

# *From Crisis to Opportunity*



## **R e b u i l d i n g C a n a d a ' s R o l e i n N o r t h e r n R e s e a r c h**

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## Executive Summary

Canada's North<sup>1</sup> occupies about half of the Canadian landmass and possesses two thirds of the country's coastline. Home to only one percent of the population, and the homeland of northern Aboriginal peoples, it is a unique and sensitive environment that is facing unprecedented social, physical and environmental challenges.

In response to concern about the decline of Canadian research in the North, the Natural Sciences and Engineering Research Council (NSERC) and the Social Sciences and Humanities Research Council (SSHRC) established a joint Task Force on Northern Research in October 1998. Chaired by Dr. Tom Hutchinson of Trent University, the Task Force comprised 17 members from the university, government and northern communities with expertise covering the broad range of natural sciences and engineering as well as social sciences. In reaching its conclusions, the Task Force consulted widely with university researchers, federal government departments, and northern and Aboriginal communities and organizations.

The Task Force found that Canadian northern research is indeed in crisis. If action is not taken, Canada will not be able to meet its international science and research obligations, or contribute to issues of global importance. Nor will we be able to meet basic national obligations to monitor, manage, and safeguard the

<sup>1</sup> For the purpose of this exercise, the North was defined as **“the area north of the southern limit of discontinuous permafrost”**.

northern environment or respond to emerging social issues in the North.

Because of the costs and logistics of research in the North, university researchers have relied heavily on partnerships with federal government programs. In recent years, these programs have been curtailed, leading to a decrease in research activity in the North by both government departments and university researchers.

The consequences have been profound. Many university researchers have abandoned their northern programs. Those who are still continuing face immense barriers. No longer able to afford expensive northern field programs, they can send only a few students to the North for fieldwork, and they are reluctant to encourage students to pursue careers in this area. As a group, their average age is now significantly higher than that of university faculty as a whole.

Canadians must not be indifferent to this situation.

Much of the world's Arctic marine and terrestrial environment lies under Canadian jurisdiction. A Canadian research presence in the North is an essential assertion of our sovereignty.

The Arctic plays a key role in global systems, and its climate is closely linked to that of densely populated lower latitudes. Climate change in the Arctic will have direct and indirect effects on all Canadians.

Canada must contribute to the pool of knowledge about the North to be able to capitalize on international research results. As other nations discover the significance of the Arctic, more international research teams are arriving in Canada's North. While Canadian researchers are welcome participants in these projects, they often cannot pay their way.

The Task Force urges Canada to rebuild a vigorous, well-supported, and respected community of researchers who are able to undertake high-quality research in the North, generate new knowledge for Canada and the international community, and train a new generation of Canadian northern experts.

Some of the most compelling arguments for this renewal were heard in northern communities. It is axiomatic, in the year 2000, that research in the natural, human, and health sciences and engineering is essential to progress. For northern communities, that need is often huge.

The North is developing economically and undergoing unprecedented population growth and social change. New industries are being established, and with the settlement of land claims, northerners are taking responsibility for self-government.

The Task Force found that the research priorities of northerners coincide to a large extent with the priorities of university researchers. Northerners need fundamental studies to support their new responsibilities and policies on issues ranging from sustainable development, climate change, and resource management to health and welfare, cultural heritage, language, and education. Forging partnerships with universities will enable northerners to start to address their own research needs, and build the capacity to generate knowledge in the North, for the North.

The Task Force urges NSERC and SSHRC and the federal government in general to champion the rejuvenation of northern research. It recommends the crafting of a program that will sustain and augment existing research expertise, train a new generation of northern researchers, increase the amount of high-quality research being done in the North, and enhance Canada's ability to contribute to northern research of national and international importance. The program will also offset the high costs of doing research in the North, provide easier access to the North for researchers, build research infrastructure in the North, and facilitate northern community involvement in the research.

Such a program would include the following elements:

### **Northern Research Chairs**

The Task Force recommends a program of 24 Chairs—12 senior and 12 junior—for outstanding researchers with strong programs and demonstrated commitment to northern research. These Chairs would be proposed through the universities to an NSERC–SSHRC peer review process.

### **Northern graduate scholarships and postdoctoral fellowships**

These will target support of excellent graduate students and new investigators who represent the future of Canadian northern research. The award would include a research supplement added to the value of a regular award.

### **Research projects on the North**

These will support high-quality basic and applied research of social, industrial, or environmental relevance. The program would also provide an opportunity for the training of future researchers in a collaborative, interdisciplinary environment.

### **Community–University Research Alliances–North**

Modelled on SSHRC's successful Community–University Research Alliance program, this element will build partnerships between community groups and university researchers by defining a research and training agenda of mutual interest.

### **Equipment, infrastructure, and logistical support**

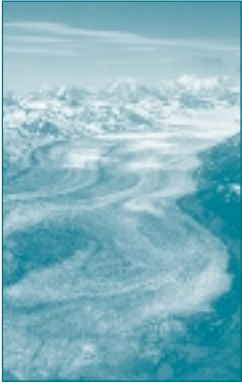
Currently there is only limited availability of research equipment in the North. The Task Force recommends that new equipment be placed in northern locations, where appropriate. It also recommends that northern research institutes be eligible to apply to the granting councils for equipment and resources for operational support.

The Task Force recommends that the Councils implement all the proposed program elements, but give highest priority to the establishment of Northern Research Chairs. The rationale for each of these elements is detailed in Section 6.1 of this report. The Task Force also makes a number of policy recommendations, which can be found in Section 6.3.

The cost of the program is outlined in Section 7. Full implementation would require \$9.2 million in Year 1 and \$17.5 million in Year 2. A steady-state annual cost of \$23.5 million would be reached in Year 3. Section 7 also provides a breakdown by program element. For example, the cost of implementing the proposed Chairs program alone would be \$1.2 million in Year 1 and \$2.4 million in Year 2, reaching a steady-state annual cost of \$3.6 million in Year 3.







## 1. Introduction

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Northern research in Canada has entered a deep crisis due to government cutbacks and downsizing during the past decade. These cuts have caused a decline in research activities and training at Canadian universities. They have effectively ended the long-established synergy between government and university research programs based in the North. The decrease in resources for northern research has led to a severe reduction in the recruitment of university researchers and graduate students with interests in such research, threatening Canada's capacity to perform northern research and meet its national and international responsibilities.

At the same time, many G7 and European Union (EU) nations have demonstrated a renewed interest in polar regions. They have implemented active research programs, many of which are being carried out on Canadian land and in Canadian waters. Indeed, most northern nations have recently passed progressive Arctic legislation or have presented position papers proclaiming the Arctic's increasing strategic, environmental, social, and economic importance. Canada does not have a formal Northern Science and Technology Policy, which leaves already fragmented Canadian northern research activities exceedingly vulnerable during times of financial stress.



Concerns about the state of northern research were first brought to NSERC's attention in January 1998. In October 1998, NSERC decided to establish a Task Force to look into the issue further. The Task Force on Northern Research was asked to work in two phases—the first to identify the issues and problems related to research in the North, and the second to propose actions to address the problems identified. The full membership and Terms of Reference of the Task Force are attached in Annex 1, and its methods of working are in Annex 2. The Task Force operated jointly with SSHRC. The Medical Research Council (now the Canadian Institutes of Health Research) was kept informed of the Task Force's progress and had observer status at meetings.



## 2. Importance of northern research

Canada's North occupies about 50% of the country's landmass and accounts for two thirds of its coastline, but is home to only one percent of the population. It is the homeland of northern Aboriginal peoples, who comprise half the population in the Canadian North. It is a unique and sensitive environment, facing unprecedented social, physical, and environmental challenges.

Over the last few years, the North has undergone enormous change. Economic development has accelerated over the last decade. Nunavut, with its new northern-based administration, has been created, and northern Aboriginal groups across Canada are proceeding with land claim settlements and regional self-government. These new regimes will be responsible for the development and implementation of policies for which substantive scientific data are currently lacking.

Future climate change is likely to be rapid in comparison to past changes, and its impact is predicted to be greatest in the North. Scientific knowledge is needed to understand and predict the effects of climate change on the physical and biological environment, ecosystems, and human population of the North. The Arctic also plays a key role in global climatic conditions, and its climate is closely linked to that of densely populated lower latitudes. Climate change in the Arctic will have direct and indirect effects on all Canadians.

Predicted trends in sea ice reduction based on global circulation models indicate that the issue of climate change impacts and adaptation will be of enormous importance to northern communities and wildlife.

Many difficult decisions face northern communities in the years ahead. While industrial activities such as oil and gas exploration, mining, and the growing tourism industry present environmental and logistical challenges, they also represent much-needed employment opportunities. Demographically, the region is different from the rest of Canada—in Nunavut, 56% of the population is under 25, compared with 33% of the Canadian population as a whole. At its current growth rate, Nunavut's population will double in two decades. Social change is moving at a fast pace in northern communities, and research into social issues such as health, education, language, and culture is critical to their future well-being.

Population growth and increased industrial development will also place greater pressure on wildlife. To take meaningful responsibility for its northern regions, Canada needs to engage in enlightened stewardship, monitoring, and management. Basic knowledge about natural and wildlife resources remains incomplete, yet is critical for their protection and management.

Canada's North, as part of the circumpolar region, shares an interest in and a responsibility for contributing to solutions to global problems such as transboundary pollutants, global climate change, and conservation of wildlife and habitat. Canada has signed international accords, such as the Montreal Protocol, the United Nations Framework Convention on Climate Change and the Kyoto Protocol on climate change. Increasingly, the circumpolar nations have realized that international co-operation and information sharing is vital to ensure the future of the northern environment. As a founding member of the eight-nation Arctic Council in 1996 (see Annex 3), and as a member of the International Arctic Science Committee (IASC) (see Annex 4), Canada shares treaty and hence moral obligations with its circumpolar partners to contribute to joint science-based Arctic programs. In order to meet its own research needs, Canada also needs to be able to draw on the international pool of knowledge.

