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# THE LAW OF THE SEA AND MARINE SCIENTIFIC RESEARCH IN THE ARCTIC OCEAN

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*Contemporary events and circumstances, such as melting ice, the International Polar Year, and the UN Convention on the Law of the Sea are providing an unprecedented boost to Marine Scientific Research in the central Arctic Ocean. This felicitous situation could be short-lived, however, as Arctic coastal states apply the provisions of the Law of the Sea to extend their sovereign rights beyond 200 nautical miles, enhancing their entitlement to regulate a range of scientific activities. This is in marked contrast to the Antarctic regime, where freedom of research is protected under the terms of the Antarctic Treaty. The principles enunciated by this Treaty are worth considering, as they could inspire a less restrictive approach towards scientific investigation in the central Arctic Ocean.*

## INTRODUCTION

Marine scientific research (MSR) may be defined as the ensemble of observations and investigations that seek to understand the nature of the ocean environment and of the processes that occur within it. Three contemporary developments are having a significant impact on MSR in the Arctic Ocean: melting ice, the International Polar Year (IPY), and the UN Convention on the Law of the Sea (UNCLOS). By forcing an adaptation to changing climate, by promoting collaboration with other states, and by driving the need to define maritime boundaries, these developments touch upon Canada's interests at the national and international levels.

Melting ice is facilitating access to expanded oceanic regions that historically have remained inaccessible to scientific research on account of their widespread and persistent ice cover. The IPY, meanwhile, is mobilizing legions of investigators for an intensive two-year campaign of data gathering and analysis across a broad range of disciplines. Finally, UNCLOS has prompted all five coastal states that front upon the Arctic Ocean (Canada, Denmark, Norway, the Russian Federation, and the USA*) to initiate national programs for seafloor mapping and research in support of claims to the extended continental shelf (ECS) beyond 200 nautical miles.

Taken together, these developments have spurred an unprecedented increase in research activity in the Arctic Ocean, with many projects assuming the character of international partnerships. Motivated by the desire to maintain a productive momentum, investigators are seeking ways to channel

* While the USA has yet to ratify UNCLOS, federal agencies in that country are engaged in a comprehensive mapping program to collect the necessary data for developing an extended continental shelf.

Canada

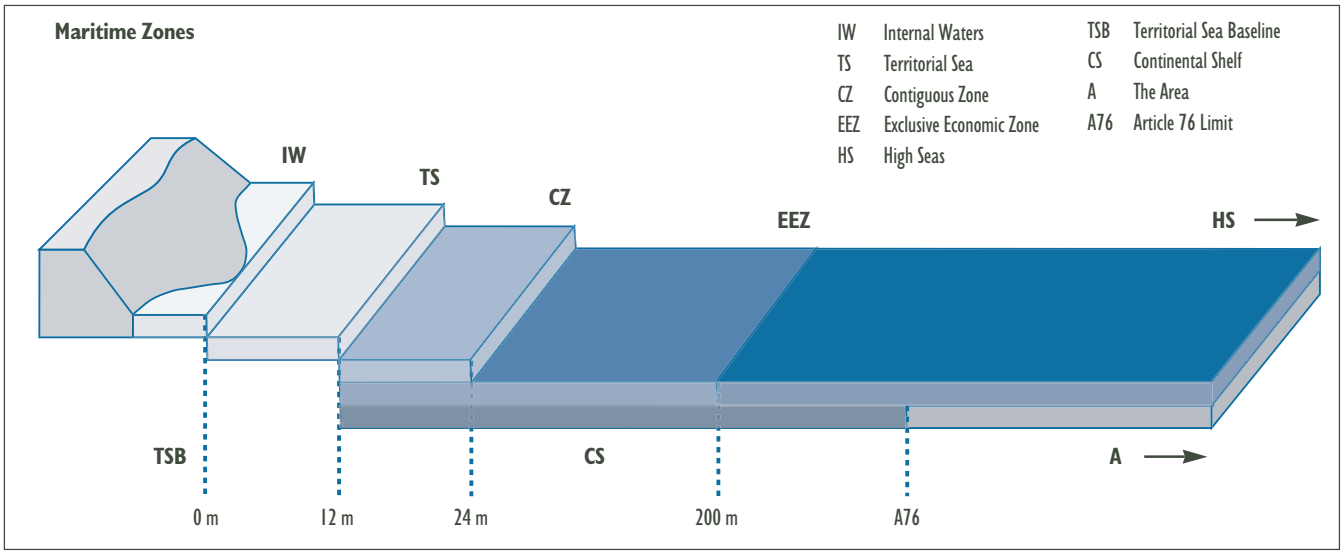


Figure 1
Coastal state sovereign rights in maritime zones. This diagram illustrates the seaward extents and overlaps of the maritime zones where a coastal state may exercise a range of sovereign rights and authorities. In general terms, the scope of those rights and authorities (including the regulation of Marine Scientific Research) diminishes with distance from the coastline. Conversely, a state that proposes to operate within another's maritime zones must relinquish certain rights as it penetrates further into those zones.

the current round of activity into a longer-lasting program that will outlive the circumstances which led to its inception. While there is no shortage of scientific objectives that are worthy of ongoing and in some cases urgent attention on a cooperative basis, the continuation of a broad-based undertaking for multilateral international research will likely require intervention and support at the political level.

## LOOKING AT THE LONGER TERM

With melting ice providing a constant and pervasive counterpoint, Arctic investigators and research managers recognize the benefits that would accrue from the establishment of a lasting framework for cooperative scientific investigation within the region. An example of such a framework that comes readily to mind is the one enshrined within the Antarctic Treaty System (ATS), which fifty years ago grew out of the International Geophysical Year (IGY).

IGY was a worldwide initiative that brought concerted international resources to bear on problems whose solutions had long been elusive. Among other things, the Treaty that it spawned continues to promote scientific research and the exchange of data under the oversight of the Scientific Committee for Antarctic Research (SCAR). Given its predominant focus on the land area of Antarctica and on the abeyance of all territorial claims, the ATS and its provisions are clearly not totally applicable to the Arctic situation. However, many of its principles could serve as useful guideposts in the development of a similar framework for cooperative scientific investigation in the North.

This note outlines some of the key research provisions in the ATS. It also considers how international law in the guise of UNCLOS could promote the rationalization of research policies and programs to maximize the benefits of international scientific collaboration in the Arctic region – or alternatively, how it could hamper field research. Finally, it assesses the prospects for creating an Arctic IPY legacy that resembles the ATS model through the establishment of a multinational infrastructure for promoting scientific research and the exchange of data on a continuing basis.

## MSR AND THE ANTARCTIC TREATY SYSTEM

Negotiated in 1959, the Antarctic Treaty entered into force in 1961, and has worked very successfully since then. The Treaty covers the area south of 60°S, without prejudicing the rights of any state under international law with regard to the high seas within that area.

The Treaty makes no specific reference to MSR, but its articles do contain some interesting points:

- A call for the freedom of scientific investigation, and for cooperation as practiced during the International Geophysical Year;
- Encouragement for the exchange of planning information, of research personnel, and of scientific observations and results;
- A call to demonstrate interest in Antarctica through the conduct of a substantial research activity such as the establishment of a scientific station, or the dispatch of a scientific expedition.

