents of the U.S. Arctic.

As part of the USARC's efforts to improve access to the Arctic, the Commission visited the Arctic field facilities of the Canadian Polar Continental Shelf Project in August 1997. The tour encompassed support bases at Tuktoyaktuk and Resolute in the Northwest Territories, and the Canadian Forces Base at Alert on Ellesmere Island (the northernmost permanent settlement in the world). Commissioners also visited Ward Hunt Island, to observe the Ward Hunt Ice

Shelf, source of ice islands (e.g., T3, Fletcher's Ice Island) that have provided floating bases for research in the Arctic.

In late August 1997, the Commission announced the release of previously classified Arctic bathymetric data collected by U.S. Navy submarines between 1957 and 1982 (see page 16).

Brass attended the June 1997 ARCUS Annual Meeting in Washington, DC and the July 1997 Polar Research Board/National Oceanic and Atmospheric Administration workshop on Arctic contaminants research (see article this page).

Logistics Recommendations for an Improved U.S. Arctic Research Capability, commissioned by the USARC and co-funded by NSF, was published by ARCUS in July 1997 (see page 14, and Publications page 23).

For more information, contact Garry Brass (800/AURORAB or 703/525-0111; fax 703/525-0114; g.brass@arctic.gov). ■

Polar Research Board

PRB Hosts Researchers to Focus NOAA's Arctic Initiative

The Polar Research Board (PRB) has continued its work to increase the voice of science in policymaking affecting polar issues. In July 1997, the PRB hosted a planning workshop for the National Oceanic and Atmospheric Administration (NOAA) to guide development of its Arctic Research Initiative (ARI, see page 20). The ARI provides grants for research on the health of the Western Arctic and Bering Sea ecosystem, focused on natural variability and anthropogenic influences. Under anthropogenic influences, research has so far focused on two areas:

- Arctic haze, ozone, and UV flux; and
- contaminant inputs, transport, fate, and effects.

Approximately 50 people engaged in the effort to provide focus and steer the ARI program so that it addresses key research questions, supports NOAA's

mission, and at the same time contributes to a coordinated national and international strategy for addressing the health of the Arctic environment. Proceedings of the workshop will be available in Fall 1997.

Also in July 1997, the PRB released a report, *The U.S. in Antarctica: Comments from the Polar Research Board*. This document comments on a report released in May 1997 by NSF, *The U.S. in Antarctica: Report of the U.S. Antarctic Program External Panel*. That panel was charged by NSF to recommend ways to improve the U.S. Antarctic Program—in particular, how to rebuild the deteriorating South Pole Station in today's constrained financial environment.

The PRB expressed concern about the recommendation that \$20 million over the next five years be reallocated from

science grants and science support to the reconstruction project. As NSF plans implementation of the External Panel's report, Capitol Hill is debating how much funding Congress will provide.

Finally, the PRB is working jointly with the Oceans Studies Board to review community-development quotas (CDQs), a method for assigning rights for fish harvesting. A committee is gathering information to assess the performance and effectiveness of CDQ programs conducted to date under the authority of the Fishery Management Councils. This study was mandated by Congress; its report should be available in Spring 1998.

For more information, contact PRB Director Chris Elfring (202/334-3479; fax 202/334-1477; celfring@nas.edu) or visit the PRB Web site (<http://www2.nas.edu/prb/>). ■

Arctic Residents and Researchers Exemplify Collaboration

by Neal Lane

The following is an edited version of the presentation entitled “Building Arctic Bridges” given by NSF Director Neal Lane at the 50th Anniversary Celebration of the Naval Arctic Research Laboratory (NARL) in Barrow, Alaska in August 1997 (see feature).

This commemoration of 50 years of research supported by NARL gives us the occasion to reflect on a theme that the local Barrow community exemplifies so strongly—the value of a strong bond between science and the communities that support it.

In the past few days, you have reflected on a wide range of studies conducted over the decades through NARL, from drifting ice stations to the aurora, polar bear and caribou, and anthropological research. An enduring legacy of these projects has been the cooperative relationship, forged over many years, between scientists and the Inupiat people of the North Slope.

When I think of what we can learn from the Arctic, I am reminded of Peter Høeg’s best-selling novel, *Smilla’s Sense of Snow*.¹ Smilla, a part-Inuit woman, is a glaciologist blessed with a mysterious ability to orient herself, to find her way even in the Arctic’s worst whiteout conditions. She harnesses this ability to guide expeditions across the Greenland ice cap. “When it happens the first time, it’s like discovering that you’re awake while everyone else is asleep,” she recalls. Smilla’s contribution to scientific expeditions evokes the unique contributions of indigenous knowledge, born of so much human experience in the Arctic environment.

Smilla also has her personal struggles with the pulls of tradition and the tremendously rapid social, technological, and environmental changes that have swept over the Arctic in a very short time. The study of such change offers compelling lessons reaching far beyond the Arctic region.

To come to grips with this rapid change, we must understand it. Right here in Barrow is an example of such foresight and what may be a unique commitment by a community to research. I am referring to the Barrow Environmental Observatory (BEO), which consists of 7,466 acres of Arctic tundra (see page 2). NSF has signed a cooperative agreement with the Barrow

Arctic Science Consortium to manage the site, and the North Slope Borough is also providing support. The site’s heritage of scientific research enhances its value for future experimentation.

When Barrow established the Environmental Observatory, the community illustrated how much it appreciates the history and the value of scientific inquiry here. Not all people have such experience and perspective. That is why it is so important for scientists to involve their communities and explain what they do in terms that those who pay the bills can understand.

When I reflect on my own experience as an academic physicist and a university administrator, I recognize the isolation that many scientists experience. Outreach can seem rather daunting for a scientist, but it does become easier with practice. As I travel across the country, I try to leave some time to speak with local groups and to meet with reporters. I hope some kind of outreach will eventually become part of a scientific career—a modest vision I call the “civic scientist.” Even NSF is realizing a new responsibility as a public advocate for the cause of science and engineering.

While it is necessary to increase public understanding of science and technology, it is equally important for scientists to deepen their understanding of the public. I have a sense that Barrow is a rather special place in this regard—a place where mutual regard has taken solid root.

I would like to recall an especially poignant example. This is the story of the girl’s body found eroding from a Barrow bluff in 1994. Local elders worked with archaeologists Anne Jensen and Glenn Sheehan to save the remains. Together, they developed a research protocol that treated the remains respectfully, while affording valuable insights into the past.

Studies were permitted. They showed that the girl lived in approximately AD 1200, that she suffered from a debilitating genetic disease, and that her community had obviously cared for her during her short life. Scientific results were presented first to the elders and then to the scientific community. The girl was reburied quickly in accordance with the elders’ wishes.

Barrow’s children named her “Dear Young Girl” and participated in the reburial.

Such mutual respect opens the door for synergy between the scientific method and indigenous knowledge. Henry Huntington of the Inuit Circumpolar Conference has gathered local knowledge about beluga whales in Alaskan and Russian communities. He writes, “Working together is the best way of helping us to achieve a better common understanding of nature.”

For all these reasons, NSF has taken the lead in formulating principles for the conduct of research in the Arctic (see *Witness* Spring 1997, page 7). Researchers we support are directed to consult with local communities in planning their work and to respect local cultural traditions.

These principles apply in the work we support with the Alaska Native Science Commission (see page 19), the Alaska Rural Systemic Initiative (see page 17), Long-Term Ecological Research at Toolik Lake (see *Witness* August 1994), the BEO, and every other NSF-supported research program in the Arctic. The principles are idealistic and compelling—and they are relevant for the conduct of research far beyond the Arctic.