Much of the world's Arctic marine and terrestrial environment lies under Canadian jurisdiction. A current concern is the growing interest in commercial and military shipping through the Northwest Passage, which would provide a more direct route between Asia and Europe or between Alaska and the northeastern United States. A Canadian research presence in the North is an essential assertion of our sovereignty.

The Canadian government bears primary responsibility for northern sustainable economic development, cultural and social well-being, and environmental stewardship. These issues clearly require the input of science and technology. Canada's fulfilment of its national and international northern research obligations is not possible without a vigorous, well-supported, and respected community of northern researchers undertaking high-quality programs.



### 3. Canadian northern research: key players, organizations and ongoing initiatives

Many federal, provincial, and territorial organizations are involved in northern research. Funding for university-based researchers is provided through the three granting councils; in most cases this forms the core funding for university research in the North. Other federal government departments are also heavily involved in northern research. Natural Resources Canada (NRCan) has its own northern programs and supports the national logistics infrastructure program—the Polar Continental Shelf Project (see Annex 3). The Department of Fisheries and Oceans (DFO) also has its own northern programs and is in charge of the icebreakers that are used as research platforms. The Department of Indian Affairs and Northern Development (DIAND) has substantial northern interests and is responsible for delivering the Northern Scientific Training Program, which supports advanced students in gaining professional experience in the North and encourages them to develop a commitment to northern work (see Annex 3). Health Canada, Environment Canada, Transport Canada, the Department of National Defence, and Industry Canada also sustain research programs or have a strategic interest in the North.

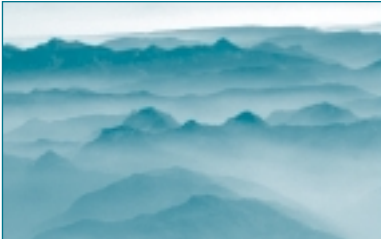
All these federal departments, plus NSERC (which also represents SSHRC) and the Canadian Polar Commission, have formed an Interdepartmental Committee on Northern Science and Technology. The main purpose of this group is to co-ordinate and promote federal science and technology (S&T) activities in the North (see Annex 3). This committee recently published a report entitled *Northern Science*

*and Technology in Canada: Federal Framework and Research Plan: April 1, 2000–March 31, 2002*, describing all federally funded northern S&T activities. The report will help determine immediate and future requirements and assist in the setting of strategic directions for Canadian northern science and technology.

The Canadian Polar Commission (CPC) is an arm's-length agency affiliated with DIAND. It has recently been reactivated and is charged with reporting on the state of knowledge about polar research, and compiling and distributing information about polar affairs. Outside the federal government, another major player is the Association of Canadian Universities for Northern Studies (ACUNS), which represents 33 universities and colleges with interests in the natural, life, and social sciences and humanities in the North in Canada. ACUNS and the CPC are both described in more detail in Annex 3.

In the North, a major focus for research activities is provided through the three territorial northern research institutes—the Northern Research Institute of Yukon College, the Aurora Research Institute of Aurora College (NWT), and the Nunavut Research Institute of Nunavut Arctic College. Their role is described in Annex 3.

Internationally, the Arctic Council is a ministerial-level organization of the eight northern circumpolar countries; the Inuit Circumpolar Conference (ICC), the Saami, the Aleut International Association, and the Russian Association of Indigenous People of the North (RAIPON) are recognized as permanent participants. Canada's Ambassador for Circumpolar Affairs is our senior representative. The circumpolar University of the Arctic is a "university without walls" designed to meet the needs of northern peoples as they face the challenges of a rapidly globalizing world. The University is a partnership of academic institutions, indigenous peoples' organizations, and the Arctic states. The Arctic Council and the University of the Arctic are described in more detail in Annex 3.



## 4. Issues and background

### 4.1 International context

There is now unprecedented international interest in polar regions, especially in the Arctic, for purposes of understanding global climate change. The United States Arctic Research and Policy Act (1984, amended 1991) represents the standard for enlightened self-interest amongst nations with manifest polar interests. This Act positions the United States as an Arctic nation with strong strategic, economic, social, scientific, and international interests pertaining to “all United States and foreign territory north of the Arctic Circle” (SEC. 112). The scope and integration of US Arctic research is now impressive, and support for it is enormous, funded principally through the Office of Polar Programs (OPP), National Science Foundation (NSF). Funding for Arctic research within NSF alone now exceeds US\$300 million annually. In contrast, the Canadian granting councils combined spend approximately \$2 million annually on northern research. Annex 4 contains further details of US programs.

International interest in the North extends well beyond the United States. In the fall of 1998, Finland’s Ministry of Trade and Industry released *The Current State of Arctic Research in Finland*. This document also highlights Finland’s success in having the EU ratify its *Northern Dimension* policy at the Luxembourg summit (December 1997), which is a co-ordinated policy on the Euro-Arctic Barents region. Finland expresses a keen interest in the Arctic, despite recognizing that its Arctic territory is small compared

to Canada's. The Finnish document also discusses Arctic research elsewhere in the world, noting that although Canada has "vast Arctic land and sea areas...national research funding has declined drastically".

The northern interests of other nations also merit brief mention. The Swedish Royal Academy of Sciences includes the Swedish Polar Research Secretariat (logistical) and the Polar Research Committee. Sweden launched its Arctic research program in 1987, and funding in 1997 (excluding the icebreaker *Oden*) was about SEK 65 million (C\$10.7 million). Last summer, the Swedish Royal Academy of Sciences funded its "Tundra Northwest Expedition 1999", hiring a Canadian icebreaker to traverse the Northwest Passage with European and North American scientists onboard. Canadian participation in this project was very limited. Sweden also operates several northern research facilities (for glaciology and space physics, etc.). Norway's national committee for polar research is actively developing Svalbard (Spitsbergen) into a wide-ranging centre for Arctic research, including educational opportunities through University Courses in Svalbard (UNIS). Norway's Norske Polarinstitut (Tromsø) has just signed a Statement of Co-operation with the NSF (OPP) to promote common interests in Arctic and Antarctic research. Denmark's Commission for Scientific Research in Greenland has published a new strategy for 1998–2002, which emphasizes the global environment, Arctic natural resources, and Arctic social development, including health. The Commission has proposed DKK 10 million (C\$1.3 million) for the implementation of its research objectives.

Arctic research is also spearheaded by prestigious institutes around the world that have no Canadian counterpart, such as the Russian Arctic and Antarctic Institute, St. Petersburg; the Alfred Wegener Polar and Marine Institute, Bremerhaven; the Norske Polarinstitut, Tromsø; the Danish Polar Centre, Copenhagen; the British Antarctic Survey and the Scott Polar Research Institute, both in Cambridge; and recently, the Japanese-funded International Arctic Research Center, University of Alaska at Fairbanks.

A majority of the eight Arctic Council nations, but not Canada, also support strong research programs in the Antarctic. Many fundamental polar research issues of importance to the North are also of global importance, and there are scientific benefits to be gained by addressing common questions related to both polar regions. The Task Force on Northern Research has not addressed in detail the issue of research in the Antarctic. However, the Task Force believes that any increased funding or other positive results from its work will ultimately help to support the case of Antarctic and bipolar research.

That Canada should be taking a leadership role in the circumpolar region is acknowledged in recent parliamentary documents. For example, the Standing Committee on Foreign Affairs and International Trade (SCFA) recommended that "the Government commit to maintain, and seek to increase, support for basic Arctic science and research as an important element of circumpolar co-operation". It effectively sets aside the "expense" argument in stating that "the cost of Canada's [Arctic] research was never high in comparison to the amounts spent by other Arctic states" (SCFA, 1997:180).

Recent initiatives that demonstrate increasing recognition of our northern and circumpolar role include the creation of the Canadian Polar Commission (1991) and the appointment of a Circumpolar Ambassador in 1993. In June 2000, the federal government strengthened Canada's foreign policy by announcing *The Northern Dimension of Canada's Foreign Policy*. This will "establish a framework to promote the extension of Canadian interests and values, and will renew the government's commitment to co-operation with our own northern peoples and with our circumpolar neighbours to address shared issues and responsibilities". The new policy cites transboundary environmental threats such as persistent organic pollutants, climate change, and nuclear waste as significant challenges to the North. The policy's objectives include the preservation of Canada's sovereignty in the North, as well as the promotion of the human security of northerners and the sustainable development of the Arctic.



## 4.2 Canadian university involvement in international programs and activities

International participation in northern research occurs through a number of different organizations and agencies, some of which require national membership and the appointment of a national representative (e.g. the International Arctic Science Committee, IASC), and others which are based on individual memberships (e.g. the International Arctic Social Science Association, IASSA). Research projects or programs within these organizations and agencies are also managed in different ways. The level of Canadian activity in international programs is highly variable; but in general over the last decade, Canadian participation in leading such projects has declined. Details of Canadian university participation in international northern research programs are given in Annex 4.

It has also become increasingly apparent that Canadian academics lack the resources to *initiate* significant northern research that would attract international interest and collaboration. Rather, except for one or two notable exceptions such as the North Water Polynya (NOW) project, Canadian academics are routinely approached to join in on scientific projects already envisaged and designed elsewhere. Canadians then “tag along”, and commonly supply their databases in return for airfare to organizational meetings.

Canadian membership in international science associations that have relevance to the North has declined in the last two decades. From a position of prominence and leadership in periglacial and permafrost research a decade ago, we are now followers of research trends developed elsewhere. For example, although the current President of the International Permafrost Association (IPA) is Canadian, the overall participation of Canadians has declined. Canadian membership in the International Glaciological Society (IGS) has declined by 50% since the 1970s. One of the most telling problems has been in the communication of international activity. Canadians are represented on most international agencies, working groups, or associations, but these activities are not adequately reported through web sites or newsletters that reach a wide science community. The recent development of e-mail lists such as IASSA, GETICITE (Université Laval), NORTHSCI (ACUNS), and Polar Access is starting to address this need.