The coordination of scientific activities in Antarctica is fulfilled by the non-governmental Scientific Committee for Antarctic Research (SCAR). The original Treaty had no specific reference to SCAR, but this changed with the entry into force of the Protocol on

Antarctic Environmental Protection to the Antarctic Treaty in 1996, which has several specific references to the role of SCAR. The Protocol calls for the Committee on the Environment to ensure that an environmental impact assessment is conducted for all activities proposed in the Treaty area prior to their initiation. This not only ensures protection of the environment, but it keeps all parties aware of developments.

## MSR IN THE ARCTIC

In the Arctic, the primary coordinator for MSR is the International Arctic Science Committee (IASC). The Committee provides scientific advice to the Arctic Council, which it predates by several years. IASC is supported by the Forum of Arctic Research Operators, and liaises with several other organizations, notably the Arctic Ocean Science Board, the International Arctic Social Sciences Association, the Northern Research Forum, and the University of the Arctic.

Within their respective spheres, SCAR and IASC have similar roles and objectives, however their legal foundations differ. SCAR has, in part, become an instrument of the Antarctic Treaty and is strengthened by the Treaty's legal status. IASC was formed by a group of scientists and has become part of the structure of the Arctic Council, which exists as a result of a political declaration and which cannot impose policy or decisions upon its member states.

## THE POTENTIAL IMPACT OF UNCLOS ON MSR IN THE ARCTIC

UNCLOS provides a framework for establishing zones of maritime jurisdiction for each coastal state: in essence, the ocean is divided into zones where states are entitled to exercise a range of rights and freedoms (see Figure 1). As a general rule, a coastal state enjoys privileged levels of authority in the zones adjacent to its territory, the authority diminishing progressively with increasing distance from the coastline. Conversely, other states must progressively relinquish freedoms as they penetrate deeper into the zones where a coastal state exercises jurisdiction. These freedoms assume several forms, but the freedom to conduct MSR is the only one that will be considered here.

Within the 12 nautical mile Territorial Sea that is adjacent to its territory, a coastal state has the exclusive authority to regulate, authorize, and conduct MSR.

Within its 200 nautical mile Exclusive Economic Zone (EEZ), a coastal state also has the right to regulate, authorize, and conduct MSR, but under normal circumstances it is expected to grant consent to other states that wish to engage in research for peaceful purposes and for the greater benefit of mankind. This consent is subject to certain conditions and procedures which are spelled out in Part XIII of UNCLOS. In the Arctic Ocean, these provisions apply within the combined EEZs of the five coastal states, which comprise an unbroken belt that completely

Figure 2
Limits of Arctic coastal state jurisdiction. The lighter area represents the combined Exclusive Economic Zones (EEZs) of Canada, Denmark, Norway, Russia, and the USA within the central Arctic Ocean (EEZs in adjoining seas, *i.e.*, Barents, Norwegian-Greenland, and Bering, are not shown for the sake of clarity). Within its EEZ, a coastal state has the right to regulate, authorize, and conduct Marine Scientific Research (MSR), but is expected to grant consent to other states for research activities that are undertaken for peaceful purposes and for the greater benefit of mankind. The darker area in the centre represents a High Seas zone beyond the coastal state EEZs, where the combined Article 76 claims of the five coastal states could result in new restrictions on MSR activities that address the seabed. The irregularly-shaped white areas in the centre are zones where a provisional analysis suggests that Article 76 would not apply, and where MSR could be undertaken without restriction by any state. In the remainder of the central Arctic Ocean, however, MSR will likely be subject to some form of coastal state control.

encircles the Ocean's outer rim while defining an enclosed High Seas zone in the centre (see Figure 2).

The Extended Continental Shelf (ECS) presents a different legal situation: this zone lies beyond the 200 mile limit of the EEZ, with a maximum extent that is determined in accordance with the technical provisions of Article 76 of UNCLOS. In this area, a qualified coastal state does not enjoy full sovereignty, but it is entitled to regulate MSR activities, particularly those that impinge upon the seabed; in principle, it can withhold consent in the case of designated zones that have been set aside for exploitation or detailed exploratory operations.

## COULD MSR BE RESTRICTED IN THE CENTRAL ARCTIC OCEAN?

As of this writing, nowhere in the Arctic Ocean (nor in the entire world, for that matter) has an Extended Continental Shelf (ECS) been formally established, however two of the Arctic coastal states (Norway and Russia) have submitted proposed outer limits to the Commission on the Limits of the Continental Shelf (CLCS). Russia's submission is in temporary abeyance, pending the presentation of new supporting information to the CLCS; Norway's submission remains in the hands of the CLCS. The other three Arctic states (Canada, Denmark, and the USA) are assembling the necessary data sets in support of their cases. Therefore it is only a matter of time until the first Arctic ECS is proclaimed, to be followed by the others in succession.

A provisional analysis suggests that the cumulative ECSs of the Arctic coastal states could encompass most of the central Arctic Ocean, leaving two zones where coastal states could not exercise sovereign rights (see Figure 2). These two excluded zones form a part of the Area, which incorporates all components of the global seabed that lie beyond national jurisdiction, and where mineral resources on and below the seabed comprise the "common heritage of mankind".

Within this context, the ability to perform MSR in the Arctic Ocean has emerged as an issue with significant political overtones. With the prospect of seeing most of that ocean encompassed by the EEZs and ECSs of the Arctic coastal states, other states have been expressing concern about the potential loss of access to regions where important scientific questions remain to be answered.

In principle, Part XIII of UNCLOS exists to facilitate scientific access to EEZ and ECS regions, however in practice coastal states are able to impose administrative delays and constraints that can effectively hamper or even prevent planned research programs. For example in one recent incident, two research icebreakers operated by non-Arctic coastal states were forced to cancel long-standing plans for scientific excursions through the EEZ of a coastal state, when local authorities attempted to impose substantial fees for access to those waters and for services which included icebreaker escort.

## MAJOR ISSUES AND THE NEED FOR MULTILATERAL MSR

When considering issues of sovereignty and access to national waters in the Arctic Ocean, it is worth recalling that worldwide, unresolved maritime limits and boundaries are estimated to number in the hundreds – so the Arctic is hardly unusual in this respect. Nevertheless, this is no time for complacency. For all its environmental rigours, the Arctic Ocean remains unique and vulnerable: unique because it is the only large enclosed sea that alternates between polar night and day; in addition, it currently features a persistent ice cover that serves as an effective barrier to the sort of ocean-atmosphere exchanges that are commonplace in other parts of the world. These circumstances make for a marine environment that is very different from that of other oceans, and one that scientists are still trying to understand.

The Arctic Ocean is also vulnerable: with a deep central zone that is essentially cut off from the world ocean, it serves as a basin for the long-term circulation and retention of contaminants that originate locally from coastal states, from shipping and related industrial activities, or from remote sites after transportation via atmosphere and surface currents. Moreover, as one of the engines that drive world climate, the Arctic is impacted by global warming, with long-term consequences that cannot be predicted with any reliability at this time.