In Spring 1998, NSF’s annual National Science and Technology Week will celebrate science and engineering in both the Arctic and Antarctic. As part of the event, NSF and its partners are developing hands-on teaching activities. In addition to examining the history and culture of Arctic communities, polar science, and engineering, we’re also hoping to give young scientists the chance to study the natural resources of the Arctic and to learn about environmental issues. We welcome your ideas and suggestions. ■

Neal Lane is Director of NSF. He came to the position in 1993 from Rice University in Houston, Texas, where he was Provost and Professor of Physics. Widely recognized as a scientist and educator, Dr. Lane has authored or co-authored over 90 scientific papers and publications, including a textbook on quantum physics, and has made numerous presentations on science and science policy. He is a fellow of the American Physical Society, the American Academy of Arts and Sciences, the American Association for Advancement of Science, and a member of the American Association of Physics Teachers.

1. Høeg, Peter. 1992. *Smilla’s Sense of Snow*. Dell Publishing, New York. 429 p.

Arctic Monitoring Program Summarizes Findings

by Ted DeLaca

The final meeting of the six-year Arctic Monitoring and Assessment Program (AMAP) took place in Tromsø, Norway in June 1997 in conjunction with the Third International Conference on Environmental Radioactivity in the Arctic.

AMAP is one component of the Arctic Environmental Protection Strategy (AEPS) that was launched by the eight Arctic nations in June 1991 (see *Witness* Winter 1993) in response to the apparent decrease in quality of the Arctic environment (see *Witness* Spring 1997). The work of the AEPS grew out of the 1989 Finnish Initiative, which first called attention to the signals of change in the Arctic. At a subsequent meeting in Iceland, the Arctic countries signed the Rovaniemi Declaration of Common Resolve. The AMAP component of AEPS was intended to assess the health of the Arctic ecosystem as a whole. Norway funded the Secretariat.

Because seven of the eight circumpolar nations made active contributions to the effort, AMAP has been characterized as an almost unprecedented success in international cooperation. Only the United States fell short of full participation; when summary data sets and analyses of trends and impacts were projected, the areas in and around Alaska were nearly blank.

Relevant U.S. data do exist; new data from Alaska are sorely needed to compare with ongoing programs in the Circumpolar Arctic. Funding must be made available for comparable U.S. Arctic studies. The United States must make a firm commitment to the future AMAP process.

AMAP and Radiation Meeting Reports

Summary findings of the AMAP and Environmental Radioactivity meetings include the following:

Persistent Organic Pollutants (POPs)

- No significant decline in past 10-15 years; concentrations of some POPs alarmingly high in Arctic food chains.
- Levels in several marine birds, fish, and mammals (*e.g.*, polar bears at Svalbard) exceeding thresholds for immune system suppression, developmental and reproductive impacts.

- Elevated levels of chlorinated hydrocarbons (HCH) in some Russian rivers.
- Adverse impacts from tributyltin observed in marine invertebrates.
- Decades necessary to reduce POPs because of long half-life.

Mercury

- Elevated levels in ecosystems and humans.
- Emissions will increase with use of coal.

Radionuclides

- Accidental releases remain largest single threat to the Arctic environment.
- Arctic people vulnerable to nuclear accidents due to proximity, simple food chains, dependence on local foods.
- Remedial action for ocean-dumped radionuclides must be carefully considered; at present, seem not warranted.
- Scandinavia taking counter measures.

Acidification

- Clear evidence of severe regional environmental damage around the Arctic.
- Problem-solving extremely difficult.

Polyaromatic Hydrocarbons (PAH)

- Risks increasing, largely from oil exploration, development, spills.
- Serious regional impacts (*e.g.*, Komi), high risk in Russia (*e.g.*, the Taimyr).
- Great challenge to reduce pollution.

Climate Change, Ozone Depletion, and Increased UV-B Radiation

- Intergovernmental Panel on Climate Change: climate change *is* occurring.
- Climate change likely to be pronounced in the Arctic; warmed Arctic likely to have disproportionate global impact.
- Arctic becoming source rather than sink for atmospheric CO₂.
- Stratospheric ozone depletion seriously increasing in Arctic; no generally accepted explanation.
- Resulting increases in UV-B impacts.

Human Health

- Blood PCB levels 2-4 times higher than in more southerly populations.
- Neurological disorders attributed to high PCB levels in blood.
- DDT concentrations in mother's milk exceed levels believed to cause neurological disorders in infants.
- Blood mercury levels 5-12 times those in more southerly populations.

- Blood mercury in northern Greenlandic populations exceed World Health Organization levels for health effects.
- Radiation fallout has led to genetic impacts in Russia.
- Increases in UV-B cannot be ignored.

Recommendations to AEPS Ministers

The following recommendations from the AMAP and Radiation meetings were prepared for the final AEPS Ministerial meeting in Alta, Norway in June 1997:

- **Radionuclide concentrations** are primarily derived from early atmospheric testing, North Atlantic disposal and reprocessing (France, United Kingdom), and Chernobyl. Ocean dumping by the Former Soviet Union does not pose a serious risk; the Arctic *is* at risk from terrestrial sources in Russia including poorly maintained nuclear power plants and inadequate storage facilities.
- **Persistent Organic Pollutants** are increasing in the environment; serious environmental and human health problems result.
- **Metals** concentrations are increasing in the environment and are thought to have adverse environmental and human-health consequences.
- **Acidification** is known to have regional environmental impacts.
- **Oil-contamination** risks are significant and increasing (especially in Russia).
- **Ozone depletion** and resulting increases in **UV-B influx** are a significant threat to the health of the Arctic (including its ecosystems and human populations).
- **Climate change** is measurable; modeling efforts indicate its impacts will be most pronounced in the Arctic. A warmed Arctic has significant positive feedback to the greenhouse scenario from released greenhouse gases and reduced albedo resulting from snow and ice melt.

For more information, contact Ted DeLaca (907/474-7314; fax 907/474-7225; ftnted@aurora.alaska.edu). ■

Ted DeLaca, Director of Arctic Research at the University of Alaska Fairbanks, has been tasked by USARC and ONR to coordinate a meeting assessing the U.S. science community's contribution to the next AMAP process.

Arctic Logistics Report Cites Access, Health, Collaboration

In July 1997, ARCUS published the report, *Logistics Recommendations for an Improved U.S. Arctic Research Capability*. While the report synthesizes more than a year of contributions and discussion on the part of U.S. academic Arctic researchers, it is envisioned as only the first step toward a community-based assessment of Arctic logistics needs. It is viewed as a living document that will be updated as necessary.

The U.S. Arctic Research Commission (USARC) and other governmental and non-governmental scientific organizations (see *Witness* August 1996) have long been concerned with improving logistics to enhance U.S. Arctic research capability. The issue has become even more pressing, as logistics costs now consume 25-40% of Arctic science funds (see *Witness* Autumn 1996, pages 10 and 16).

In 1995, the USARC asked ARCUS to assess current logistics on behalf of the academic arctic research community, to evaluate limits placed on research by the current resources, and to formulate recommendations for improving science-driven logistics support. Funding for developing the report was provided by the USARC and NSF.

A notable outcome of the surveys, community meetings, and individual input is consensus on five recommendations from essentially all disciplines. These are:

- Ensure access to the Arctic over the entire year.
- Increase availability and use of remote and autonomous instruments.
- Protect the health and safety of people conducting research in the Arctic.
- Improve communication and collaboration between Arctic peoples and the research community.
- Seek interagency, international, and bilateral logistics arrangements to efficiently use all available resources and to reduce costs by avoiding duplication of efforts.