## 4.3 Industrial activities in the North

Development in the North is still largely driven by natural resource industries in the mining and oil and gas sectors. These industries often have their greatest local economic impact in the relatively short construction phases, so longer-term revenue-sharing arrangements are becoming more common. There has been a recent increase in activity in diamond exploration, and, with land claims settlements, a renewed interest in oil and gas development in the Mackenzie Delta seems likely. These trends reverse the moratorium on economic development that followed the Berger enquiry (1977). Increased scientific research will be required if the impacts of such developments are to be reduced and sustainable development assured. Today’s picture is also being influenced by the availability of new technologies in the North, the growth in the number of small businesses, and increased tourism activity in the region.

The territorial governments play a role in industrial development in the North through their support of R&D activities in the northern research institutes. Activities include research on renewable energy technologies (solar, wind, biomass), the development of community energy plans, and projects to utilize distance education technologies that link community learning centres with college campuses. The territorial governments also provide assistance to small industry, through business loans and planning assistance, and initiate economic development strategies. For example, a development plan is underway for the Mackenzie Valley region that will have an impact on the mining and oil and gas industries, and on the development of value-added secondary industries.

The federal government has several programs that contribute to industrial development in the North, such as the Industrial Research Assistance Program (IRAP) and the Canadian Technology Network (CTN). NRCan has several programs that contribute to energy conservation, and the Geological Survey of Canada carries out geoscience surveys that assist mining and geotechnical services firms in the North.

The availability of Internet connectivity in the North is now allowing knowledge-based small industries, such as firms specializing in geographic information systems, graphics design, and geotechnical services, to flourish. The North is also leading the way in satellite-

based innovation. For example, Inuvik TV was among the first North American companies to offer Internet services to their communities using cable modems and satellite-based cable TV in 1996. However, continual upgrades in telecommunications infrastructure are needed to support these small industries. Tourism and ecotourism industries are also a major and growing focus in the North, and could provide the main economic development in areas without large mineral, oil, or gas reserves.

Nevertheless, the development of natural resources is still the principal driver of the northern economy and has traditionally provided northerners with long-term, well-paying jobs. The recent opening of Canada's first diamond mine, coupled with an active exploration industry, is bringing jobs and growth to the North and represents significant revenues for Canada (\$2.3 billion, projected over 20 years for BHP's Ekati mine). The North contains about 18% of Canada's remaining discovered conventional oil and 25% of remaining discovered gas, but, more importantly, Canada's northern basins are estimated to contain approximately 48% of Canada's undiscovered conventional light crude oil potential and 46% of its undiscovered conventional gas potential. The likelihood that these undiscovered mineral and energy resources will become reserves that can be developed will be improved with enhanced geoscience knowledge and exploration activity. As well as being fundamental to resource exploration, geoscience knowledge has a critical role in environmental assessment, infrastructure development, resource project development, and community decision making about further economic development.

In 1996, there were eight operating mines in NWT and Nunavut, but they have been virtually eliminated by low gold and base metal prices. There is still some gold-mining activity in the Yukon. However, if metal prices increase, some of the closed mines may reopen. In NWT, diamond mining is the major new opportunity, with the development of the BHP and Diavik diamond mines. This is leading to secondary industries in the NWT such as diamond grading and finishing. Oil and gas exploration and development work is expanding in NWT, and pipeline projects to take gas south to market are underway. Since the associated economic development activity could be very short term, revenue-sharing negotiations have begun. There is also international interest in the development of gas hydrates in the Mackenzie Delta. In support of the renewed emphasis on industrial development, the NWT Department of Transportation has designed a strategy to support highway construction up the Mackenzie Valley corridor and is exploring funding options.

Research is needed to support all areas of northern industrial development. This includes research in the geosciences, cold-climate technologies, energy technologies, climate change, permafrost processes, geophysics, engineering, communications, and a wide range of public health, social, economic, political and education questions.



## 5. Task Force findings

For the purposes of this exercise, the Task Force defined the North as “the area north of the southern limit of discontinuous permafrost”. The Task Force gathered a large amount of information through questionnaires and consultations. One of the main tools used to gather input from the university community was a detailed questionnaire. To gather more information from northern communities, two series of personal consultations were held in the North before and after the development of the recommendations. See Annex 2 for details. All the information gathered through the questionnaires, consultation, and other sources was used by the Task Force in reaching its findings for Phase 1. These are presented below.

1. Research in the North is needed to honour international obligations and protocols (e.g. the Montreal Protocol, the United Nations Framework Convention on Climate Change and the Kyoto Protocol on climate change) and to give input on research issues of global importance. Other countries are more advanced than Canada in their northern research initiatives, and are actively pursuing northern research agendas on Canadian territory. In contrast, Canadian research activity in its own northern territories has been declining. Research in the North is needed for the purpose of “being seen to be active in the North”, thereby reinforcing Canada’s sovereignty in the region.

2. There has been an overall national decline in northern research activities, due in large part to cutbacks in federal northern research programs and a decrease in the number of researchers with northern expertise. Canada is in serious danger of being unable to meet its basic national obligations to adequately monitor, manage, and safeguard its northern environment, or to respond to current and emerging social issues in the North. Some of the most compelling arguments for renewal of Canadian northern research were heard in northern communities.
3. There is no federal policy on Northern Science and Technology; nor are there effective or comprehensive federal programs of support for northern research.
4. Canadian northern research capacity is declining. University expertise is not being renewed, and northern researchers are comparatively older than the general faculty population. Amongst existing researchers there is low morale and a reluctance to encourage students to pursue careers in northern research. Many question the wisdom of encouraging students to commence or continue a research career related to the North because of lack of funding, the length of time taken to publish research related to the North (in a funding environment that is linked to productivity), and the difficulties of mounting and sustaining expensive field programs in a region where unpredictable local conditions can adversely affect research outcomes.
5. The cost of doing research in the North is high and rising, while resources and funding have declined. High airfares and airfreight, which have approximately doubled in the last three years, are one example of the financial barriers. Others include the cost of food and lodging (at least 30% higher than in the south), inflation, and higher student wages. There are often unexpected costs associated with northern work, such as cost overruns due to logistical requirements (e.g. \$1000 per hour for Twin Otter support). The high risk of cost overruns on a severely limited budget is simply too problematic for some researchers, and they have abandoned their northern programs. NSERC and SSHRC awards are the principal

sources of funding for many university researchers, and these often do not cover all the costs of a research program. Many researchers need to access other sources of funds or in-kind support in order to remain active in northern research, but such sources often are not readily available. Another factor is the need for researchers to make additional trips to the North to communicate and meet with local communities on whose land the research is being conducted. This entails travel and accommodation costs, and in many cases the costs of translation of documents into the local language.

6. There is a need for ongoing, productive partnerships between researchers and northern communities in order to ensure the latter's participation in the definition of research needs where appropriate, the planning of research programs, and the transfer and application of research results. The Task Force also found that while there are some problems related to the licensing process that can be challenging and frustrating for some researchers, the process itself is not an insurmountable barrier to performing research in the North. However, a key component of licensing requirements for northern researchers is consultation and communication with government, community, and land claim agencies. Research funding agencies do not adequately take into account significant costs associated with consultation and reporting (travel and lodging, translation, etc.). Indeed, the funds required to establish and sustain strong partnerships and good two-way communications are generally not available. This presents obstacles to initiating or continuing research, especially in areas of concern to northern residents. These problems, when added to reductions in federal support for northern research, contribute to the perception amongst northerners that government and researchers in general lack any serious commitment to the northern communities that have accepted their research. The costs and effort required to promote and undertake northern research are significant and can present a serious barrier to creating the necessary partnerships among the different stakeholders involved.

7. Logistical support (e.g. the Polar Continental Shelf Project) has declined since the early 1990s, although PCSP support for universities has been maintained at \$1 million a year. Demand for logistical support is declining, due to general funding problems (described above), a decline in the number of northern researchers, uncertainties about the funding level of PCSP, and low morale in the research community, often related to the licensing process. It is difficult, therefore, to argue for a funding increase for PCSP when demand is declining, even though it is the reductions in the PCSP budget that have led to this decline. A strong, sustained logistics program is critical to the success of northern research programs, since researchers contemplating northern programs need to be confident that logistical support will be available. The Task Force was very pleased, however, to see the announcement in April 1999 of an increase of \$1 million to the PCSP budget for fiscal 1999–2000. While this increase was not targeted at the university community, it is a positive sign. The number of field station users has decreased, and many field stations are in serious need of repair and refurbishing. Field stations should remain in good repair, ready for business for the long term and easy to reactivate, even during cycles of low demand. There is also a lack of state-of-the-art equipment and lab facilities in northern locations. A major equipment update relevant to northern research is needed, both in the North and in the South. The ability to undertake northern marine research is severely limited by the cost and lack of availability of icebreakers and other marine platforms.
8. Research and new knowledge is needed in the North to support developing northern communities with their policy development and decision making. Current research interests and priorities in the research community and northern communities coincide to a large extent, leading to partnership possibilities among northern communities, governments, and non-governmental organizations. For example, research is needed on global change, environmental management, biodiversity and ecology, resource and mineral exploration, sustainable development, oral history, language and traditional knowledge, children and youth, health, welfare, and poverty. Collaboration among researchers from different disciplines will be required to address many of these issues.
9. Young people in the North need to be provided with new, varied, and ongoing opportunities that will stimulate their interest in science. This is a fundamental component of northern capacity building. During consultations, a strong message from northern communities was that bridges need to be established between universities and colleges and northern high schools to enable northern students to move on to higher education and research careers.
10. Northern communities and northern Aboriginal groups are showing an increased interest in getting involved in research. During the northern consultations, it became clear that the foundation for partnerships with northern communities is consultation and open dialogue during all phases of the research process, using appropriate visual and written materials and plain language. Considerable progress has been made in recent years by the northern research institutes through their development of the community research agendas. As a result, there are many win-win approaches to developing and undertaking northern research projects. A recent example of a successful partnership involving northerners is the federal Northern Contaminants Program, which involves four federal departments and five Aboriginal organizations. During the Task Force consultations, several northern and Aboriginal groups expressed an interest in partnerships, to which they are willing to contribute cash or in-kind support. They noted the lack of fundamental research, which they need to support their new responsibilities but which they are unable to undertake themselves. Northern groups also wish to see local people involved in the research itself, and the northern research institutes are looking at innovative ways of making this possible. Many opportunities are available to partner with communities and educational organizations to ensure wide dissemination of the scientific information and knowledge gained.