Many of the scientific problems and challenges that are associated with the Arctic Ocean transcend national boundaries, and their satisfactory resolution can only proceed on the basis of cooperation among coastal states. This cooperation requires a pooling of interests, along with a willingness to engage in multiparty debate and decision-making with a view to initiating collective action that will lead to some greater good. Such action could imply a temporary suspension of certain sovereign rights in the offshore, which coastal states would no doubt be reluctant to accept for various reasons, *e.g.,* defense and environmental concerns; ownership of living and non-living resources; cultural and historical perceptions that underlie a sense of national identity; etc.

## PROSPECTS FOR INTERNATIONAL COOPERATION

The realization of an Antarctic-style concept for maintaining an open, multinational research regime could be difficult to achieve in the Arctic Ocean, however nothing rules out cooperation among coastal states for the

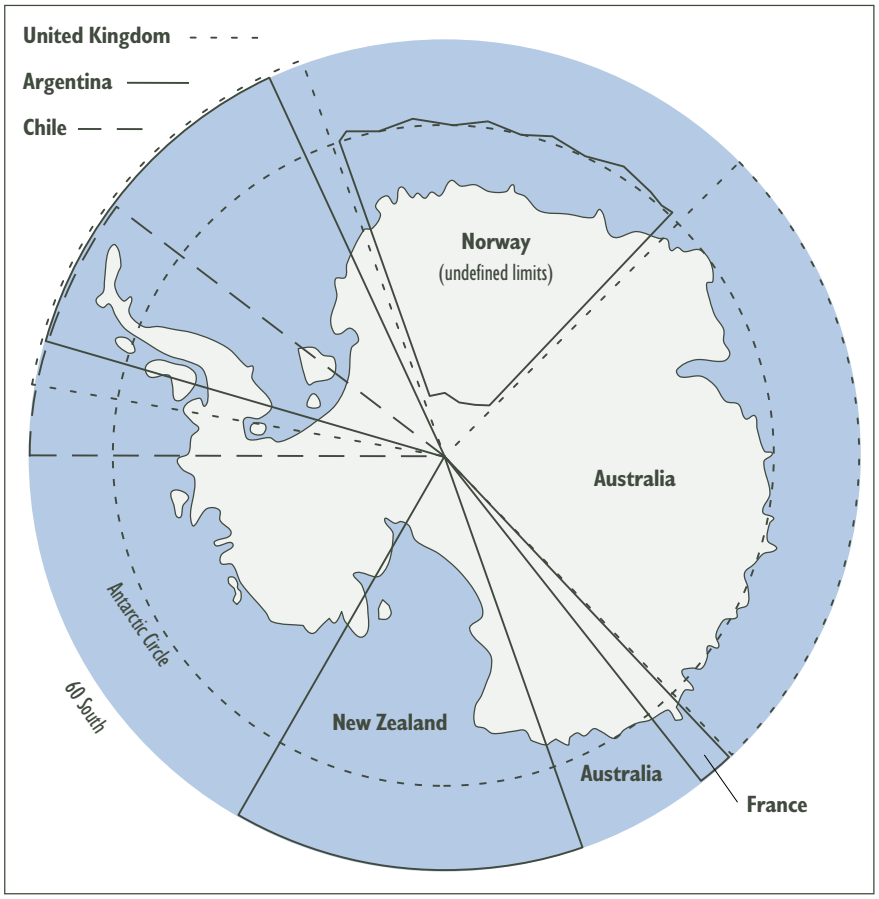


Figure 3
Sector claims in Antarctica. This diagram illustrates the locations and extents of claims by Argentina, Australia, Chile, France, New Zealand, Norway, and the United Kingdom. Brazil has also declared a 'Zone of Interest' which is not presently considered a formal claim. All claims except Norway's begin at the South Pole and extend to 60°S, the northern limit of the Antarctic Treaty. Including the seven claimant states, the Treaty now has 46 signatories, including Canada. The Treaty makes no specific reference to Marine Scientific Research (MSR), but within its area it does commit state parties to support freedom of scientific research, to promote cooperation and exchange, and to conduct substantial research activity. These parties would therefore appear to have freedom to conduct MSR in areas south of 60°S without the imposition of constraints by other states — as long as they adhered to the provisions of the Treaty.

purpose of attaining a worthwhile collective goal. Indeed, Part IX of UNCLOS advocates cooperation among the coastal states that border enclosed or semi-enclosed seas such as the Arctic Ocean.

Specifically, Part IX encourages affected states to coordinate their actions in:

- the management, conservation, exploration, and exploitation of living resources;
- the protection and preservation of the marine environment;
- the development of policies and programs of scientific research;
- the constructive involvement by other interested states or organizations.

Thus there is a legal, if not a moral, incentive for Arctic coastal states to implement a regional framework of transboundary cooperation that would enable them to devise effective solutions for common problems. Such an arrangement might not match all the provisions of the Antarctic Treaty System, but its effect would be to promote the development of a circumpolar community that shunned the pursuit of narrow national self-interest and sought instead to involve participating states in an ongoing process of communication, consultation, and collaboration.

With the International Polar Year relying heavily on multinational scientific cooperation, coastal states have entered a propitious era for capitalizing and acting upon their common interests in the Arctic. The IPY could be a very effective springboard for launching a spate of ideas and activities that culminated in the development of a regional mechanism for promoting the freedom of scientific research without transgressing unduly upon coastal state rights.

## CONCLUSION

Article 76 of UNCLOS and the requirements of the Commission on the Limits of the Continental Shelf have imposed a timeframe on coastal states, while the start of the IPY has provided an impetus to accelerate the process of delineating outer continental shelves through increased international cooperation in research aimed at polar issues. It is worth noting that Canada was a member of the IPY Planning Group, and that it contributed to the final report *A Framework for the International Polar Year 2007–2008.*

The IPY Plan makes it clear that bipolar aspects of the world should be included, and the following quote is of interest:

> *The IGY of 1957–58 resulted in the creation of an innovative model of Antarctic governance based on international scientific and political agreements: IPY 2007–2008 could provide a comparable opportunity to further advance and facilitate international scientific cooperation in the Arctic.*

The emphasis in this context is on *innovative*, as the political situations differ in the two polar areas. Governance in Antarctica follows the internationally recognized Antarctic Treaty and its associated regulatory schemes, collectively known as

the Antarctic Treaty System (ATS). In Antarctica, there are no coastal states because territorial claims (see Figure 3) have been set aside in accordance with the provisions of the Treaty. This situation has been conducive to regional scientific collaboration.

By way of contrast, both Arctic and non-Arctic states face potential conflict over their MSR rights in the Arctic offshore. It is too soon to say whether the Arctic Council, which was established by a declaration in 1996 and which lacks the legal authority of the ATS, will play a role in developing a political climate that facilitates free international research throughout the high seas zone. The current IPY could provide some movement in this direction through its focus on Arctic research issues, which in turn might motivate the development of a common perspective on how best to resolve the region's scientific challenges.

In the long run, this could create conditions favourable to the establishment of a voluntary regime for free scientific research in the Arctic. Such a regime might lack the regulatory power that has benefited scientific research in Antarctica, but given the right conditions and with suitable international goodwill, the arrangement could prove to be equally effective.