These five general recommendations outline a coherent logistical support strategy for U.S. research. In addition, the many specific disciplinary recommendations (summarized on pages 62-63 of the



Research in remote areas sometimes requires the hire of boats or all-terrain vehicles from local villagers. Here, local residents in Kotzebue prepare to transport field gear to a distant campsite where geologists plan to work on the glacial and sea-level stratigraphy of Baldwin Peninsula (photo by Julie Brigham-Grette).

report) are shared by, or will benefit, other disciplines. Priorities are based on:

- feasibility of the improvement,
- maturity of technology,
- number of disciplines served, and
- the possibility of an investment dramatically improving science capabilities.

In the process of developing this report, ARCUS:

- appointed a working group representing a wide variety of disciplines, geographic regions in which research is conducted, and institutions conducting research;
- consulted existing evaluations of logistical needs;
- canvassed approximately 1,000 Arctic researchers in the U.S. academic research community for current and future needs;
- presented preliminary survey results as a springboard for discussion at a logistics workshop, attended by approximately 70 researchers in the context of the May 1996 NSF/ARCSS All-Investigator Workshop;
- posted the first draft of recommendations from the survey and May 1996 meeting (see *Witness* August 1996), and subsequent drafts of the report, on the WWW between August 1996 and May 1997; and

- incorporated significant revisions and additions suggested by those who reviewed the drafts.

The resulting document evaluates the limits placed on Arctic science by the currently available logistical resources. It endeavors to describe the science-driven logistics needs for the U.S. Arctic research community for the next decade with a clear focus on the scientific challenges currently unmet in the Arctic. The report:

- outlines the current logistics situation,
- summarizes the major scientific issues by discipline,
- defines the logistics requirements to address those questions, and
- makes recommendations for logistics improvements to address the scientific needs.

The report also notes that implementation of the recommendations requires improved coordination within and among scientists, agencies, communities, and nations.

Logistics Recommendations for an Improved U.S. Arctic Research Capability is available from the ARCUS Web site (<http://arcus.polarnet.com/Logistics>). The publication can be requested from ARCUS (arcus@polarnet.com). ■

Workshop on the Study of Arctic Ocean Change

An open workshop on the Study of Arctic Change will be held at the University of Washington in Seattle, 10-12 November 1997.

The Arctic is in the midst of significant physical change involving both the atmosphere and ocean. Results of several recent expeditions indicate that the influence of Atlantic Water is becoming more widespread and intense than previously noted (see *Witness* Spring 1997). Data collected during the SCICEX cruises of 1993 and 1995 and the Summer 1994 Arctic Ocean Section of the *Polar Sea* and the *Louis S. St. Laurent* all indicate that the area occupied by the eastern water types is nearly 20% greater than previously observed. The greater intensity of the Atlantic influence is also shown by warm cores observed over the Lomonosov and Mendeleev ridges.

This ocean change may be associated with a decadal trend in the atmospheric pressure pattern, including the observation that annual mean atmospheric surface pressure is decreasing.

Thus far, 50 scientists from seven countries have endorsed an open letter advocating a long-term study of the physical changes in the Arctic.

The November 1997 workshop, supported by a grant from the Arctic System Science (ARCSS) Program of the NSF Office of Polar Programs, is being convened to explore the extent of the change and to begin planning a program to study it. Oceanographers, atmospheric scientists, sea-ice researchers, and others with data or modeling results indicating changes in the physical characteristics of the Arctic over the last 10 years are

encouraged to attend. Researchers with information on changes in terrestrial ice and snow or changes at lower latitudes are also encouraged. Participants will address:

- evidence of Arctic change,
- a plan to study the change,
- relationship with other U.S. and international programs, and
- an organizational plan for future work.

The workshop is scheduled to dovetail with the November 1997 ACSYS meeting (see Calendar page 23). Limited funding is available to help with travel costs.

Those interested in attending, please contact Peggy Hartman at the Polar Science Center in Seattle (206/543-6613; fax 206/543-3521; peggy@apl.washington.edu) and copy Jamie Morison (206/543-1394; fax 206/543-3521; morison@crosby.apl.washington.edu). ■

Arctic Chair at Office of Naval Research Builds on 20 Years

The Office of Naval Research (ONR) and the Naval Postgraduate School (NPS) recently celebrated the 20th anniversary of the Chair in Arctic Marine Science.

The Chair provides six months of salary support to scientists with a strong, well established background in the physical science of the polar regions, (e.g., those studying various components of the atmosphere-ice-ocean properties of the polar oceans). Occupants of the Chair, from universities, government, and research laboratories, and from different countries, have represented a variety of disciplines (see table). Bill Hibler (Dartmouth College) and Martin Jeffries (University of Alaska) will be the Chair holders in 1997-98 and 1998-99, respectively.

Objectives of the Arctic Chair are to:

- encourage scientists to conduct polar research and assist in translating basic knowledge into operational products,
- to provide the Navy with a cadre of officer and civilian polar experts by inculcating in students at NPS and elsewhere an interest in polar science.

While in residence at the Oceanography Department at NPS in Monterey, California the Chair holder pursues his or her research interests, provides seminars and lectures to students and faculty,

participates in field programs, and pursues other scholarly activities.

For more information, contact Bob Bourke at NPS (408/656-2673; fax 408/656-2712; bourke@oc.nps.navy.mil). ■

Occupants of the Arctic Marine Sciences Chair

1976-77	Warren W. Denner	Naval Postgraduate School	Ice Dynamics/Mechanics
1977-78	Allan M. Beal	Arctic Submarine Laboratory	Sea-Floor Bathymetry
1978-79	Wilford F. Weeks	Cold Regions Research & Engineering Laboratory (CRREL)	Ice Mechanics
1979-80	Allan R. Milne	Institute of Ocean Sciences	Ambient Noise
1980-81	Peter Wadhams	Scott Polar Research Institute	Ice-Wave Interaction
1981-82	Ola M. Johannessen	University of Bergen	Marginal Ice Zone
1982-83	Miles G. McPhee	Private Consultant	Ice-Water Boundary Layer
1983-84	Walker O. Smith	University of Tennessee	Ice-Edge Biology
1984-85	H. Joseph Niebauer	University of Alaska	Ice Dynamics
1985-86	Stephen A. Ackley	CRREL	Ice Mechanics
1986-87	John E. Walsh	University of Illinois	Sea-Ice Variability
1987-88	Robert S. Pritchard	Consulting Scientist	Arctic Sea-Ice Dynamics
1988-89	Arne Foldvik	University of Bergen	Ocean-Ice Shelf Interaction
1989-90	James H. Morison	University of Washington	Under-Ice Boundary-Layer Dynamics
1990-91	John L. Newton	Consulting Scientist	Arctic Anti-Submarine Warfare (ASW)
1991-92	Alan Thorndike	University of Puget Sound	Sea-Ice Physics
1992-94	James H. Wilson	Consulting Scientist	Arctic Ambient Noise & ASW
1994-95	Arnold L. Gordon	Lamont-Doherty Earth Observatory	Antarctic Circulation
1996-97	Lawson W. Brigham	Cambridge University, U.S. Coast Guard (retired)	Remote Sensing, Ice Operations

25 Years of Arctic Sub Bathymetric Data Declassified

In August 1997, the U.S. Navy and the U.S. Arctic Research Commission (USARC, see page 11) announced an agreement to declassify the largest quantity of Arctic Ocean bathymetric data in history. The new information will increase by ten-fold the data available to civilian researchers and the public worldwide regarding the topography of the ice-covered Arctic Basin.