11. Trained northern researchers are needed not only to replace retiring university researchers and to maintain northern research expertise in the academic sector, but also to provide expertise and knowledge on northern issues in other sectors, both public and private. Many opportunities exist in the North for qualified people to take up careers related to northern issues and to assist in capacity building in communities. Job opportunities for trained researchers in the North can be expected to grow, and lack of trained personnel will be an impediment to sustainable northern development. Those trained in an interdisciplinary environment will be particularly in demand. However, within the university community there remains uncertainty and pessimism about potential job opportunities for trained researchers, reflecting the apparent lack of government commitment to northern research over the last decade or more.



## 6. Task Force recommendations

In Phase 2 of its work, the Task Force used the issues described in Section 5 to reach a number of policy and program recommendations. If implemented, these recommendations would have a significant impact on the problems identified and would also take advantage of many of the opportunities for partnerships in the North. While these recommendations were still in draft form, consultations were held across the North with a range of northern and Aboriginal groups and organizations to determine if the recommendations were acceptable to potential partners and participants. In general, there was strong support for the recommendations, and some changes were made following the consultations. The recommendations were also presented to a number of interested groups (e.g. ACUNS, PCSP Board, Interdepartmental Committee on Northern S&T), and feedback was received. Details of these consultations and presentations are described in Annex 2.

### 6.1 Program recommendations: An NSERC/SSHRC Joint Initiative on the North

The Task Force recommends that an NSERC/SSHRC Joint Initiative be launched to address some of the issues identified above, namely:

- the need to rejuvenate, sustain, and augment existing northern research expertise and to train a new generation of researchers on and in the North;
- the need to augment the amount of high-quality research being done on and in the North;

- the need to enhance Canada's ability to contribute to northern research of international and national importance;
- the lack of easy access to the North for researchers and the very high costs of doing research in the North;
- the lack of research infrastructure in the North; and
- the lack of appropriate and satisfactory community participation in the research being done.

A Joint Initiative would provide maximum flexibility to meet the needs of researchers, reflect the state of development and knowledge on the North, and address the special requirements of the northern communities and partners. Through this mechanism, NSERC and SSHRC would jointly fund a new program of research on the North, encouraging researchers, communities, and other partners to work together on similar problems, as appropriate. This would build new collaborative research partnerships around the specific needs and challenges of the different sectors and organizations involved. In many cases this would require the collaboration of researchers from different backgrounds working on interdisciplinary and multidisciplinary research problems.

The Joint Initiative program would comprise the following complementary award and grant mechanisms:

1. Northern Research Chairs
2. Northern graduate scholarships and postdoctoral fellowships
3. Research projects on the North
4. Community–University Research Alliances–North
5. Equipment, infrastructure, and logistical support

Examples of research areas that could be covered by this joint initiative include: children and youth, poverty, tourism and recreation, integration and violence, globalization, local and regional economic development, health and welfare, language and education, community capacity, social cohesion, cultural heritage management and traditional knowledge, religion and society, gender issues, sustainable development, renewable resources, climate change, paleoenvironment and earth sciences, biodiversity conservation, wildlife management,

remote sensing, northern communications, tundra ecology, Arctic marine resources, the human food chain, northern ecosystems, permafrost, ice and snow, and hydrology. It is expected that much of the research supported would be interdisciplinary in nature.

The main objective of this program would be to generate new knowledge about the North, with an emphasis on the excellence of the researchers and the merit of the research.

Communities in the North and organizations based in the North or with northern interests should be involved and integrated in the research, where possible and appropriate, and partnership arrangements would be encouraged under all program components. However, it is recognized that some research may not be appropriate for partnership arrangements. For the purposes of the program, a non-university partner would be defined as one who is actively involved in the planning and execution of the research and who has the capacity to use the research results. Non-university partners could include non-governmental and Aboriginal organizations, industries or industrial consortia, and federal, territorial, and local government agencies and departments. Partners could make a financial contribution (cash or in-kind) but would not be required to do so. Partnerships could also involve the exchange of personnel between the university and the partner organizations. In this context, the Community–University Research Alliances program is of particular interest, given its goal of building research partnerships with community groups around issues of mutual concern.

The proposed program elements are described below. The Northern Research Chairs are the top priority. The other four elements and supporting mechanisms are not placed in any particular order.

### **6.1.1 Northern Research Chairs**

Amongst the various options and mixtures of options for rectifying the decline in northern research and training, a program of Northern Research Chairs offers some of the most promising and long-lasting solutions. The Task Force's recommendations are based partly on existing models: (i) NSERC's successful and effective Industrial Research Chairs program, which covers a wide range of research areas; (ii) two targeted Chairs programs, NSERC Chairs for Women in Science and



Engineering and the NSERC/SSHRC Chairs in the Management of Technological Change; and (iii) the Canada Research Chairs (CRC) program recently announced by the federal government. The Task Force considered whether the need for Northern Research Chairs could be met by the new CRC program. It decided that it would be difficult to persuade universities to include northern research in their strategic plans (and therefore propose Chairs in this area) at this time. Furthermore, many of the Northern Chairs may involve strong links and partnerships with northern groups, organizations, and communities, which is not a requirement of the CRC program.

The Task Force recommends that a significant Northern Research Chairs program be initiated, incorporating some of the most useful aspects of the above-mentioned Chairs programs. In addition, the Northern Research Chairs would incorporate new features designed to maximize Canada's northern research potential, including providing high-level training and, where appropriate, close links to northern communities, colleges, and research institutes.

The Task Force recommends a model that includes two types of Chairs—a senior Chair and a junior Chair—as in the NSERC Industrial Research Chairs model and the CRC program. All Chairs would involve outstanding researchers with strong programs and demonstrated commitments to northern research. Such Chairs would be proposed by the universities to an NSERC–SSHRC peer review process. While the candidates, disciplines, and research areas would be wide and open to nomination, the Task Force feels that a great benefit to the northern community could be gained by having some of the Chairs and their students, where appropriate, directly involved with the communities, research institutes, and colleges in the North. The northern communities have developed an initial set of research priorities and, where appropriate, research matches and co-operation should be sought. Partnerships with the full range of non-university partners would be encouraged for all Chair nominations.

Under the proposed model, a university would nominate a senior Chair. A successful nominee's normal teaching and administrative duties would be markedly reduced to allow concentration on research, on the training of highly skilled researchers, and on

developing research connections to the North. Junior Chairs would generally, but not necessarily, be associated with a senior Chair, and could be nominated separately. Either the senior or junior Chair and his or her students would establish meaningful links to northern institutions and communities, where appropriate. This could mean that either the senior or junior Chair would physically locate in the North for extended periods in appropriate circumstances, and be involved in the training of students at the northern colleges and institutes. One of the Chairs or associated postdoctoral fellows may also be involved in providing training courses in advanced research techniques using equipment located in the North. This would enable the training of northern personnel in advanced techniques to be conducted in appropriate northern locations. There may be some Chairs for which such arrangements are inappropriate; but in all cases, good communication with the North and networking with other Chairs would be essential. In fact, networking amongst the Chairs would be an important element of the program. This will contribute to the creation of a critical mass of expertise in Canada and a new community of northern researchers. (See Section 6.2.2 for more details on mechanisms to promote networking.)

The eventual size of the program recommended would be 24 Chairs—12 senior and 12 junior—to be reviewed and renewed every five years. Funding would be at the level of \$200,000 per year for senior positions and \$100,000 per year for junior positions. It is recommended that funds be used to cover salary and the direct costs of research in a very flexible manner.

It is expected that this Chairs program would be instrumental in re-invigorating northern research capacity and northern field centres, and in achieving a new level of research and training co-operation. The Chairs program would lead to skilled personnel capacity building in both the North and South, to close co-operation with northern communities, colleges, and institutes and with other non-university partners, and to a much-enhanced Canadian capacity for international research co-operation. The Chairs program received strong support from northern communities and organizations during the consultation process. They saw it as a very effective way of building partnerships in the North, enhancing northern capacity building, and promoting research in the North.

### **6.1.2 Northern graduate scholarships and postdoctoral fellowships**

The graduate scholarships and postdoctoral fellowships on the North would target excellent graduate students and new investigators who would help ensure the future of Canadian northern research.

The program would provide stipend support to students at the MA/MSc and PhD levels at the rate of 40 new graduate scholarships and 40 new postdoctoral fellowships per year (see Section 7). The postdoctoral fellowships would support the most promising new northern researchers in the disciplines under the responsibility of the granting councils, assisting them in establishing a research base at an important time in their research careers. In recognition of the high costs of doing research on and in the North, research supplements could be added to the normal award. Internships in the North would be encouraged in both of these programs.

### **6.1.3 Research projects on the North**

To promote and sustain research and training in and on the North, the Task Force recommends that a component of the Joint Initiative supports teams of researchers conducting innovative, multidisciplinary northern projects. This component would be modelled on the NSERC Strategic Projects program. It is proposed that approximately 70 projects would be supported at full program strength, at an annual cost of \$7 million (see Section 7).