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## GLOBAL WARMING: ARCTIC SHIPPING

*Captain Patrick R.M. Toomey*

Whatever the effects of global warming turn out to be in the near and distant future, there will always be ice in the Arctic Ocean in winter. As long as the plane of the sun's apparent path (the ecliptic) remains tilted at approximately twenty-three and a half degrees from the plane of the equinoctial (the Equator), there will be a long winter night in the polar regions. Sea ice will form, and every winter for the foreseeable future ships crossing the North Pole should expect to encounter ice – eventually, perhaps, only thick first-year ice. The long-desired shortest sea-route between the Atlantic and Pacific Oceans will never be the ice-free year-round transit dreamed of since the world was discovered to be a globe, and so starry-eyed shippers hoping for it had better get used to that fact now.

### A GRADUAL CLEARING OF MULTI-YEAR ICE FROM THE NORTHWEST PASSAGE

What is most likely, however, is a gradual clearing of old (multi-year) ice from the traditional Northwest Passage routes through the Canadian Archipelago in the next 15 years or so. The open water shipping season on these routes will lengthen until it extends from perhaps April to December. There will be first-year ice in the remaining winter months, but ice conditions will probably be no worse than in the Gulf of St. Lawrence during the past 50 winters, when shipping has been able to move almost uninterrupted with icebreaker assistance. The long Arctic winter night in very high latitudes will make ice navigation more difficult than it would be in daylight, but this is not an insurmountable problem. In the Beaufort Sea ice conditions will never be as benign as they will eventually become in the channels between the Canadian islands, but the gradual reduction in quantity and quality of the old ice in the Arctic Ocean and the Beaufort gyre can only work to the advantage of shipping in both summer and winter.

In the Arctic Ocean, the extent of dangerous old ice will diminish and become much less of a factor for over-the-Pole ship transits. The multi-year ice will eventually disappear, perhaps over 50 to 70 years. Some second-year ice will always remain as a hold-over from each winter season. It is unlikely that trans-Polar shipping lanes will become open-water routes for very long periods in the near future, but the ice conditions will certainly become easier to navigate than in the past, so that ice-breaking – even ice-strengthened – commercial vessels will eventually be able to cross the Arctic


Ocean year-round. I expect that open water summertime transits will be possible in some years quite soon, perhaps in the next 20 to 30 years, but will remain a very risky option for vessels not strengthened for ice navigation. The thick first-year ice circulating in the Arctic Ocean each winter will remain a formidable obstacle for many months each year, even if all the old ice disappears, and when deformed and in consolidated ridges, will be almost as difficult to negotiate as older ice. Six voyages to the North Pole aboard the Russian icebreaker *Yamal* between 1999 and 2005 have permitted me to observe that most of the thick first-year ice at and around the Pole is greatly weakened or melted altogether by the end of August

Right to left: The icebreakers *Yamal* (Russia), *Louis S. St-Laurent* (Canada) and *Polar Sea* (USA), near the North Pole. Russia's superior icebreaker fleet illustrates Russians' view of their arctic as a high priority worthy of considerable investment. Photo: USCG, Steve Wheeler.

each year, the remaining ice being predominantly old ice. Without the old ice that predominates in summertime in very high north latitudes, there would be much more open water around the Pole.

## SHIPPERS WOULD NEED LITTLE CONVINCING TO SEE THE SAVINGS

Today's interest in the shipping routes across the Arctic Ocean is motivated, just as in the 16th century, by commercial pressure to shorten the sailing distance between the northern Atlantic and Pacific Oceans. The sailing distance over the North Pole between Kobe, Japan and Hamburg, Germany is only about 5,000 nautical miles, as opposed to 11,225 nautical miles via the traditional westbound route through the Suez Canal. At less than half the distance, the polar route saves fuel and time, once the threats of damage or delays caused by ice are removed. Shippers would need little convincing to see the savings on, for example, the voyage from London to Yokohama: via Suez and the Straits of Malacca, 12,573 nautical miles (via Panama at 11,440 nautical miles) versus the Pole route at 8,595 nautical miles. New York to Yokohama over the Pole means about 2,000 nautical miles less than the Panama Canal route; and Hamburg to Vancouver would save about 1,300 miles by going over the North Pole. As the Arctic Ocean ice thins and becomes less menacing it will certainly become more attractive to send icebreaking and ice-strengthened ships on the polar route; and later, once the open water routes develop, conventional vessels, at least in the summer season. Stronger vessels will be able to continue year-round.

There are three main shipping routes to follow across the Arctic, two coastal and one direct. A shipper can choose to brave the drift ice of the Beaufort Sea and thread the Canadian archipelago to the open waters of the Labrador Sea and the Atlantic, commonly known as the Northwest Passage; or instead, follow the Russian Siberian coastline along what is known in Russia as the Northern Sea Route; or thirdly, set off directly for the North Pole between the Bering Strait and either Denmark Strait or Spitsbergen and the Greenland Sea.

Putting international politics aside for a moment – there is some disagreement on sovereignty and national control of waterways – both coastal routes already provide virtually open water transits in summer. The open water period of the coastal routes will last longer each year as global warming reduces the ice-cover, and so these routes will see earliest development of shipping traffic. The greatest savings from the direct route across the Pole will not be realised until much later as only very ice-capable ships will be able to use it for many years to come, and ice will always cause either damage or delays.

## RUSSIA IS BEST PLACED TO DICTATE THE CONDITIONS FOR NORTH POLAR TRANSITS

Now for the politics. Russian control of the Northern Sea Route along the Siberian coast from the Bering Strait to the Barents Sea has never been seriously challenged internationally, and Russian sovereignty is vigorously pursued along its whole length from the Bering Strait to the Norwegian border. Since at least the beginning of the 18th century Russia has jealously guarded the right to control shipping traffic, marine exploitation, exploration and all other activities in the region. It has developed the Russian Arctic by populating it, sometimes by force, establishing industries and coastwise transportation links. Russia was the first nation to develop a serious Arctic icebreaking fleet, and continues to dominate this activity with eight nuclear-powered icebreakers (not all currently in service). The newest, the *50 Let Pobedy* began operating just this year. A large variety of smaller icebreakers is available, many currently laid-up, but ready for reactivation should the need arise, and several of them more powerful than any Canadian icebreaker today. For all these reasons, Russia is in a very good position not only to control marine traffic along the Northern Sea Route, but also to promote, assist, and regulate such traffic to

its own advantage. Consequently Russia is best placed to dictate the conditions for North Polar transits: it is the only nation with icebreakers powerful enough to assist – or rescue – vessels taking the polar route in the early stages of that route becoming practical.

In contrast Canada, with the second longest Arctic coastal sea-route after Russia, seems to have no abiding interest, either political or practical, in controlling access to her Arctic waterways, exploiting them for national commercial benefit, or protecting them from ecological disaster caused by unregulated shipping. The Canadian Arctic Waters Pollution Protection Act with its Arctic Shipping Pollution Prevention Regulations (revised in 1996 with the Arctic Ice Regime Shipping System) has worked thus far on a voluntary basis as a form of control and protection for the Northwest Passage, mainly because nobody else thought it worthwhile to contest the Act's provisions. However with big money at stake the *laissez-faire* attitude of other nations might change. Canada is even lukewarm on sovereignty issues – pin-pricks like the dispute with Denmark over Hans Island aside – as the question of whether the Northwest Passage is international or Canadian waters remains undecided by any international court.