The data sets for over 120,000 nautical miles of track in the 5.5 million-square-mile Arctic Ocean were collected by U.S. Navy nuclear submarines from 1957-1982 during routine operations in the Arctic. Submarines, underway continuously, constitute an ideal platform for collecting this valuable record. The data include:

- water depth,
- latitude and longitude,

- general time frame,
- type of bottom sounder, and
- navigation system used.

Configuring the first batch of declassified data into a format that can be used by the scientific community will take approximately six months. When released, the data will help answer a number of significant questions. It will be useful for:

- improving the accuracy of hydrographic charts,
- refining models of Arctic Ocean circulation,
- enhancing the understanding of global climate, and
- predicting the transport of contaminants.

The data will assist scientists in understanding the geological structure of the Arctic and the geologic history of

the Arctic Ocean basin, including the tectonic development of the region.

The data-release plan, recently approved by the Chief of Naval Operations (CNO), is the product of a cooperative effort by the U.S. Department of State, the Director of the Submarine Warfare Division, the Oceanographer of the Navy on the CNO's staff, and the USARC.

For more information, contact Garry Brass at the USARC in Arlington, VA (703/525-0111; fax 703/525-0114; g.brass@arctic.gov) or Lieutenant Joe Walker at the U.S. Navy Office of Information at the Pentagon in Arlington, VA (703/697-5342; fax 703/695-5318). ■

Recipients as Researchers: Villagers Evaluate Services

Residents in the southwest Alaskan communities of Hooper Bay, Scammon Bay, and Chevak have been engaged in a new process for evaluating services available in their villages. They have participated in a qualitative evaluation of the accessibility, acceptability, and quality of substance-abuse treatment using a process developed by researchers at the University of Alaska Anchorage's Institute for Circumpolar Health Studies.

Residents were asked to help evaluate a pilot program that selected and trained six villagers in 1994 to provide substance-abuse treatment services in the three rural communities. The villagers were trained to provide services based on traditional Yup'ik and Cup'ik Eskimo customs and practices rather than those based exclusively on Western substance-abuse treatment approaches. Each local program relies heavily on the advice of local policy steering committees.

That pilot program has been supported by grant funds from the federal Center for Substance Abuse Treatment in Rockville, Maryland and sponsored by the regional Yukon-Kuskokwim Health Corporation

headquartered in the southwest Alaska hub community of Bethel.

Residents of the three villages have now supported a rigorous evaluation of the services received under this demonstration grant. The procedure developed for this evaluation includes:

- focus groups designed to answer questions of major interest to both the villagers and federal funding agencies;
- videotaped interviews requested on the basis of insights from focus groups;
- production of a 50-minute videotape describing in the service recipients' own words how the program is being received.

Feedback from program participants suggests that:

- qualitative evaluation methods developed for this project conform to Yup'ik and Cup'ik cultural expectations and customs;
- participating communities do not feel invaded by researchers;
- villagers feel that their voice is being heard in their assessment of the accessibility, acceptability, and quality of the programs provided;

- people are proud of the results and therefore own them; and
- evaluation findings are being used in local health-service management and policy decisions.

These evaluation techniques can be used by other researchers working to increase participation of service recipients in remote, culturally distinct communities. The orderly, qualitative process engages villagers as active participants in the evaluation. Their perceptions can then be used to assess the reliability and validity of quantitative evaluation techniques.

For more information, contact Brian Saylor at the Institute for Circumpolar Health Studies, University of Alaska Anchorage (907/786-4024; fax 907/786-4019; anbls@uaa.alaska.edu) or Joan Hamilton at Chemical Misuse Treatment and Recovery Services in Bethel, AK (907/543-6760 or 800/450-2822; fax 907/543-6712). ■

Partnership Formed to Develop Indigenous Curricula

In Spring 1997, the Arctic scientific community represented by ARCUS, and the Alaska Native community represented by the Alaska Federation of Natives (AFN) and its Rural Systemic Initiative (AKRSI), launched a partnership to coordinate science-education initiatives. ARCUS and AFN are collaborating through a Memorandum of Agreement in a project to improve access to locally produced curriculum resources for rural schools in Alaska. Sean Topkok assumed the position of Indigenous Curriculum Specialist with ARCUS in April 1997 and began to compile, catalog, and disseminate the volume of material that has been produced over time.

The AKRSI is a five-year project funded in 1994 (see *Witness* Spring 1995), in part by the NSF Educational System Reform Programs, and in part by the Annenberg Rural Challenge.

In 1993, the Honorable Walter A. Annenberg, former U.S. ambassador to

Great Britain, made a five-year, half-billion-dollar challenge grant for American public schools (the Annenberg Challenge). He subsequently established another \$50,000,000 fund, known as the Annenberg Rural Challenge, in light of compelling evidence that a national school-reform effort, to be effective, must include rural schools. One third of the nation's schools are rural, and a quarter of the nation's students and teachers meet in rural schools. The Rural Challenge funded AKRSI as part of a national network committed to transforming rural education.

The AKRSI is dedicated to systemic reform through the integration of Alaska Native and Western scientific knowledge into educational systems throughout Alaska. AKRSI has developed the Alaska Native Knowledge Network (ANKN) to help compile and exchange information related to knowledge systems and ways of knowing that Alaska Natives have acquired through cumulative experience over

millennia. ANKN intends to make such information available to Native people, government agencies, educators, and the general public.

A database of curriculum resources compiled by the Indigenous Curriculum project since April 1997 is now available at the ANKN Web site listed below.

The curriculum resources included in the database illustrate ways in which indigenous and Western knowledge systems can be applied in schools through a balanced, comprehensive, and culturally aligned curriculum framework adaptable to local circumstances. The resources will help teachers and students connect the knowledge, skills, and ways of knowing necessary for a village livelihood with those reflected in the school curriculum.

The database resources are cataloged by aspects of life in rural Alaska around which school curricula can be organized. The twelve themes are:

- Family,
- Language/Communication,
- Cultural Expression,
- Tribe/Community,
- Health/Wellness,
- Living in Place,
- Outdoor Survival,
- Subsistence,
- Alaska Native Claims Settlement Act,
- Applied Technology,
- Energy/Ecology, and
- Exploring Horizons.

AKRSI also is developing cultural standards—guidelines for relating classroom learning to students' experiences in the cultural and physical environment outside of school. Draft cultural standards pertain to:

- learning experiences of the student,
- composition of the curriculum,
- practices of the teacher, and
- context of the school itself.

The standards are being distributed for review and will be proposed for adoption at a conference of Native educators in February 1998. The draft cultural standards are available on the ANKN Web site (<http://www.uaf.edu/ankn>) and from Sean Topkok at ANKN (907/474-5897; fax 907/474-5615; fncst@aurora.alaska.edu).

Barrow Hosts Science Education Assembly

Over 30 scientists, educators, parents, and North Slope community members gathered in Barrow, Alaska in August 1997 to reflect on the importance of science education in the Arctic. The Arctic Science Education Conference, sponsored by Ilisagvik College and the Alaska Rural Systemic Initiative (see article this page), was held in conjunction with "Science in the Community," the 50th anniversary of the Naval Arctic Research Laboratory (NARL, see feature).

The goal of the Conference—*"to develop specific recommendations, guidelines, and techniques for educating North Slope students in the sciences into the 21st century while maintaining a sensitivity to the cultural heritage of the Iñupiat lifestyle"*—was emphasized by Alaska North Slope Borough (NSB) Mayor Ben Nageak in his opening address on the value of science education to the Borough.