Through the direct support of research teams, this program would help create a critical mass of researchers and research expertise on the North. It would support high-quality basic and applied research of social, industrial, or environmental relevance. Review criteria would emphasize excellence of the research team and project. Research results might be used to assist in the development of public policies and new technologies. The program would also provide opportunities for the training of future researchers in a collaborative, interdisciplinary environment. It would foster links between academics, practitioners, and policy makers, and encourage the intellectual and financial participation of public and private sector partners in research projects on or in the North. The program would also promote the systematic communication of research results to other potential users, such as

researchers, policy makers, the private and voluntary sectors, and the public at large.

The participation of non-university organizations would be a requirement in this program, except as noted below. A cash contribution from the non-university participants would not be a requirement, but they would be encouraged to be actively involved in the planning and execution of the research project, and in the use of the research results. This involvement should include provision of guidance relating to any commercial or industrial benefits resulting from the research.

In some cases, the involvement of non-university organizations may not be appropriate or possible, if, for example, a user capacity does not exist at present. In these cases, the applicant would explain why the involvement of non-university organizations is not appropriate. Applicants should indicate how the results would be used to the benefit of Canada and the North, or how the results would be used to contribute to research and policy issues of global concern.

As well as providing funds to support the direct costs of research, this program would provide the resources necessary to establish and maintain strong partnerships and good communication between partners, as well as those required to ensure communication and dissemination of the research results to all interested parties. This would help to address the issues described in Section 5, in particular the high cost of doing research in the North.

### **6.1.4 Community–University Research Alliances (CURA)–North**

This element would be modelled on SSHRC's successful CURA program. The purpose of the CURA–North component is to build strong partnerships between community groups and university researchers in order to define a research and training agenda in a research area of mutual interest. It is proposed that approximately nine projects would be supported at full program strength, at an annual cost of \$2.25 million (see Section 7).

These alliances are intended to assist in the definition and analysis of questions of importance for the social, cultural, or economic development of the North and consequently for Canada. They promote the sharing of knowledge, resources, and expertise between universities and northern community organizations,

and help the partners sustain their ongoing collaboration in order to enhance community decision making, research capacity building, and problem solving. The program would enrich research, teaching methods, and curricula on the North in Canadian universities, and provide valuable research training to students.

A CURA–North would be an equal partnership between a university group and one or more organizations from the community. Partners could make a financial contribution (cash or in-kind) but would not be required to do so. This program supports planning, co-ordination and implementation of diversified activities, centred on areas of mutual importance and closely related to the existing strengths of the university partner(s).

Each program of activities under a CURA would include:

- 1) a research component (e.g. short-term and long-term projects, research relevant to community or broader northern issues, etc.);
- 2) an education and training component (e.g. in the context of research projects, apprenticeships, activities credited as part of coursework, field training, etc.); and
- 3) a knowledge-sharing component (e.g. workshops, seminars, colloquia, publications, public lectures, etc.).

The CURA–North would be directed and its goals championed by an individual from the university or the community, or both. Programs of activities would be jointly defined by the CURA–North partners and jointly carried out by teams of university researchers and students as well as community-based practitioners and managers. The programs of activities should continue to evolve and, in addition to strengthening original alliances, the CURA–North should continue to recruit new partners during the period of the grant.

A CURA grant may be used to cover non-physical infrastructure costs for the support and co-ordination of the university researchers and the partners, and for carrying out some of the joint activities. Eligible expenses would include staff salaries, equipment, start-up of research projects, support for liaison and dissemination activities, and release time for the director(s) and for some professors and/or partners.

CURAs would be expected to seek funding from other sources beyond SSHRC and NSERC to help sustain their programs of activities.

Given the importance of having adequate consultation among partners to define prospective research programs, the CURA program should provide seed funding to researchers and communities to help them develop a full-scale CURA proposal.

### **6.1.5 Equipment, infrastructure, and logistical support**

In order to be able to adequately support research in the North, there needs to be a certain level of infrastructure available to researchers. This might include the placement of specialized equipment in northern locations, the maintenance of existing and new facilities in the North (e.g. field stations), and ongoing logistical support (e.g. planes, helicopters, ships). While some of the capital infrastructure needs may now be met through the Canada Foundation for Innovation, the critical operational support must still be provided. Similarly, the PCSP provides logistical support on a limited basis to university researchers, but cannot meet all logistical needs in all northern regions. *It should be recognized that if the proposed Joint Initiative is implemented, there will be an increase in the amount of northern research, which to be effective will require a proportional increase in the PCSP budget.*

State-of-the-art equipment is required for much of the research in natural sciences and engineering. Currently, there is only limited availability of such equipment in the North. The Task Force recommends that researchers successful in obtaining equipment be encouraged to place that equipment in northern locations, where appropriate. This would allow northerners, as well as students conducting research projects in the North, to be trained on and have access to state-of-the-art equipment. Having facilities on site would also ease some of the challenges related to the analysis of samples. This constitutes a deliberate change to past (and current) practice, when equipment and facilities were exclusively located in the South. The Task Force recognizes the importance of an enhanced research capacity being created and located in the North.

The Task Force further recommends that the northern research institutes should be eligible to apply to the

granting councils to host equipment, and for resources for operational support of equipment and other research infrastructure. The case would need to be made on the basis of high-quality research programs to be conducted at the institutes.

The Task Force also recommends that logistics requirements of the Chairs (6.1.1), research projects (6.1.3), and CURAs (6.1.4) that cannot be met by PCSP or other sources should be eligible expenses under these programs. In other words, the full costs required to undertake a program of research should always be taken into account. There should also be mechanisms (not currently available) to ensure that the icebreakers and other marine platforms required for northern marine research are available to university researchers. This goal could be achieved, at least in part, by simple changes to NSERC's Shiptime Program.

## 6.2 Cross-cutting activities and supporting mechanisms

The Joint Initiative described above would be significantly enhanced if it included some cross-cutting activities to ensure communication of research results and networking within the research community. A small secretariat would also be needed to administer the program. These elements are described below.

### 6.2.1 Program secretariat

This would be a joint NSERC/SSHRC program requiring a dedicated staff of three to four people. This group would be responsible for establishing, administering, and promoting the Joint Initiative, organizing or facilitating some of the activities described below, and organizing periodic reviews of the program and the funding balance between the program elements.

### 6.2.2 Conferences and workshops

An important element of the Joint Initiative is to significantly boost research activity on and in the North, to build capacity, to form networks of researchers, and to engage northern partners. The program will create new faculty positions and fund new research activities. It will be very important to facilitate good communications and interactions between all the program participants. It is envisaged that the new Chairs would play a leadership role in bringing the community together. Therefore, the

secretariat would need adequate funds for periodic meetings of the Chairs, as well as funds to organize workshops on important research themes. The Task Force also recommends that there be an annual conference of all program participants, preferably initiated by northern participants and held in the North.

### 6.2.3 Field practice training course

A number of graduate students embarking on master's or doctoral research in the North, as well as some faculty, arrive in northern communities without adequate preparation for working in the modern reality of Nunavut, NWT, or Yukon. Despite awareness of the ACUNS Ethical Principles for the Conduct of Research in the North, and territorial licensing requirements for conducting northern research, some students attempt to conduct research without prior experience or exposure and with absentee supervisors. This has caused a number of problems in communities and for the research institutes, who are the point of contact for researchers with northern agencies.

The objective is to offer a comprehensive field orientation course for new researchers in the North. This course would:

- introduce the basics of communication with local communities and individual residents;
- illustrate the unique role that northern culture, government, and community play in the design and conduct of research in the North;
- provide instruction on logistics planning for northern research;
- explain the requirements of the licensing and consultation process;
- instruct students in firearms and safety issues;
- explain ethics and liability issues in the conduct of research; and
- involve students in promoting science in northern high schools.

The course would be targeted to beginning graduate students who have no previous exposure to northern research and who may not have a supervisor present during the conduct of the research. It is also proposed that as part of the orientation, outside students would be paired with local students, for example from the northern colleges' environmental technology programs, as a learning experience for both students. To maximize

participation and to minimize costs, the course would be organized in one of the major centres of the North, using accommodation and instructional facilities of the northern colleges and research institutes.

### 6.3 Policy recommendations

#### A. To NSERC/SSHRC

1. There should be a policy statement by both Councils, as a preamble to program announcements. A suggested draft is below.

*Research in Canada's North is vitally important. Canada has basic national and international obligations to adequately monitor, manage, and safeguard its northern environment. It needs to respond to changing governance in the North, as well as current and emerging social issues. International interest in northern research is growing, and Canada, with its vast northern territories, should be at the leading edge of research issues of global importance, such as climate change, contaminants, and the sustainable use of living resources. However, the Canadian northern research community is currently unable to adequately address its long-term research objectives, the changing needs for government policies, the concerns of northern residents, or Canada's international obligations.*

*It is therefore important to maintain and enhance northern research capacity, both in Canadian universities and in the North. In order to accomplish this, NSERC and SSHRC propose to introduce a joint program targeted to the North, designed to boost Canada's research capacity, training, and research activity in a number of important areas of northern research. Universities are encouraged to renew their northern research expertise and to recognize the risks and costs associated with northern research. The granting councils support only part of the costs of conducting northern research. Consequently, successful northern research programs will rely heavily on a continuing and improved partnership involving the councils, universities, northern communities and governments, federal and provincial government departments, and federal programs such as the Polar Continental Shelf Project (NRCan) and the Northern Science Training Program (NSTP).*

2. Research in all the sciences and engineering often requires access to state-of-the-art equipment. There is only limited availability of such equipment in the North, leading to a lack of facilities for both visiting and local researchers and students. The northern research institutes (NRI) should be eligible to apply to NSERC to host equipment and infrastructure support, provided that high-quality research programs are conducted at the institutes. (Note that NRI researchers are already eligible to apply for SSHRC funding.)
3. NSERC and SSHRC should play a more active role on the international stage on issues related to the North. This could mean involvement in planning circumpolar and other international research initiatives and policies. NSERC or SSHRC staff could sit on appropriate international committees or delegate this responsibility to selected researchers where appropriate. A mechanism should be established to allow the representative at the international level to report back to the community.
4. NSERC and SSHRC should become involved in science promotion in the North. This could cover a range of activities, leading, for example, to provision of material for high school teachers, visits by NSERC/SSHRC-funded researchers and students to schools and community groups, or trips to fieldwork sites for members of the community. This recommendation is consistent with NSERC's new strategy to try to exert influence beyond its program reach, and with its recently announced PromoScience program. This new program could focus on the North as one area of particular need, to encourage northerners to consider post-secondary education leading to a career in science and engineering. Much could be achieved in collaboration with northern education groups, agencies, and colleges.
5. The costs and challenges of sustaining a successful northern research program are often not appreciated by NSERC and SSHRC selection committees and panels. Peer review committees should be made aware of issues related to research in the North, such as higher costs, and the possible impact of these issues, such as delays in research

productivity and training, on review criteria. This could be done through briefings at policy meetings and updates to the Peer Review Manual(s). Where appropriate or necessary, efforts should be made to appoint researchers with experience of northern research to peer review committees.