## CANADA WILL WATCH FROM THE SIDELINES

The Canadian icebreaker fleet is very small compared to the Russian fleet, not only in numbers but in polar capability. Canada does not possess a single truly Polar icebreaker, although the *CCGS Louis S. St Laurent* – now almost 40 years old – did make it to the North Pole in 1994. Most of our other major icebreakers were designed and built in the 1980s, and I am not aware of any Canadian icebreaker replacement plan that could change anything in the next ten years. The cancelled Polar 8 Project of 1987–90 would have been a start in gaining some international respect for a serious Canadian year-round interest in the Arctic Ocean and the Arctic Archipelago. Since then the Finns have become the acknowledged design innovators for both pure icebreakers and commercial adaptations of revolutionary icebreaking principles, which are seemingly being adopted by everyone but Canada. There is little doubt that the Russians and Finns, whose icebreakers are now operated by private shipping companies, will gleefully fill this void in Canadian polar icebreaker capacity. Russia will re-activate its dormant fleet and sell its services for escort, surveillance, and even rescue, to the highest bidder. Canada, which should have been leading the way, will watch from the sidelines. It will be too late to catch up.

NABOS 2007. Photo: Mike Dunn.

The May 2007 announcement of a construction program for six corvette-sized Arctic Patrol vessels for the Canadian Navy does not begin to address the icebreaker problem for penetrating the polar ice; even this program will not be operational until 2015 and it will only replace – not augment – the fleet of new, armed icebreakers promised by the current government in the most recent federal election campaign. In July the Prime Minister announced the construction of only three of these small vessels. He emphasized the fact that they will not be icebreakers, but merely ice-strengthened vessels – that they will only break one metre of ice! They might as well stay south if that is all they can handle. Two to three metres thickness of first-year ice should be the minimum standard. The Prime Minister also noted that these ships would not be needed in the Canadian Arctic outside the traditional summer ice navigation season as there is no traffic in wintertime to warrant their presence. This may be true now; but very soon there will be traffic, some of it quite possibly totally inappropriate. The major problems with foreign shipping in Canadian Arctic waters are much more likely to happen outside, rather than during, the navigation season. I must admit to a personal interest in the "Polar 8" Project, with which I was deeply involved until its cancellation; and in hindsight I have to admit that, had she been built, she would probably have been larger than necessary, given the way that global warming has diminished the polar ice so quickly – but who in 1987 was thinking it would all happen so fast? The pendulum should however not swing so far the other way that Canada builds and deploys vessels unable to cope with even the diminished ice

conditions brought on by global warming – because as mentioned earlier, first-year ice will be a formidable obstacle for many years to come.

## RUSSIA IS STEPPING IN TO FILL THE VOID IN ICEBREAKING CAPACITY

On the North American side of the Arctic Ocean, both the United States and Denmark, through Greenland, also have stakes along with Canada in the development of commercial navigation along their coastlines. Currently neither of the two major North American arctic coastal states can be counted upon to provide polar icebreaker support or control of Arctic Ocean shipping. The Danes have no icebreaking capacity because hitherto there has been no need for icebreakers anywhere in Greenland – and not much in Denmark – therefore they are unlikely to participate in what might eventually become a multinational polar-icebreaker fleet. The United States does have two polar icebreakers, the US Coast Guard's *Polar Star* and *Polar Sea.* Both entered service in the mid 1970s and, already past their expiry date, cannot be expected to remain in service much longer. The United States is already chartering Russian icebreakers to resupply McMurdo Base in Antarctica, which may be the first sign of things to come throughout the polar regions as the Russians step in to fill the void in icebreaking capacity. There is no American plan to replace their two pioneering polar icebreakers. The *USCGC Healy,* which entered service in 2000 is not a purely polar icebreaker and cannot seriously be considered for continuous work in the polar seas. That leaves Canada alone to take some action. Canadian governments of the recent past and present do not however seem in any hurry to respond to this challenge – one that an optimist might call an opportunity.

The legalities of regulation and port state control of international shipping are complex and become more so where transit without port calls is involved, even when full sovereignty is claimed and recognized, as in Russian Arctic waters. They become more convoluted in Canada's situation where our sovereignty over the Northwest Passage is disputed by our so-called friends, never mind our enemies. Just imagine the legal challenges that will arise for trans-polar voyages in the undoubtedly international waters of the Arctic Ocean if the littoral states of Russia, Canada, the United States, Denmark and Norway each decide to impose their own, possibly conflicting, controls on shipping. This situation has no counterpart – not even in Antarctica, which has an international treaty of its own. It would appear that the only way a comprehensive set of rules can be applied to commercial shipping in the North Polar Basin is to have the International Maritime Organisation (IMO), an agency of the United Nations, negotiate a new Polar Navigation Convention similar to the existing IMO Conventions for Safety of Life At Sea (SOLAS) and MARPOL, which governs marine pollution and the discharge of waste at sea. While this negotiating process is slow and seems to take forever, both SOLAS and MARPOL are now the international accepted standards routinely enforced by just about every maritime nation in the world.

## POLAR NAVIGATION: THE ROLE OF INSURANCE COMPANIES

Unsafe shipping practices in the Arctic pose a risk to ships, their crews, and the Arctic environment. Perhaps no one is more conscious of this than the insurance industry. There have been many instances of insurance companies discouraging unsafe practices – such as ice navigation with unsuitable ships – by charging enormous premiums for coverage. Insurers have in fact often led the way for reforms and regulations in the shipping industry. Failing prompt national and international government action to address potential problems as polar navigation becomes much more attractive, the marine insurance industry, if only in self protection, will establish *de facto* control. They will make insurance coverage impossibly expensive without sufficient safeguards such as the use of ice-breaking freighters with competent ice-navigators on board, icebreaker escort services, and rescue and cleanup facilities either on board or available, because SOLAS and MARPOL will apply at the North Pole just as they do at the Equator and all points in between. By this means the flood of expected traffic braving the polar ice may be stemmed, and some of the over-enthusiastic "cowboy" operators discouraged from sending their ships by any of the polar routes until there is international agreement on regulation.

## CONCLUSIONS

Issues of sovereignty and control of territorial waters; the validity of straight baselines when setting national and economic frontiers to various oceanic zones; the management of shipping and ecological matters: these must all be resolved by negotiation or reference to international courts before polar navigation becomes commonplace.

There must be new protocols established for polar navigation by the IMO in conjunction with – or as additions to – the present SOLAS and MARPOL regulations which will pay particular attention to the unique circumstances of ice navigation in relation to ship loss or damage and consequent pollution. The provision of certified ice-navigators should be a priority.

Nations with polar coastlines should be working towards the establishment of either several national fleets, or one international fleet, of truly polar icebreakers ready

to assist or rescue commercial vessels which may find themselves in difficulty or danger in polar waters.

Member States of the IMO should ratify the clauses of SOLAS concerning ice navigation which have been under negotiation – or waiting for ratification – for 20 years or more, so that there will be a system in place to train ice-navigators, and eventually to licence ice-navigators before they are needed in large numbers as the commercial routes in the Arctic Ocean become more and more attractive to shippers. The lack of certified ice-navigators is a recipe for disaster which marine insurers are unlikely to accept without special premiums for polar navigation that will mean enormous cost for the shipping industry.