Presentations, representing many voices, included information on:

- science education from a Native American perspective;
- standards-based education and Alaska state education initiatives;
- new developments in Arctic science education from a scientific perspective; and
- curriculum resources for Arctic science education.

Participants discussed the kinds of science education currently available and what they would like to see in their respective communities. The day closed with a distillation of salient points from three participants—a Barrow resident and business leader, the head of the NSB Department of Wildlife Management, and a leading scientist. A planned report will provide guidelines for future Arctic science education endeavors.

For more information, contact Frank Willingham, Ilisagvik College, (907/852-9176; fax 907/852-1146; fwillingham@co.north-slope.ak.us).

Arctic Social Sciences Workshop to Develop Science Plan

Approximately 25 invited participants will meet in late October 1997 at an NSF-funded workshop in Seattle, Washington to prepare a comprehensive science plan for the Office of Polar Programs Arctic Social Sciences Program.

The Arctic Social Sciences Program was initiated by NSF in 1990 in response to *Arctic Social Science: An Agenda for Action*, published by the National Research Council in 1989 and relating to all federal agencies. That report suggested that research was necessary in three major areas:

- rapid social change,
- community viability, and
- human/environment interactions.

The multidisciplinary and interdisciplinary program that developed according to the report's recommendations encompasses all social sciences supported by NSF, including anthropology, archaeology, economics, geography, linguistics, political science, psychology, sociology, and related subjects.

The program has been successful in many areas, supporting projects that have produced significant and much needed knowledge about the prehistory of the Arctic and the cultural life of indigenous peoples. Many of these studies are important in understanding environmental and climate change, and help make predictions about future global change (see *Witness* Autumn 1994 and Autumn 1995).

The Arctic Social Sciences Program has also supported important collaborations and partnerships, including cooperation between U.S. and international scientists, researchers and indigenous peoples, social and natural scientists, and social scientists and schools.

In addition, the program has funded non-research activities that greatly impact the conduct of social science in the Arctic. For example, support provided for the establishment of the Alaska Native Science Commission (ANSC, see page 19) has helped to strengthen connections and communications between scientists and Native communities and groups.

An *International Directory of Arctic Social Scientists* published in Spring 1997

(see Publications page 23) has already proven invaluable in helping researchers from various social science disciplines, and natural and social scientists, form collaborative relationships.

A growing awareness of needs that are, as yet, inadequately addressed is prompting a call for additional research. Attention to current political, social, economic, and environmental issues could contribute insights highly relevant to the immediate future of those living in the Arctic.

Accordingly, the priorities of the 1989 *Agenda for Action* will be revisited by workshop participants in October 1997. The workshop planning process will address the diversity of social science disciplines and researchers supported by the program. Invited participants represent a broad array of perspectives and a variety of disciplines, including those that typify the program's significant accomplishments and important gaps in understanding.

Participants have been asked to draft a comprehensive science plan that will provide a framework for ongoing development of the social science research program. In order to develop recommendations

for the science plan, they will review:

- priorities of the existing program,
- goals and objectives set forth in *Arctic Social Science: An Agenda for Action*,
- recommendations from the workshop on *Traditional Knowledge Systems in the Arctic* convened by ANSC in March 1997 (see *Witness* Spring 1997), and
- other recommendations for the conduct of Arctic social science.

The new plan is envisioned to be a set of dynamic recommendations subject to continuing evolution as research is conducted, new questions emerge, and priorities shift to address changing needs.

ARCUS has been tasked by NSF to convene the October 1997 workshop and coordinate publication of the science plan. The draft plan will be posted on the ARCUS Web site for community review and comment prior to publication.

For more information, contact Arctic Social Sciences Program Manager Fae Korsmo (see box this page) or ARCUS (907/474-1600; fax 907/474-1604; arcus@polarnet.com; <http://arcus.polarnet.com>). ■

Korsmo Becomes New Arctic Social Sciences Program Manager at NSF

Fae L. Korsmo will become the new Arctic Social Sciences Program Manager at NSF beginning 1 October 1997. Korsmo comes to her new position from the University of Alaska Fairbanks (UAF), where she has been Associate Professor and Chair of the Political Science Department.

Korsmo's research interests have involved comparative indigenous rights in the circumpolar North, focusing on constitutional issues and land claims. Ongoing research includes the influence of the International Geophysical Year (1957-58) on international relations and domestic politics in the Arctic. Another topic of continuing research encompasses the human dimensions of global change.

For the past year, Korsmo has organized and directed the Social Science Research Group at UAF, with the purpose of encouraging interdisciplinary research and curriculum development. She plans to foster interdisciplinary approaches at NSF, integrating social science and educational elements with the natural and physical sciences. Her goals also include strengthening relationships between research communities and local populations.

Korsmo can be reached in Washington, DC (703/306-1029; fax 703/306-0648; fflk@aurora.alaska.edu; after 1 October 1997, fkorsmo@nsf.gov). ■

Alaska Native Science Commission Installs Seven

In June 1997, the Alaska Native Science Commission (ANSC) officially installed seven commissioners at a public reception in Anchorage, Alaska.

ANSC was created in 1994 to bring research and science into partnership with Alaska's Native community. The community mobilized after Senator Murkowski's May 1993 keynote address at the Arctic Contamination Conference reviewed decades of Cold War research including Project Chariot (see *Witness* Winter 1993) and iodine experiments on Native residents (see *Witness* Spring 1996). In light of Murkowski's talk, Alaskan Natives resolved to become actively involved in scientific research, to become aware and informed of science investigating Native lives and environment, and to ensure that science conducted in Alaska occurs with the knowledge, cooperation, and understanding of the Native community.

In 1994, NSF provided a portion of the funding that established ANSC. The organization's mission is "to endorse and support research that enhances and perpetuates Alaska Native cultures, and ensures the protection of indigenous cultures and intellectual property."

Following is a brief introduction to the individuals who fill the seven ANSC seats.

Elaine Abraham holds the Teacher seat on the Commission. She is a resident of Yakutat, where she was born and raised in the traditional Tlingit manner. Abraham has a nursing degree; an M.A. in Teaching; and additional degrees in human resources development, Native linguistics, and anthropology. She organized the southeast Alaska program that became the model for the statewide Alaska Native Health Aide Program, and has played a key role in many other initiatives. Between 1976 and 1996, Abraham served as Vice-President for Rural Education Affairs, Coordinator of Native Student Services, and Associate Professor at the University of Alaska (UA).

Dolores "Dolly" Garza holds the Scientist seat. She is Associate Professor for the UA Marine Advisory Program. She has applied her knowledge of subsistence practices, her cultural skills and values, and her



ANSC installed its first Commissioners in June 1997. They are (second from left to right) Michael Pederson, Dolly Garza, Anne Walker, and Oscar Kawagley; (seated) Paul John and Elaine Abraham; (missing) Richard Glenn. They are joined in this photo by (far left) University of Alaska Chancellor Lee Gorsuch; and (far right) Alaska Federation of Natives Vice-President Dorothy Larson, former NSF Arctic Social Sciences Program Director Carole Seyfrit, and ANSC Executive Director Patricia Longley Cochran (photo courtesy of ANSC).

academic training (including a Ph.D. in Marine Policy) to subsistence management, marine mammal management, and marine safety work in western and southeast Alaska.

Richard Glenn fills the Arctic Science seat. Glenn is President of the Barrow Arctic Science Consortium (see page 2); an ARCUS board member; and a member of the Ilisagvik College Board of Trustees, the Native American Science Education Commission, and the U.S. Arctic Research Commission (see page 11). Glenn holds an M.A. in Geology from the University of Alaska Fairbanks (UAF) and has extensive professional field experience.