6. The University of the Arctic is a new initiative that is gaining momentum (see Annex 3). In Canada the initiative is being implemented through the northern colleges and some of the universities. The concept is to enable northerners to complete university studies at the undergraduate and graduate levels in the circumpolar world and allow southern students to obtain a more in-depth education in polar issues. NSERC and SSHRC should continue to monitor the development of the University of the Arctic, look for opportunities to interact with it, and ensure that there are no unnecessary barriers to its eventual participation in their programs (e.g. scholarships and fellowships), where appropriate.
7. The Canadian Polar Commission (CPC) has a mandate to develop and disseminate circumpolar knowledge through consultation, communication, and partnership for the benefit of all Canadians and the circumpolar world. It has an important role to play in promoting and supporting Canadian study of the polar regions. NSERC and SSHRC should continue working in partnership with the CPC and northern agencies to help make the best case possible for enhanced support of Canadian northern research and training opportunities.
8. The Task Force recognizes and appreciates the initiative by the Interdepartmental Committee on Northern Science and Technology to develop a Northern S&T Federal Framework, leading to a Federal Northern S&T Strategy. This should lead in the shorter term to improved communication between federal departments and better co-ordination of research efforts and resources. In the longer term, however, several of the Task Force members urge the creation of a Federal Northern S&T Policy. NSERC and SSHRC could advise the Minister that such a policy with an accompanying legislative structure is required to formally recognize Canada as a northern nation, to define and review priorities, to integrate existing

national resources into a more effective structure, and to ensure a serious and ongoing federal government commitment to northern research.

9. There remains a critical need for all government agencies and university researchers to better co-ordinate their research activities in the North. It is recommended that NSERC and SSHRC continue to participate as active member(s) of the Interdepartmental Committee on Northern S&T, to bring the recommendations of this Task Force to that Committee, and to look for ways in which the university research community can assist in the development and implementation of the Federal Northern S&T Strategy, the ultimate goal being enhanced support for *all* Canadian northern research activities.

#### **B. To the Interdepartmental Committee on Northern S&T**

10. The existing logistics program for support of northern research is limited in its budget and coverage, and its ability to provide support in some northern regions is restricted due to lack of funds (e.g. in northern Quebec). The Task Force notes that if the proposed Joint Initiative is funded, it will lead to a significant increase in northern research activities. This increased activity will call for substantial additional logistical support, currently provided through PCSP. The Task Force recommends that these needs be taken into account in the new Northern S&T Strategy. It also recommends that, in the future, thought should be given to new collaborative models of providing enhanced logistical support in order to ensure effective coverage of all northern regions (Arctic and sub-Arctic).

#### **C. To the northern research community**

The Task Force strongly encourages the Canadian northern research community to:

- a) consider developing proposals for future competitions of the federal Networks of Centres of Excellence Program; and
- b) develop new and creative research addressing the problems and needs of the North, using the programs proposed under the new Joint Initiative.



## 7. Cost of implementation

The following implementation scenario is presented for discussion purposes. It describes a program that increases over three years to about \$24 million per year. If less funding were available, the relative funding balance of the program elements would need to be reviewed.

Sub-programs	YEAR I		YEAR II		YEAR III	
	No.	Budget (\$k)	No.	Budget (\$k)	No.	Budget (\$k)
1. Northern Chairs						
Senior (\$200k/yr)	4	800	4 (+4)	1,600	4 (+8)	2,400
Junior (\$100k/yr)	4	400	4 (+4)	800	4 (+8)	1,200
2. Graduate Scholarships						
(\$25k/yr, 2 yrs)	35	875	40 (+35)	1,875	40 (+40)	2,000
PDFs (\$45k/yr, 2 yrs)	20	900	40 (+20)	2,700	40 (+40)	3,600
3. Research Projects						
(\$100k/yr, 3–5 yrs)	30	3,000	20 (+30)	5,000	20 (+50)	7,000
4. CURA–North						
(\$250k/yr, 3–5 yrs)	3	750	3 (+3)	1,500	3 (+6)	2,250
5a. Equipment		1,000		1,000		1,000
5b. Infrastructure		1,000		2,000		3,000
Cross-cutting Activities		500		1,000		1,000
<b>TOTAL Budget</b>		<b>9,225</b>		<b>17,475</b>		<b>23,450</b>

Note: Figures in parentheses indicate the number of awards from earlier years that have ongoing commitments in later years.







## 8. Conclusions

Through extensive data gathering and consultation with the university research community and northern communities, the NSERC/SSHRC Task Force on Northern Research has found that there is currently a crisis in Canadian northern research. This is not an issue that can be resolved by a simple, quick solution. The Task Force has recommended that the long-term problem of capacity building and rejuvenation of the northern research community should be addressed by a targeted but highly flexible funding initiative, the main priority of which would be the creation of a number of Northern Research Chairs. To support this program, the Task Force has also made a number of policy recommendations that, if implemented, could considerably enhance the chances of success of the funding initiative.

The Task Force urges NSERC and SSHRC to support full implementation of its recommendations.





## Annex 1

### Members of the Task Force on Northern Research and terms of reference



#### Chair (member of NSERC Council)

Thomas Hutchinson                      Department of Environmental and Resource Studies, Trent University

#### Members

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John England	Dept. of Earth and Atmospheric Sciences, University of Alberta
Milton Freeman	Dept. of Anthropology, University of Alberta
Richard Grieve	Chief Geoscientist, ESS, Natural Resources Canada
Bonni Hrycyk	Director, Polar Continental Shelf Project, NRCan
Peter Johnson	Dept. of Geography, University of Ottawa
David Malcolm	Indian and Northern Affairs Canada
Barney Masuzumi	Former Research Director, Dene Cultural Institute, Yellowknife
Serge Payette	Centre d'�tudes nordiques, Universit� Laval
Bruce Rigby	Executive Director, Nunavut Research Institute
Douglas Stenton	Chief Archeologist, Government of Nunavut
Leslie Whitby	Indian and Northern Affairs Canada
Mary Williams	Faculty of Engineering & Applied Sciences, Memorial University of Newfoundland

#### Observer

Mary Anne Linseman                      Medical Research Council/CIHR

#### Councils representatives

Elizabeth Boston (Secretary to Task Force)	NSERC
France Landriault	SSHRC



## Terms of Reference of the Task Force on Northern Research

### Phase 1

#### *The Task Force will:*

- identify problems and develop issues to be addressed by:
  1. gathering information about the level of university research activity in the North over the past 5–10 years and projecting into the future;
  2. assessing the current funding environment (logistics, research costs, training, infrastructure) for northern research. Sources of funds will include the federal granting agencies and other federal departments, the Polar Continental Shelf Project, the Northern Science Training Program, and provincial and territorial governments;
  3. reviewing recent government initiatives (e.g. Federal Northern S&T Strategy);
  4. reviewing the opportunities for northern communities to participate in and benefit from the research;
  5. reviewing past NSERC initiatives to support northern research (e.g. Northern Supplements Program);
  6. considering what is happening in other countries (e.g. United States, circumpolar countries, Japan) to ensure that potential opportunities for co-operation and collaboration are not lost.
- report to the councils on its findings and the issues to be addressed in Phase 2.

### Phase 2

#### *The Task Force will:*

- propose actions to address the issues identified in Phase 1. Actions will be those that lie within NSERC's and SSHRC's mandate and can be accomplished through modifications to existing programs or establishment of new programs;
- propose ways in which NSERC and SSHRC can work with government departments (federal, provincial, and territorial) and other partners to facilitate and promote research in the North;
- present recommendations to the councils and a plan for implementation.



## Annex 2

# The Task Force's method of working and the consultation process

### Information gathering (Phase 1)

For the purposes of this exercise, the North was defined as “the area north of the southern limit of discontinuous permafrost”. The Task Force gathered a large amount of information through a variety of mechanisms. During its first meeting, in December 1998, it was presented with background information on the key players, organizations, and programs related to northern research, as well as previous studies, and then identified where additional information was needed. In order to obtain more information about the university community, a questionnaire was designed that asked for information and opinions about funding and the research climate, field work, training, careers, relations with northern communities and licensing, research priorities, and opportunities. This questionnaire was mailed to a list of over 700 researchers from the NSERC and SSHRC communities who were known or thought to have an interest in northern research. Another questionnaire was sent to the chairs of university Northern Studies Committees to find out about retirements and replacement of faculty associated with northern programs.

To gather more information from northern communities, one Task Force member visited the North twice during February 1999 and held consultations with approximately 25 different groups in Iqaluit, Inuvik, and Yellowknife. This included representatives from the governments of Nunavut and NWT, the education community including school boards and colleges, Aboriginal organizations and

governments, and non-governmental organizations (see list below). These groups were asked to give input on issues related to research and research needs, funding, training opportunities and needs, local involvement in research, licensing, attitudes to research, and communication with researchers.