Polar navigation for commercial shipping in the Arctic Ocean is coming soon, whether the states to be affected by it are ready or not. It would be sensible to start the process of getting ready now, not wait until emergency measures have to be cobbled together at great cost and probably not done right the first time around. If no action is taken, there will be a certain grudging satisfaction in being able, some time in the future, to say, "I told you so back in 2007!" But I would rather not be placed in that position.

*Patrick R.M. Toomey is a retired Canadian Coast Guard icebreaker captain. He lives in Kingston, Ontario.*

## PEARL – A CANADIAN SUCCESS STORY

*Jim Drummond on behalf of the CANDAC/PEARL Team*

In the 2002 Fall/Winter Edition of *Meridian* my colleague Kimberly Strong detailed the closure of the Arctic Stratospheric Ozone Observatory (ASTRO) at Eureka, Nunavut and the loss to Canadian science that would ensue. This article is a sequel to that one – and for once the news is fairly good.

Dr. Strong recounted in the previous article how, after nearly a decade of service, the observatory was going to be closed, not because the science was no longer relevant, but for lack of funding from the government. She also mentioned that a group of ASTRO researchers were getting together to try to save it for future measurements. We formed the Canadian Network for the Detection of Atmospheric Change (CANDAC) as a consortium of university and government researchers with the aim of generating facilities for conducting research in this area and training the researchers required. It proved to be a somewhat prescient move as at that time public interest in our major research areas of ozone, air quality, and climate change was nowhere near as strong as it is today. Now with the environment front and centre in many social and political discussions, renewed interest in Canadian sovereignty in the North, and International Polar Year (IPY) in full swing, the newly-formed Polar Environment Atmospheric Research Laboratory (PEARL) is in the forefront of Canadian research efforts.

PEARL was conceived as an expansion

Figure 1
Attending to instruments on the PEARL roof. In the foreground is a Brewer ozone spectrometer, in the centre is an SPS. Roof hatches for radiometers, spectrometers and lidars run from front right to centre-back.

Figure 2
The PEARL laboratory, at 610m above sea level. The laboratory is on the peak to the left of centre of the picture and the access road runs up the ridge to the right. Photo: Jim Drummond.

of the ASTRO laboratory activities, which had concentrated on ozone and related measurements in the middle atmosphere. These measurements were incorporated into the new structure because the longevity of the data records is extremely important when long-term studies are required. But it was also recognized that additional research areas were needed; and so the research at PEARL is divided into four major themes: Tropospheric Transport and Air Quality; the Radiative Environment: Impacts of Clouds, Aerosols, and "Diamond Dust"; Arctic Middle Atmospheric Chemistry; and Waves and Coupling Processes. In addition to these four major themes the site is also used for satellite validation. Finally, we are always on the lookout for "sudden events" that might cause us to schedule a special set of observations at short notice.

## TROPOSPHERIC TRANSPORT AND AIR QUALITY

Many materials are transported into the Arctic including toxic substances such as pesticides and organic pollutants, as well as sea salt and other less hazardous substances. Some of these pollutants occur in the form of very small particles produced by urban pollution, industrial processes, forest fires, etc. In addition there is a constant flow of volatile organic materials into the Arctic due to an evaporation-condensation mechanism called the "grasshopper effect" that cycles the organic compounds from the surface to the atmosphere during warm periods, then back to the surface when the temperature decreases. While in the atmosphere, they are spread in all directions by winds and migrate north, where they become trapped by the consistently low temperatures and accumulate to levels dangerous to the human and animal populations. The research objective is to quantify the amounts of material transported by these mechanisms and identify the sources from which they originate. With this and complementary information from researchers at other locations, we will be able to provide a consistent picture of the transport, which will help point the way to an eventual elimination of these pollutants.

The major tool in this study is an aerosol mass spectrometer (AMS) which is capable of detecting and analyzing these pollu-

tants. Normally only used in a clean warm laboratory setting, this instrument now has to operate unattended in a remote location. However the existence of the PEARL facilities and support structures make this feasible. This is supplemented by star and sun photometers which like many PEARL instruments not only make measurements for the PEARL research objectives but also contribute data to global observing networks.

Figure 3
Laying the power cable for the new SAFIRE site which is 2km from the nearest supply. The 'dozer drags the sled with the reel (weighing 6,500 kg) across the frozen ground paying out the orange power cable behind. Photo: Jim Drummond.

## THE RADIATIVE ENVIRONMENT: IMPACTS OF CLOUDS, AEROSOLS, AND "DIAMOND DUST"

Many reports show that the Arctic's climate has changed significantly in the past decades. Over 30 years the temperatures have risen by up to 4°C, which is comparable to the amount of warming after an ice age. Summertime arctic sea ice coverage has steadily declined in response to the warming, which has implications for wildlife, indigenous peoples, and sovereignty. The Arctic is quickly entering a new climate regime and this is causing substantial stress on natural ecosystems which cannot adapt so rapidly.

Climate is determined by the complex interplay between infrared radiation, the atmosphere, and the Earth's surface. This theme uses an array of instruments to characterize the arctic atmosphere's composition and structure at the PEARL location. A lidar (laser radar) system will measure profiles of atmospheric temperatures, aerosols, clouds, and water vapour; and an atmospheric emitted radiance interferometer (AERI) will be used to understand their impact on the infrared light that reaches the surface. Sun and star photometers will determine the vertically integrated loading and size properties of aerosols above Eureka. These integrated parameters are critical to assessing the climatic impact of aerosols transported into the Arctic from lower latitudes.

The data from these instruments will provide new insights into the physical processes that determine the arctic climate. As the arctic atmosphere becomes warmer and increasingly humid, the interactions between the constituents and infrared light are expected to enter a different regime. The PEARL measurements will document and provide important insights into this process.

## ARCTIC MIDDLE ATMOSPHERIC CHEMISTRY

What is the chemical composition of the stratosphere: how and why it is changing with time? How is the chemistry coupled to dynamics, microphysics, and radiation? And how are climate change and future arctic ozone depletion linked? This theme aims to improve our understanding of the processes controlling the arctic stratospheric ozone budget and its future evolution, using measurements of stratospheric constituents and other observations made at PEARL. It builds extensively on the previous history of the ASTRO laboratory at this site.

PEARL measurements will provide a significant new long-term dataset of arctic chemical composition measurements, which will yield better understanding of day-night, day-to-day, seasonal, and year-to-year variability. Using these measurements we can study chemical ozone loss at Eureka during each winter and spring, and determine trends in ozone and related constituents. We can also increase our understanding of processes that cause feedbacks between stratospheric ozone depletion, rising greenhouse gas concentrations, and climate change in the High Arctic. This will improve our ability to predict the future of arctic stratospheric ozone.

Measurements are made by an ozone lidar, a Fourier transform infrared spectrometer, a UV-visible grating spectrometer, a Brewer spectrophotometer, and an atmospheric emitted radiance interferometer (AERI). Other instruments at the site also provide useful data. This information, when combined with atmospheric models, will bring improvements to atmospheric modelling and interpretation of measurements,

leading to better understanding of arctic chemistry and climate system processes.