Paul John holds the Elder's seat on the Commission. A Native of Toksook Bay, he is distinguished by his first-hand knowledge of natural science from a Yup'ik world view and his effective educational work with both the young and old. John has worked with regional leaders to incorporate local perspective and worldview into management plans that affect the resources upon which he and his community depend.

Oscar Kawagley fills the Education seat. A Native of Bethel whose first language is Yup'ik, Kawagley earned a Ph.D. from the University of British Columbia and is now an Associate Professor of Education at UAF. His long history of leadership includes service as

executive director of many non-profit organizations; President of Calista Corporation, a Native regional corporation; and President of ESCA Corporation, an earth-science and remote sensing consulting company.

Michael Pederson, an Iñupiat Eskimo from Barrow, holds the Natural Resources seat. He works as the Natural Resources Specialist for the Arctic Slope Native Association. He is a member of Eugene Brower's whaling crew, has worked with the Alaska Eskimo Whaling Commission, and has participated in meetings of the International Whaling Commission. Pederson is also involved in cultural resource issues, including repatriation of human remains and artifacts.

Anne M. Walker fills the Health seat on the Commission. Born in Kotzebue, Walker earned her M.A. in Public Health Science in 1981 and became Executive Director of the Alaska Native Health Board in 1990.

ANSC is currently administering the following projects:

- Social Transition in the North,
- Contamination of Subsistence Foods Harvest, and
- workshops on Traditional Knowledge Systems in the Arctic.

For more information, contact Patricia Longley Cochran (907/786-7704; fax 907/786-7739; anpac1@uaa.alaska.edu). ■

NOAA Arctic Research Initiative Extends into 1998

The National Oceanic and Atmospheric Administration (NOAA) expects to continue funding its Arctic Research Initiative (ARI) in 1998 at the level of \$1-1.5 million. The Cooperative Institute for Arctic Research (CIFAR) at the University of Alaska Fairbanks will continue to administer the program for NOAA (see *Witness* Spring 1997).

CIFAR plans to release the new announcement of opportunity in October 1997. Details of research conducted since the Initiative was launched in 1997, and future plans will be discussed at a meeting in Seattle on 9-10 October 1997 (see Calendar page 23). Proposals will be due in December 1997; funds will be allocated in March 1998.

The overall goal of the ARI is to address the following national Arctic policy objectives:

- protect the Arctic environment and conserve its biological resources,
- assure that natural resource management and economic development are environmentally sustainable,
- strengthen institutions for international cooperation, and
- involve the region's indigenous people in decisions that affect them.

In fiscal year 1997, the ARI program focused on the health of the Bering Sea/Western Arctic ecosystem, in particular:

(1) Natural variability of the Bering Sea/Western Arctic ecosystem

- processes and ecosystem production in the Bering Sea green belt;
- atmosphere-ice processes that influence ecosystem variability; and
- atmospheric, cloud, and boundary-layer processes.

(2) Anthropogenic influences on the Bering Sea/Western Arctic ecosystem

- Arctic haze, ozone, and UV flux;
- contaminant sources, fate, and effects on the ecosystem.

The 1998 program is expected to be somewhat more ambitious in objective and scope. In addition to addressing the scientific areas identified in 1997, the Initiative will strive to embrace research needs identified in science planning for the Arctic Monitoring and Assessment Program (AMAP, see page 9)

and for the International Arctic Research Center (see page 22). AMAP research needs fall into three areas:

- monitoring, data collection, exchange of data on the impacts and assessment of contaminants and their pathways;
- increased UV-B radiation due to stratospheric ozone depletion; and

• effects of climate change on ecosystems. IARC research priorities have just been made available for review (see page 22).

For more information, contact Patricia Anderson (907/474-5698; fax 907/474-6722; patricia@gi.alaska.edu) or Gunter Weller (907/474-7371; fax 907/474-7290; gunter@gi.alaska.edu). ■

Regional Surveys Assess Change

The second of 18 regional workshops designed to collate information and concerns regarding climate change and its consequences for the United States took place in Alaska in June 1997. The workshop on Impacts of Global Change on the Western Arctic/Bering Sea Region (Mackenzie River to Lena River) brought together approximately 100 researchers and stakeholders from Canada, Japan, Russia, and the United States.

The resulting assessment will contribute to three larger assessments:

- a national scientific assessment called for in the Global Change Research Act of 1990 and sponsored by the U.S. Global Change Research Program (USGCRP),
- a circum-Arctic assessment sponsored by the International Arctic Science Committee (see *Witness* Autumn 1996), and
- a global assessment conducted by the Intergovernmental Panel on Climate Change (IPCC).

The national assessment, due to be completed in 1999, will contribute a summary of anticipated consequences for the United States to the global assessment.

The USGCRP was established in 1989 "to increase understanding of the Earth system and, thus, provide a sound scientific basis for national and international decisionmaking on global change issues."

The program is currently focused on:

- climate variability (seasonal-interannual);
- climate change (decades-centuries);
- changes in ozone, UV radiation, and atmospheric chemistry; and
- changes in land cover and terrestrial and aquatic ecosystems.

The regional workshops are designed to examine the vulnerability of various

regions of the United States to long-term change, particularly climate variability and climate change. The workshops are:

- reviewing and updating coarse impact assessments compiled from previous workshops;
- educating stakeholders;
- soliciting stakeholders' concerns about the possible impacts of global change in the region;
- defining a research agenda to further improve the impact assessments; and
- developing support for strategies to cope with any adverse impacts.

A national forum on Climate Change Impacts 12-13 November 1997 in Washington, DC will consider input from the seven regional assessments conducted in 1997 and focus on identifying cross-cutting questions.

The Western Arctic/Bering Sea workshop was funded by NSF and the U.S. Department of the Interior as part of the circum-Arctic study (see *Witness* Autumn 1996). For more information, see the Bering Sea Impact Study (BESIS) Web site (<http://www-cgc.uafadm.alaska.edu/besis>) or contact Gunter Weller, Director of the Center for Global Change and Arctic System Research in Fairbanks, AK (907/474-7371; fax 907/474-6722; gunter@gi.alaska.edu).

For more information about the national science assessment, contact the USGCRP Coordination Office in Washington, DC (202/488-8650; fax 202/488-8681; regional.workshops@usgcrp.gov; <http://www.usgcrp.gov>). ■

NOAA Funds Comprehensive Bering Sea Database

In 1996, the National Research Council's *Report on the Bering Sea Ecosystem* flagged the lack of a comprehensive database as the major impediment to studying the Bering Sea (see *Witness* Autumn 1996).

To address this deficiency, the National Oceanic and Atmospheric Administration's (NOAA's) Environmental Services Data Information Management has funded Bernard Megrey (NOAA Alaska Fisheries Science Center) and Allen Macklin (NOAA Pacific Marine Environmental Laboratory) to compile a Bering Sea Ecosystem Metadatabase.

The inventory will include physical and biological data that will help researchers, managers, students, fishermen, and the general public investigate and understand the complex ecosystem of the Bering Sea. Data will be available through various mechanisms, including the Internet.

Physical and biological data that already have been collected include:

- single-point and gridded time series,
- repetitive observations from earth-orbiting satellites,
- ocean surveys of physical and biological oceanographic significance,
- specimen collections, and
- historical records of animal population changes.