### Profile of questionnaire respondents

In response to the university questionnaire, a total of 158 responses were received and analyzed. The majority of respondents were northern researchers currently at a Canadian university (92%). 87% of respondents identified themselves as working on the North, and 94% considered that their research program is relevant to the North. 95% of respondents conduct fieldwork. The respondents had, on average, 18 years of experience in the North, ranging from 2 to 45 years. The majority (65%) of respondents receive or received NSERC funding, with 17% receiving SSHRC funding. One respondent receives MRC funding, and some respondents receive funding from other sources, including NASA and the US National Science Foundation (NSF). A variety of other sources of funding, both federal (e.g. DFO) and provincial (e.g. FCAR), as well as industrial funding, were also cited by respondents. Many respondents receive funding from more than one source, and 70% cited NSERC as their *principal* source of funding.

To some degree, this reflects the make-up of the mailing list generated, where 68% of those who received a questionnaire were identified as natural scientists or engineers, 29% were identified as social scientists, and 3% were identified as medical researchers. It should also be noted that some health-related research in the North is funded by sources other than MRC, such as SSHRC and Health Canada.

80% of the respondents carry out their research in collaboration with others, for at least part of their northern activities. 39% of the respondents are involved in international collaborations, mostly with the United States but also with the United Kingdom, Scandinavian countries, Russia, Germany, and Japan. Most of these collaborations are critical or helpful for their research programs.

### Consultations on draft recommendations (Phase 2)

During Phase 1, a number of northern groups were asked for input on what they saw as the problems and issues related to northern research. The input was taken into account during the Task Force's formulation of the problems and opportunities, and the draft recommendations. Following the formulation of the draft recommendations in October 1999, another series of consultations was undertaken in the North from November 1999 to January 2000. Representatives of the following organizations were consulted during one or both of the consultation phases (Phase 1 and Phase 2):

- Yukon College;
- Aurora College;
- Aurora Research Institute;
- Nunavut Research Institute;
- Nunavut Arctic College;
- Arctic Research Establishment, Pond Inlet;
- Inuvialuit Regional Corporation;
- Inuvialuit Renewable Resources Committee;
- Gwich'in Renewable Resources Board;
- Council of Yukon First Nations;
- Champagne Aishihik First Nations;
- Qikiqtani Inuit Association;
- Dept. of Education and Status of Women, Yukon;
- Baffin Regional Health and Social Services Board, Iqaluit;
- Baffin Divisional Board of Education;
- Dept. of Education, Culture and Employment, NWT;
- Nunavut Wildlife Management Board;
- Nunavut Impact Review Board;
- Nunavut Planning Commission;
- Community Government and Transportation, Nunavut;
- Dept. of Education, Nunavut;
- Dept. of Adult Education, Inuvik;
- Beaufort Delta Region Education Council;
- Beaufort Delta Self Government Negotiations;
- Circumpolar Ambassador for Canada;

- Circumpolar Envoy, Yukon;
- Dept. of Health and Social Services, NWT;
- Dept. of Wildlife, NWT;
- DIAND, Iqaluit;
- Natural Resources Canada, Iqaluit;
- Environment Canada, Yukon;
- Fisheries and Oceans Canada, Iqaluit;
- Canadian Wildlife Service, Iqaluit;
- Dept. of Renewable Resources, Yukon;
- Dept. of Sustainable Development, Nunavut;
- Inuvik Regional Health and Social Services Board;
- Prince of Wales Heritage Centre, Yellowknife.

The central Task Force recommendation is for a new joint NSERC/SSHRC funding program, with a strong emphasis on partnership with northerners. The purpose of the Phase 2 consultations was to determine whether the draft recommendations appropriately dealt with the issues and concerns expressed by northerners, and whether northern groups and communities would be willing and able to support and participate in the proposed new programs, where appropriate.

The following questions were considered during the consultations:

1. Does the proposed new program and the accompanying policy recommendations respond to the needs and problems expressed by your organization/group?
2. Do you see your organization participating in the new program? If yes, how? If no, how could the program be modified to make participation possible?
3. What role could members of your organization play in each of the proposed program elements? If a role is not evident, what changes would be needed to make it possible?
4. Could your organization contribute as funding partners on projects of mutual interest, either as in-kind or cash?
5. From your perspective, are there any important issues not covered by the proposed recommendations and programs?

There was general support for the recommendations from all the northern groups consulted, and appreciation that their opinions had been sought while the recommendations were in the draft phase. The groups gave some useful feedback on the importance of good communications between researchers and northern communities, and provided good advice on clarification of the wording of several of the recommendations. There was particularly strong support for the proposed Northern Chairs program.

In addition to the northern consultations, the draft recommendations were also presented to the following groups for feedback (see Annex 3 for a description of some of these organizations). These groups were also supportive of the recommendations and provided good advice on how to strengthen the final report and recommendations.

- Association of Canadian Universities for Northern Studies (annual meeting)
- Polar Continental Shelf Project Advisory Board
- Interdepartmental Committee on Northern Science and Technology
- International Science and Technology Counsellors (Foreign Affairs)
- Several NSERC Grants Selection Committees
- NSERC Committee on Research Grants
- SSHRC Standing Committee on Strategic Grants and Joint Initiatives
- NSERC Council

All the information gathered during the consultations was presented to the Task Force during its final meeting in March 2000, and was taken into account in finalizing the recommendations contained in this report.







## Annex 3

### Key players and organizations involved in northern research

#### Arctic Council

The Arctic Council is a ministerial-level organization of the eight northern circumpolar countries (Canada, USA, UK, Norway, Finland, Sweden, Russia, and Denmark); the Inuit Circumpolar Conference (ICC), the Saami, the Aleut International Association, and the Russian Association of Indigenous Peoples of the North (RAIPON) are recognized as permanent participants. There is also provision for the participation of non-Arctic states and intergovernmental and non-governmental organizations as observers, such as the International Arctic Science Committee (IASC), the International Union for Circumpolar Health (IUCN), etc. Ministerial meetings occur every two years, when the Chair of the Council rotates (Canada was the first Chair, the USA was the second, and Finland is now the third). Regular meetings of the Senior Arctic Officials (SAOs) discuss policy and projects, and emphasis has been placed on sustainable development, youth, and contaminants.

#### University of the Arctic

The circumpolar University of the Arctic is a response to demands in all eight circumpolar nations for North-relevant university education delivered in the North, for the North, and eventually with northern instructors. Although some of the circumpolar northern countries have universities north of 60, the demographics of many regions precludes extensive programs concentrating on northern issues, cultures, and environments. The University of the Arctic is designed to maximize circumpolar co-operation in education at the

undergraduate and graduate levels, and to provide intensive education concentrating on the North. The University is also designed to provide equal emphasis on northern indigenous values and culture, and Western traditions in teaching and research.

Although the idea of a university in the North has been raised a number of times in the last few decades, the current institution, with an international focus, was proposed in 1997 by Canadian and Nordic interests, and resulted in a Feasibility Study by the Circumpolar Universities Association (CUA). This was transformed into an international working group with the approval of the Arctic Council in late 1997. The concept developed into a firm proposal for a university based on virtual instruction principles combined with face-to-face instruction, field programs and Internet modular components. The concept received wide approval around the circumpolar North and in countries with interests in the Arctic. The Government of Finland provided initial support for the secretariat.

Since early 1998 a number of program activities at the undergraduate and graduate levels have been integrated under the umbrella of the University of the Arctic. The Bachelor of Circumpolar Studies has developed a program framework and has issued a call for detailed curriculum development. At the graduate level there are a number of activities integrating existing initiatives, such as the Social Sciences PhD Network. As the initiative grows there will be demands for research activity and financial support for that research activity. This will necessitate integration into the existing university research funding systems in the circumpolar countries.

The University of the Arctic has received widespread support from northern colleges (Aurora College, Yukon College, and Nunavut Arctic College), indigenous groups (Inuit, First Nations), and governments (Yukon, NWT, and Nunavut). The Arctic Council has endorsed the institution as a way to address issues of capacity building in the North. The Department of Foreign Affairs and International Trade has referred to it in its *Northern Dimension of Canada's Foreign Policy*, and the Interdepartmental Committee on Northern Science and Technology has made reference to its role.

The University of the Arctic, as a circumpolar higher education institution, is a reality that will be delivering post-secondary education and research opportunities in the North in the immediate future. It is a response to the limited opportunity for advanced training in the North, specifically on northern issues and subjects relevant to and adequately reflecting northern cultural values.

### **Association of Canadian Universities for Northern Studies (ACUNS)**

ACUNS represents 33 universities and colleges with interests in the natural, life, and social sciences and humanities in Canada. It is responsible for a number of initiatives for the promotion of northern research. Briefs have been submitted to the Interdepartmental Committee on Northern Science and Technology, to northern foreign policy initiatives of the Department of Foreign Affairs and International Trade, to the NSERC/SSHRC Task Force, and to the Arctic Council on issues pertaining to its work. It has initiated the NORTHSCI e-mail communication system for all northern researchers to promote the processes of information gathering and dissemination on Arctic issues. ACUNS administers the Canadian Northern Studies Trust which awards five to eight scholarships and bursaries per year for a number of aspects of northern research. The National Students Conference on Northern Studies, held every three years, is acknowledged as one of the most important communication mechanisms for students interested in northern research. ACUNS has also been very active in lobbying on behalf of northern research within the university community and in government.

### **Interdepartmental Committee on Northern Science and Technology**

The Interdepartmental Committee on Northern Science and Technology is composed of Assistant Deputy Minister-level representatives from government departments with a role in the North, together with NSERC (which also represents SSHRC) and the Canadian Polar Commission. Its mandate is to be an interdepartmental forum for information exchange, development of advice, and promotion of co-operation in northern S&T. It also promotes awareness of northern S&T issues and activities, investigates mechanisms for S&T program co-ordination and

delivery, and undertakes activities to promote co-ordination and collaboration.