## WAVES AND COUPLING PROCESSES

Atmospheric circulation occurs in a distinct pattern over the polar regions. Over most of the year, the atmosphere ascends over the summer pole (the pole currently experiencing the summer season). From about 40km to about 85km it rises, then crosses the globe to the winter pole and descends again. At the same time in the stratosphere (the middle levels of the atmosphere) a strong circulation forms each winter around the pole – the polar vortex – and significantly influences the chemistry of this region. While we understand these large-scale events reasonably well, the coupling between them and other regions of the atmosphere is a topic of vigorous scientific research.

Much of the atmospheric structure that we see results from waves. Waves also couple different parts of the atmosphere. Identifying their sources, where they travel, and their impact when they dissipate is important to understanding the atmosphere's basic form. At the PEARL observatory, a variety of instruments will be used to study the nature of the wave field in the arctic atmosphere and how it varies. Details of the coupling will develop through combining data from several instruments, collaborations with other observatories, and by using satellite data and models.

Instruments to be used for these studies include an E-region wind instrument; a spectral airglow temperature imager; a meteor radar (which operates by scattering radio waves off meteor trails to learn about upper atmosphere temperature and density) and an all-sky imager.

## INSTRUMENTS SPECIALLY BUILT OR ADAPTED FOR ARCTIC USE

Groups working at PEARL have access to other research groups' data, a major advantage of working at such an active site. A group studying the surface radiation balance, for instance, has access to radar and lidar data on cloud and aerosol conditions and to atmospheric chemical composition through the spectrometer measurements of other groups. Research is also spread over three sites: the original laboratory at 610m above sea level; a sea-level site, dubbed ØPAL (the zero-altitude PEARL Auxiliary Laboratory); and the SAFIRE (Surface and Atmospheric Flux, Irradiance, Radiation Extension) site for experiments which need to be far from any structures or other human influences. These sites are all linked by microwave communication to the main laboratory, hence to the outside world. Some measurements are taken at several sites to exploit differences in altitude.

Figure 4

Normally access to Eureka is by chartered plane only, but on July 12, 2006, a 737 with 45 people and 8,000 kg of equipment flew from Edmonton to Eureka for the opening ceremonies of the PEARL laboratory. Onboard were scientists and representatives from most of our supporting organizations. Photo: Jim Drummond.


Many of the instruments at PEARL are specially built or adapted for use in the Arctic. The AMS, for example, needs an inlet system capable of operating at −50°C; the AERI has to work at longer wavelengths than normal to provide coverage of a long wavelength region of transparency – a "dirty window" – in the atmospheric absorption spectrum, present only at polar latitudes with low levels of water vapour. All instruments are automated as much as possible to economize on operator time. Keeping instruments operating is one of the many challenges we face doing this kind of research in the Arctic.

Because of PEARL's High Arctic location and the very high number of satellite overpasses occurring the laboratory is an excellent place to perform satellite validation. Very little satellite validation is done in the Arctic, although accurate satellite information is crucial there, as it is in other inaccessible regions. Validation requires comparison of satellite measurements from overhead with other measurements on the ground when measurement conditions are favourable for both measuring instruments. Many Earth observation satellites pass almost directly over the pole once every orbit, making a large number of potential comparisons possible. PEARL is in fact located in a planetary "sweet spot" for this type of measurement. Currently we have measurements at PEARL contributing to validation of the Canadian SciSat satellite and the NASA Aura, Cloudsat and PICASSO missions.

PEARL has benefited from a number of international collaborations. The US Study of Environmental Arctic Change (SEARCH) has placed several instruments at PEARL which expands the range of instrumentation

Figure 5
The PEARL laboratory from the road. The roof deck provides access to many of the instruments and the communications dish – which is actually mounted upside-down, hence the feed horn in the air – is used for internet and phone communications. There are also three smaller microwave dishes that provide links to the other sites (ØPAL and SAFIRE) and the weather station. Photo: Jim Drummond.

available. The International Arctic Systems for Observing the Atmosphere (IASOA) IPY project provides links to other Arctic observatories and the Network for the Detection of Atmospheric Composition Change (NDACC) provides linkages to other sites performing similar research around the world.

Eureka is clearly much better off than it was a few years ago, and is in fact well on the way to becoming one of the best research sites in the world. State-of-the-art equipment is being installed and scientific results are already emerging. But all is not perfect. PEARL, like many similar installations in Canada, has no permanent funding. It depends for its survival on a succession of short-term grants and contracts – hardly a satisfactory situation for a laboratory whose mission extends well into the future. Government plans for controlling greenhouse gases refer to dates as far ahead as 2050 or even 2100. PEARL will be needed throughout that time if we are to monitor the success or failure of our efforts to control the anthropogenic climate drivers. The CANDAC team is grateful to the ten organizations that have supported the foundation of PEARL, but we still look for a more secure source of funds so that we can plan for the next decade or two – when things will really start to heat up.

*Jim Drummond holds a Canada Research Chair in Remote Sounding of Atmospheres He is a professor of Physics and Atmospheric Science at Dalhousie University and the University of Toronto.*

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*The CANDAC/PEARL team:*
*Principal Investigator:* James R. Drummond, University of Toronto and Dalhousie University. *Theme Leaders:* Jim Sloan, Waterloo; Tom Duck, Dalhousie; Kimberly Strong, Toronto; William Ward, New Brunswick. *Co-Investigators:* Stephen Argyll, Western Ontario; Hans Fast, Environment Canada (EC); David Hudak, EC; Alan Manson, Saskatchewan; Tom McElroy, EC; Norman O'Neill, Sherbrooke; Marianna Shepherd, York; Gordon Shepherd, York; Robert Sica, Western Ontario; Kevin Strawbridge, EC; Kaley Walker, Toronto; Bruce McArthur, EC; Jim Whiteway, York.

Details on CANDAC and the PEARL laboratory can be found at: www.candac. ca.



## THE CENTRE D'ETUDES NORDIQUES AND THE QAUJISARVIK NETWORK

*Yves Bégin*

Qaujisarvik is a network of Northeast Canadian research stations maintained by the Centre d'études nordiques (Laval University, University of Québec at Rimouski [UQAR] and the National Institute for Scientific Research [INRS] Centre for Water, Earth, and Environment) and several partner organizations in northern Quebec and elsewhere in Canada.

The Centre d'études nordiques (CEN – centre for northern studies) and its northern partners received funds to form a network of eight eastern arctic and subarctic research stations along a nearly 3,500km south-north transect through all the Northeast Canadian ecozones. Most of the *Qaujisarvik* (which means research station in Inuktitut) facilities are owned by universities (Laval and UQAR),

while some belong to First Nations or Inuit. All are dedicated to university research.