While some data reach back through the last century, the Bering Sea has been the subject of much closer scrutiny during the last two decades by such major research programs as the Outer Continental Shelf Environmental Assessment Program (OCSEAP) and Processes and Resources of the Bering Sea Shelf (PROBES). Even more recently, the region's economic and biological significance has provided impetus for the proliferation of a number of active research efforts including:

- **regional studies**—North Pacific Marine Science Organization (PICES)/Global Ocean Ecosystems Dynamics Research (GLOBEC) International Climate

Change and Carrying Capacity Program (CCCC), Bering Sea Impacts Study (see *Witness* Autumn 1996),

- **national studies**—Bering Sea Fisheries-Oceanography Coordinated Investigations (FOCI), Southeast Bering Sea Carrying Capacity, Bering Sea Ecosystem Study (see *Witness* Autumn 1996),
- **international studies**—PICES/GLOBEC, Japanese and Russian programs.

All of these programs have field-data collection components and are in a position to contribute to, and benefit from, the metadatabase.

For more information or to contribute data, register at the Metadatabase Web site (<http://www.pmel.noaa.gov/bering/mdb/>), or contact Bern Megrey at NOAA/Alaska Fisheries Science Center in Seattle, WA (206/526-4147; fax 206/526-6723; bmegrey@afsc.noaa.gov) or Allen Macklin at NOAA/PMEL in Seattle (206/526-6798; fax 206/526-6485; macklin@pmel.noaa.gov). ■

Conference to Focus on Culture, Ethics, Self-Determination

For millennia, circumpolar societies have adapted and responded to environmental and social changes and shown great resiliency. The pace and intensity of this change has increased dramatically during the 20th century. Circumpolar peoples have responded in complicated and varied ways. They have also initiated cultural, social, and economic changes to improve livelihoods and create new possibilities for present and future generations. Such self-initiated changes pervade the local, national, and international communities.

Changes in the Circumpolar North—Culture, Ethics, and Self-Determination will be the subject of the Third International Congress of Arctic Social Sciences (ICASS III). The Conference convenes 21-23 May 1998 in Copenhagen, Denmark (see Calendar page 23).

Three major sessions are planned:

- Indigenous and Local Knowledge,
- Social Viability and Cultural Continuity, and
- Political Dynamics, Governance, and Self-Determination.

Circumpolar peoples have urged the science community to conduct research adhering to the highest standards of (1) professional responsibility and (2) accountability to those affected by this research. Research conducted in this manner becomes a part of community development and community action.

This is in accordance with IASSA's *Guiding Principles of Ethics for the Conduct of Research*, guidelines for developing research partnerships based on the principles of informed consent, accountability, and mutual respect. The International Arctic Social Sciences Association (IASSA) has, thus, stressed the significance of including representatives of user communities in the conference.

Suggestions for sessions are welcome before 1 October 1997, and abstracts before 15 February 1998.

For more information, contact Frank Sejersen at the IASSA Secretariat in Copenhagen (+45 32 88 01 67; fax +45 32 88 01 61; iassa@coco.ihl.ku.dk). ■

New IASC Director

In May 1997, the International Arctic Science Committee (IASC) elected David J. Drewry as its new President. Drewry, a glaciologist, is Director of Research and Technology at the Natural Environment Research Council, United Kingdom. He has previously been Director of the Scott Polar Research Institute and the British Antarctic Survey, both in the United Kingdom.

For more information, contact Odd Rogne at the IASC Secretariat in Oslo, Norway (+47-22959600; fax +47-22959601; iasc@npolar.no). ■

International Program in Global Change Prediction Opens

At the beginning of 1997, Japan created the Frontier Program, for the study of global change prediction. Under the Frontier Program, the Japanese Government will construct five research centers—three in Japan and two in the United States. One of the U.S. centers, the International Pacific Research Center in Hawaii, will concentrate on climate issues in the western Pacific region, especially on the El Niño-Southern Oscillation and the Asia-Pacific monsoon. The other center, the International Arctic Research Center (IARC), is housed at the University of Alaska Fairbanks (UAF). These U.S.-based centers will be jointly planned and implemented by the Japanese and U.S. governments.

Development of the Frontier Program marks the beginning of scientific planning for IARC activities that will combine U.S. and Japanese Arctic research resources and interests.

International Arctic Research Center

IARC is designed to serve as headquarters in which experts can share knowledge about a variety of natural phenomena that occur in the Arctic, particularly within the context of climate change.

Creation of the 100,000 square-foot building at UAF began in 1994 with a proposal from the University of Alaska (UA) to the Japanese Government to participate in the construction and use of Arctic research facilities in Alaska (see *Witness Spring* 1996). This proposal led to the construction of Building I ("I" for International) at UAF. The first phase of the construction project took place during the summer of 1995; the scheduled completion date is December 1998.

The \$30 million project is funded by the Government of Japan, the State of Alaska, the City of North Pole, UAF bond sales, and private donations.

Scientists plan to occupy the building in early 1999. Among the first to move into the building will be the Fairbanks Forecast Office of the National Weather Service; and the Geophysical Institute's Keith B. Mather Library, Atmospheric

Science Group, GeoData Center, and Map Office.

Japanese agencies scheduled to occupy the building include the National Research Institute for Earth Science and Disaster Prevention.

Initiatives to be addressed at the IARC will include:

- Arctic Climate,
- Arctic Hydrologic Cycle,
- Global Warming,
- Atmospheric Compounds,
- Arctic Ecosystems,
- Tectonic Hazards in the Arctic Region,
- Socio-Economic Impacts of Global Change in the Arctic, and
- Middle and Upper Atmosphere.

The draft *IARC Science Plan* is available at the Web site listed below.

International Administration

IARC is an organization within UAF with its own director and internal UAF advisory committee. Interagency oversight will be carried out by the IARC Implementation Committee (IARC-IC) which consists of representatives from the

U.S. and Japanese government agencies sponsoring research at the Center. The IC is chaired by Garry Brass of the U.S. Arctic Research Commission (USARC, see page 11) and Eiichi Muto of the Japanese Science and Technology Agency (STA).

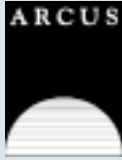
A Scientific Advisory Committee (SAC) of Japanese, U.S., and other international expert scientists will serve as scientific advisors to the IARC and the IC; this committee will also review the annual science plan submitted to the IC by the Center.

The IARC-IC in turn reports to the Joint Council on Global Change (JC) chaired by Bob Corell, Assistant Director of NSF's Geosciences Directorate, and Tsuyoshi Maruyama, Director of Ocean and Earth Division of STA.

For more information, see the Center for Global Change and Arctic System Research Web site (<http://www-cgc.uafadm.alaska.edu/iarc>) or contact Garry Brass at the USARC in Arlington, VA (800/287-6722 or 703/525-0111; fax 703/525-0114; g.brass@arctic.gov). ■



The flags of Japan and the United States mounted high on the building's structural framework signify the collaboration taking place, as construction proceeds on the new International Arctic Research Center (IARC) at the University of Alaska Fairbanks in July 1997. IARC will be physically attached to the Geophysical Institute building on the right (photo by Syun Akasofu).



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witness (wit nis) *n.* 1.a. One who has heard or seen something. b. One who furnishes evidence. 2. Anything that serves as evidence; a sign. 3. An attestation to a fact, statement, or event. —*v. tr.* 1. To be present at or have personal knowledge of. 2. To provide or serve as evidence of. 3. To testify to; bear witness. —*intr.* To furnish or serve as evidence; testify. [Middle English *witnes(se)*, Old English *witnes* witness, knowledge, from *wit*, knowledge, wit.]