With the support of an Interdepartmental Working Group, the Committee has held two workshops, bringing together academics, northerners, and representatives of federal agencies to discuss co-operation, co-ordination, and promotion of northern S&T. These have led to the preparation of a document entitled *Northern Science and Technology in Canada: Federal Framework and Research Plan: April 1, 2000–March 31, 2002*, describing northern S&T activities of federal departments and agencies. The report, published in August 2000, represents a co-ordinated federal approach for the promotion and enhancement of Canadian northern S&T co-operation, partnership, and international linkages throughout the circumpolar region. The Framework and Research Plan will help to maximize investments in northern S&T and to focus attention on the scientific resources and expertise, as well as capacity building and training, that are needed to address the issues that are most important to the Canadian North and to the rest of Canada. It will help determine immediate and future requirements, and lead to the setting of strategic directions and priorities for Canadian northern S&T on an interdepartmental basis.

### Canadian Polar Commission

Established in 1991, the Canadian Polar Commission (CPC) has a mandate to develop and disseminate circumpolar knowledge through consultation, communication, and partnership for the benefit of all Canadians and the circumpolar world. The purposes of the Commission are to monitor the state of knowledge of the northern and southern polar regions and report regularly to Canadians; co-operate with other organizations, institutions, and associations in the determination and communication of polar knowledge priorities to Canadians; support the dissemination of polar knowledge; advise the Minister of Indian Affairs and Northern Development; and enhance Canada's international profile as a circumpolar nation.

In carrying out its mandate, the Commission hosts conferences and workshops, publishes information on subjects of relevance to polar research, and works closely with other governmental and non-governmental agencies to promote and support Canadian study of the polar regions.

### Northern research institutes

The role of the northern research institutes is to provide research and laboratory facilities for the post-secondary education systems of the territorial northern colleges. They also assist the territorial, regional, and community governments in setting priorities and developing research projects in their territories, where research is considered broadly in terms of traditional knowledge, research in the social and natural sciences, and technology development. In this role they work mostly at the community level, and act as research brokers on behalf of community groups and individuals. They also provide information on research projects in a wide variety of areas, provide advice on funding programs, and assist in the development of proposals for submission to funding agencies. In the case of NWT and Nunavut, the research institutes are mandated to administer the territorial Scientists Act, and to administer the research licensing process.

### Polar Continental Shelf Project (PCSP)

Logistical support in northern Canada is critical to the vitality of northern science because of the added costs of working in isolated areas. The Polar Continental Shelf Project (NRCan), created in 1958, has been the pre-eminent facilitator for Canada's current generation of northern researchers. From bases in Resolute Bay and Tuktoyaktuk (dormant since 1998), it operates chartered aircraft that provide the co-ordinated logistical support for staging and evacuating fly (tent) camps widely dispersed throughout the northern mainland and islands. There are no PCSP bases in northern Quebec, Labrador, or Yukon, although PCSP is sometimes able to operate in these areas if there is sufficient demand. PCSP does not normally charge cost recovery to Canadian university researchers.

Despite PCSP's exceptional reputation for efficiency, and having received exemplary reviews from Treasury Board on several occasions, it nonetheless suffered substantial cutbacks during the federal government's Program Review. Its budget was reduced from a high of approximately \$6.5 million during the early 1990s to about \$3.5 million in 1998. The accompanying reduction in the number of northern projects undertaken by government research departments has been especially damaging because there has been a long-standing synergy between government agencies and universities (co-sponsored theses, etc.). PCSP

procedures require university researchers to submit applications to the PCSP's Scientific Screening Committee, which ranks the applications based on peer review and recommends to PCSP whether they should be considered for support. The final decisions are based on logistics feasibility and cost effectiveness. Although support is not automatic, individuals with NSERC/SSHRC funding are the primary recipients. The success rate for current applications is high, reflecting the small number of experienced applicants who are submitting well-designed projects.

### **Northern Scientific Training Program (NSTP)**

This DIAND program supports advanced students in gaining professional experience in the North and encourages them to develop a commitment to northern work. NSTP funds are restricted for use as a supplement to offset the additional costs of northern research (e.g., transportation and living costs). The program budget is currently \$636,000 per year. The program funds approximately 250 students, so the average support is about \$2500. The NSTP program has brought many students to the North over the years; however, its budget has been reduced from \$878,000 a decade ago to its current level. The number of students has declined significantly during this 10-year period, from an average of 300 students per year to 250, and the average supplemental grant has declined, despite the increasing costs of fieldwork. Also, the location of the research has moved south, with far fewer Arctic projects, particularly in the physical sciences. However, the number of applicants wishing to work in northern Quebec has increased significantly and the demand on the program continues to be high, showing a strong degree of interest amongst the student population.



## Annex 4 International issues

### 1. US Arctic policy and research activities

The scope, integration, and support for US Arctic research is now extensive, funded principally through the US Office of Polar Programs (OPP), National Science Foundation (NSF). Disciplinary research within OPP (both Arctic and Antarctic) encompasses atmospheric sciences, biological sciences, earth sciences, glaciology, ocean sciences, and social sciences. Within OPP there are three subdivisions: Arctic System Science (ARCSS), Arctic Natural Sciences, and Arctic Social Sciences. Interdisciplinary research is concentrated within ARCSS, whose data are managed and archived by the Data Co-ordination Center, University of Colorado at Boulder. Additional disciplinary programs within the Foundation are connected through an Arctic Affiliates system, which provides co-ordination across NSF.

The US Arctic Research and Policy Act was amended in 1990 to establish the Arctic Research Commission (ARC) and an Interagency Research Policy Committee (IARPC) to help implement the Act. IARPC includes many of the major federal agencies (NSF, Departments of Commerce, Defense, State, Agriculture, Energy, Interior, and Transportation, as well as NASA and the EPA, etc.). NSF chairs the IARPC and develops a five-year plan to promote the national policy. It updates the plan biennially in order to develop and establish an integrated national policy and to support co-operative international programs. The biennial review and the status of current US research is published by NSF in

the journal *Arctic Research of the United States*, aimed at both a national and an international audience. The diversity of research reported in any of these issues is enormous (from geophysics and glaciology to marine ecology and medical and human engineering).

There is also the Arctic Research Consortium of the US (ARCUS), which is a non-profit corporation co-ordinating educational, professional, and scientific interests. It has recently established the Arctic Research Support and Logistics Working Group, supported by NSF. Funding for Arctic research within NSF now exceeds US\$300 million annually.

NSF support is further supplemented by other opportunities such as the Office of Naval Research, which has procured the first dedicated scientific icebreaker, the USCGC *Healy*. Plans are also underway to provide a dedicated nuclear submarine for scientific research throughout the Arctic Ocean Basin. Consequently, the marine component of US Arctic research is vigorously proactive. The United States also has large and active Arctic research programs at several universities, whose funding is annually in the tens of millions of dollars, notably the Institute of Arctic and Alpine Research (INSTAAR), University of Colorado at Boulder, the Polar Science Center, University of Washington, and the Byrd Polar Research Center, Ohio State University at Columbus.

## 2. Details of Canadian university involvement in international programs and activities

International participation in northern research occurs through a number of different types of organizations and agencies, some of which require national membership and the appointment of a national representative, and others of which are based on individual memberships. The level of Canadian university participation in these programs and organizations is quite variable.

IASC, the International Arctic Science Committee, requires national membership and the appointment of one Council Member and one member of the Regional Board, this last being composed of the eight northern circumpolar nations. Projects involving international participation are submitted to IASC Council for approval, and progress is evaluated every year by the Executive Committee. IASSA, the International Arctic Social Science Association, has individual members rather than national membership. Its objectives are to promote and stimulate international co-operation and to increase the participation of social scientists in international and national Arctic research. Currently, Canada is hosting the secretariat at Université Laval, with both dynamic leadership and active Canadian membership.

In 1999, IASC had 14 projects, plus an Arctic Climate Impact Assessment (ACIA) project and one IASC/IASSA joint initiative, Rapid Cultural and Social Change in the Circumpolar North. The latter project has nine components, two of which are led by Université Laval and funded by SSHRC. An IASC-IPA (International Permafrost Association) Arctic Coastal Dynamics Project is in the development phase. A substantial Canadian contribution to this project is proposed, much of it from government. Other IASC-approved projects have limited Canadian participation, in some cases maintained by retired scientists, and in many cases maintained by government scientists.

In addition to the IASC programs, several international programs now exist, some of which are under the umbrella of the Arctic Council. The Arctic Monitoring and Assessment Program (AMAP), the Commission on Arctic Flora and Fauna (CAFF), and Protection of the Arctic Marine Environment (PAME), are examples of programs for which monitoring and research are conducted but in which Canadian university involvement has often been limited.

Both the Circumpolar Arctic Social Sciences PhD network and the Circumpolar Environmental Sciences PhD network hold yearly seminars with active participation from Canadian faculty and students (mainly Université Laval, UNBC and University of Alberta).

In the environmental earth sciences, examples of international initiatives include the NSF-funded Circumarctic Paleoenvironments (CAPE), the NSF-funded Paleoecology of Arctic Lakes and Estuaries (PALE), and the European Science Foundation's Quaternary Environments of the Eurasian North (QUEEN). Increasingly these research groups will focus on northern Canada, where the most expansive tundra exists and logistics are far simpler than in northern Russia. The NSF-funded SHEBA Project (Surface Heat Budget of the Arctic Ocean), which involved a Canadian icebreaker frozen into the sea ice of the Barents Sea (1998–99), was dominated by US researchers. The North Water Polynya (NOW) project is the only major international northern research project to be led by a Canadian university group in recent years.