Calendar

- September 24-27, 1997** 48th Annual AAAS Arctic Science Conference. Valdez, Alaska. Contact Linda Barker at the University of Alaska Fairbanks (907/474-7531; fax 907/474-5863; barker@murre.ims.alaska.edu).
- October 9-10, 1997** Arctic Research Initiative (ARI) Meeting. Seattle, Washington. National Oceanic and Atmospheric Administration (NOAA). Contact Patricia A. Anderson at the Cooperative Institute for Arctic Research (CIFAR) in Fairbanks, Alaska (907/474-5698; fax 907/474-6722; patricia@gi.alaska.edu).
- October 27-31, 1997** First International Conference on Re-Analyses. Silver Spring, Maryland. Contact the International GEWEX Project Office in Silver Spring, Maryland (301/427-2089 ext. 33; fax 301/427-2222; gewex@cais.com).
- November 3-6, 1997** Conference on Polar Processes and Global Climate. Orcas Island, Washington. Arctic Climate System Study (ACSYS) of the WCRP. Contact Tordis Villinger in Oslo, Norway (+47 22 95 73; fax +47 22 95 96 01; tvilling@npolar.no).
- November 7-8, 1997** Community Development From the Inside Out. Calgary, Alberta, Canada. Contact Heidi Hoernig at Northern Planning and Development Studies, The Arctic Institute of North America, University of Calgary (403/220-4051; fax 403/282-4609; hjhoerni@acs.ucalgary.ca).
- November 10-12, 1997** Study of Arctic Change. Seattle, Washington. Arctic Systems Science (ARCSS) section of the NSF Office of Polar Programs. Contact Peggy Hartman at the Polar Science Center in Seattle (206/543-6613; fax 206/543-3521; peggy@apl.washington.edu) and copy Jamie Morison (206/543-1394; fax 206/543-3521; morison@crosby.apl.washington.edu).
- November 15-16, 1997** OAI Science Steering Committee Fall Meeting (open to the community, outside of the executive session periods). Knoxville, Tennessee. See the OAI Web site (<http://www.arcss-oai.ccpo.odu.edu>) or contact Jackie Grebmeier (423/974-2592; fax 423/974-3067; jgreb@utkux.utk.edu).
- December 8-12, 1997** The American Geophysical Union (AGU) Fall Meeting. San Francisco, California. Contact AGU Meetings Department (202/462-6910, ext. 291 or 800/966-2481; fax 202/328-0566; meetinginfo@kosmos.agu.org; <http://www.agu.org>).
- April 19-23, 1998** Past Global Changes and Their Significance for the Future. London, England. Contact Frank Oldfield, Executive Director, at the IGBP PAGES International Project Office in Bern, Switzerland (+41 31 312 3133; fax +41 31 312 3168; pages@ubclu.unibe.ch; <http://www.pages.unibe.ch/pages.html>).
- May 21-23, 1998** Changes in the Circumpolar North: Culture, Ethics and Self-Determination. Copenhagen, Denmark. Third International Congress of Arctic Social Sciences (ICASS III). Contact Frank Sejersen at the IASSA Secretariat in Copenhagen (+45 32 88 01 67; fax +45 32 88 01 61; iassa@coco.ihl.ku.dk). ■

Check the ARCUS Web site Calendar (<http://arcus.polarnet.com>) for more...

Publications

- Arctic Pollution Issues: A State of the Arctic Environment Report.** June 1997. AMAP. Oslo, Norway. 188 p. (+47 22 57 36 36; fax +47 22 67 67 06; <http://www.grida.no/amac>).
- International Directory of Arctic Social Scientists.** March 1997. NSF. Washington, DC. 221 p. (703/306-1029; fax 703/306-0648; <http://www.nsf.gov>).
- Logistics Recommendations for an Improved U.S. Arctic Research Capability.** July 1997. ARCUS. Fairbanks, AK. 88 p. (907/474-1600; fax 907/474-1604; arcus@polarnet.com; <http://arcus.polarnet.com>).
- NSF Grant Proposal Guidelines and Proposal Forms Kit.** August 1997. NSF. Washington, DC. (703/306-1243; fax 703/306-0280; policy@nsf.gov; <http://www.nsf.gov>).
- People and the Arctic—A Prospectus for Research on the Human Dimensions of the Arctic System.** May 1997. ARCUS. Fairbanks, AK. 75 p. ■

A Note from the President

Some years ago, I was doing research at the National Archives in Washington, DC. As I was waiting for my material, I struck up a conversation with the person standing in front of me. He asked about my topic. I told him that it was federal policy toward pre-World War II Arctic Alaska. "My," he said, "what an obscure topic."

Within ARCUS, we frequently discuss how to raise the national policy profile of Arctic research. All too often, we hear that it is an obscure topic. Public funding for science cannot be built entirely on the logic of scientific discovery. Publicly funded science must—at least occasionally—show results that the public can understand. Examples come through the news of existing discoveries that capture public attention. One is tempted to seek such attention for Arctic research. One can spend considerable time trying to figure out what stories will capture the media's imagination.

The danger is, however, in creating sensational stories built on shaky science. Examples have arisen where the probabilities associated with each link in a chain of argument make the conclusions—and the

newsworthy story—thin. The weakest link can be between media interest and actual importance to people's lives. Do we really need to know that life might—*might*—have existed on Mars rather than such things as whether our planet will be able to support life in the future? Publicity can direct investigations toward further thin results rather than strengthening less interesting links.

Most robust results require yeoman service to scientific work. Science is an accumulation of knowledge built-up over generations. GISP2 has been an excellent example of polar research that can draw public attention, but do so on a frame of solid science. In truth, the Arctic science community will not find many opportunities like the Greenland Ice Sheet. Interesting results take far greater work. Each link in the chain needs to be supported.

Most in the scientific community, and many in the press, understand the need for both exciting results and obscure but essential work. We can never know beforehand what we need to know.

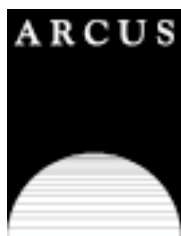
Concern arises when government officials, from senators to program managers, talk about the need for exciting results.

Arctic research needs to follow the logic of scientific discovery. Decisionmakers need to see the importance of normal science—even when it seems expensive but obscure. The continuing trend is toward interdisciplinary research within the Arctic, research that can at least draw immediate connections to larger systems and, possibly, human affairs. We can show the extraordinary in the normal.

Nicholas S. Flanders

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ARCUS Announces Second Annual Award for Arctic Research Excellence

ARCUS recently announced the second annual Award for Arctic Research Excellence for undergraduate and graduate students. Submissions are due 1 December 1997. Up to four awards will be given in recognition of excellent research on any aspect of the Arctic. Papers will be judged within the following categories: Life Sciences, Physical Sciences, Social Sciences, and Interdisciplinary. Interdisciplinary research and research that considers Local and Traditional Knowledge is strongly encouraged. Contestants must be 1) registered undergraduate or graduate students as of 1 December 1997, 2) the sole or primary authors of the paper, and 3) major contributors to the research.

Winners will receive a \$500 cash award and travel costs paid to attend the March 1998 ARCUS Annual Meeting in Washington, DC. There, they will present their papers to an audience of senior researchers and government officials at the *Arctic Forum*. Last year's winners commented that the opportunity to meet and network with top researchers in their field at the *Arctic Forum* was one of the most valuable benefits to winning the award.

A complete competition announcement and entry forms are available from ARCUS (907/474-1600; fax 907/474-1604; arcus@polarnet.com; <http://arcus.polarnet.com/Award/EntryForm.html>). ■

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