1 The Radisson Ecological Research Station (53°47' N, 77°37' W) is owned by the municipality, which provides it without charge by emphyteutic lease to the CEN. The station's laboratory includes facilities for dendrochronology, environmental telemetry, sedimentology, and organic compound tracing.
2 The CEN research station at Whapmagoostui-Kuujjuarapik (55°17' N, 77°46' W) is the network's showpiece. Its five buildings include an experimental greenhouse, laboratories, a cafeteria, and workshops.
3 The station at the future Lac à l'Eau-Claire Park (56°00' N, 75°00' W) includes five buildings, is useable from May to October, and has an airstrip nearby. The Kativik Regional Government owns the station; CEN is the main user.
4 The Umiujaq cold weather technology laboratory (56°32' N, 76°31' W), owned by the Umiujaq landholding corporation and maintained by Makivik Corporation, has two freezer rooms that allow work on frozen materials, as well as preparation workshops, clean rooms, and a storage shed. The facility is suitable for work on permafrost cores, paleosols, archaeological artifacts, and microbiological samples.
5 The Boniface River station (57°44' N, 76°10' W), which belongs to CEN, is in a "sanctuary" of old forests at their range limit. It is a laboratory for the study of climate change impacts on natural ecosystems. The site has an airstrip.
6 In Kuujjuaq (58°06' N, 68°24' W), the Nunavik Research Centre, which is owned by Makivik Corporation, is open to researchers in all fields who work with northern communities. The station is modern and well equipped for laboratory work.
7 Bylot Island station, owned by CEN, is in Sirmilik National Park (73°08' N, 80°00' W). The laboratory is in a permanent tent-shelter (Weatherhaven type). CEN researchers and their colleagues have been using the site for two decades; their research contributed to the creation of the park.
8 Ward Hunt Island station, property of Quttinirpaaq National Park on Ellesmere Island (83°01' N, 75°00' W) is the most northerly research station in Canada. It has three Parcoll type buildings.

CEN research concentrates on four themes.

1) *The origin and resilience of natural ecosystems and biodiversity:* We study the development of terrestrial biomes over time that leads to the formation and resilience of the ecosystems supporting biodiversity.
2) *The impact of animal populations on northern ecosystems:* Northeastern Canada is host to large migratory animal populations to which migratory species conventions apply. CEN researchers devote significant effort to these populations which have a major impact on northern environments because of their increasing numbers.
3) *Permafrost:* Permafrost melt and resulting ecosystem destabilization, resulting from climatic warming, constitute a major problem. Using new technologies we are analyzing permafrost degradation processes and their consequences on inhabited and natural zones.
4) *Water resources:* Records from instrumental measurements that enable us to evaluate water resource cover only a few decades. Indirect methods (dendrochronology, varves, paleolimnology) enable us to extend these chronologies further into the past. Using paleolimnology we are studying water quality over time in order to document ecological changes.

Because much of Northern Canada is difficult to reach, sustained research there requires specially adapted facilities. Responsible management of northern areas requires understanding of the role of abiotic and biotic factors in northern ecosystems, and works to the benefit of the resources they contain. This kind of research is important both for northern residents and for Canada's status as a leading circumpolar centre of northern research.

Our funding, obtained from the Canada Foundation for Innovation and the Quebec Ministry of Education, Recreation and Sports, totals $3,037,000 and will enable improvements to the northern facilities, including building renovations and new laboratory equipment. This network constitutes the terrestrial component of research infrastructure made available to ArcticNet researchers by CEN, half of whose researchers are ArcticNet members.

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*Principal Northern Partners*

For the research stations, from south to north: Locality of Radisson, Hydro-Québec, Cree Regional Council, Cree First Nation of Whapmagoostui, Northern Village of Umiujaq, Kativik Regional Government, Makivik Corporation, Sirmilik National Park, Quttinirpaaq National Park.

Research institutions: Laval Unversity, University of Québec at Rimouski, National Institute for Scientific Research [INRS]-Centre for Water, Earth, and Environment.

Other partners: Ouranos, ArcticNet, Geological Survey of Canada.

Number of principal researchers: 60. Number of users: 160.

# SOCIAL HOUSING NORTH

*Avi Friedman*

I was foreign to the far north when I accepted an invitation to visit Iqaluit, Nunavut's capital, where I was about to design social housing. My design and building knowledge above the 60th parallel and familiarity with the Inuit dwelling culture were rudimentary. The barren landscape of Baffin Island and the challenges faced by local architects were an eye-opener, which could offer a lesson for the rest of us southerners.

Northern Canada is in transition. The marks of new mineral discoveries, cultural transformation and climate change are visible and introduce new paradigms affecting design. A good place to start, however, is with the fundamentals.

Canada's modern presence in the north is linked to trade, the military, and sovereignty over land which some suggest contains our future riches. Until the end of the 19th century, the Canadian Arctic, the home of many Inuit groups, was visited occasionally by explorers and for a time frequented by whalers. In 1914, the Hudson's Bay Company began to set up trading posts throughout the arctic. Growth came to Iqaluit, formerly Frobisher Bay, in World War II. when the Americans built an air base in the area. During the 1950s Cold War era, the base was turned over to the Canadian government and became part of the DEW (Distant Early Warning) Line. The place drew southerners, who needed basic amenities. Additional expansion took place in the 1970s with the building of a hospital, school, homes, apartment buildings, hotels and other traits of a modern town. In 1999, with the division of the Northwest Territories, Iqaluit became the capital of Nunavut, population 30,000, a region that occupies one-fifth of Canada's land mass and assumes its own governance, structure, and cultural identity.

## BUILDING IN THE NORTH

Designing for extreme temperatures and a very short construction period poses awesome challenges. Perhaps the biggest of them all is logistical. Every building component needs to be ferried from the south by boat during the warmer season. Failing to deliver a large item on time may mean that the building process may come to a halt or that the piece will have to be flown in – a costly prospect. It gives real meaning to the term "miss the boat". Lack of a deep water harbour in Iqaluit also requires the transfer of goods from boats to barges to land and trucking them to sites. It also means that most building needs to be conceived as a well-designed kit of parts for rapid assembly.

Linking buildings to municipal utilities and constructing infrastructure pose other formidable challenges. As the terrain freezes to a depth of two to three metres, the use of conventional pipes is forbidden. Instead, freshwater runs in insulated conduits whose contents need to be kept in constant motion to avoid freezing. The community, therefore, has circulation pumping stations throughout. Up until recently, most homes in Iqaluit were not connected to central freshwater supplies and sewer disposal. Instead, each home was frequented daily by trucks which supplied them with fresh water and collected grey water. Thirty percent are still served in this way.

Despite a vast land mass, finding terrain to build on is not easy in the north, since much of the ground under the topsoil is permanently frozen. Conventional southern foundation practices, deep or shallow, cannot be applied here, and the rocky terrain does not make things easier once appropriate land is found. Steel piles need to be driven into the ground, and beams, upon which the superstructure sits, welded to their heads. When a heated building sits directly on the ground, a zone of thawed soil in the perennially frozen soil develops. It can affect the stability of the permafrost and, as a result, damage lower floors. This is now reported often, a result of climate change.

Climatic considerations affecting designs have extreme importance in the north. Energy costs for instance, much higher due to the cost of transporting oil, must be kept down, and inhabitant comfort made a priority. Harold Strub's excellent book, *Bare Poles* (Carleton University Press, 1999) systematically lists many of the aspects a designer needs to consider.

Blowing snow in frigid arctic weather is one such phenomenon. There is simply not much that can block wind and snowdrift formation above the tree line but the structures themselves. Urbanistically, buildings need to be sited to shelter each other. The long axis of each building needs to be aligned with the wind and raised above grade to form an open crawlspace. A blocked underbelly will cause snow accumulation on the building's other side. The structure's silhouette also needs to be streamlined and the roof's height shallow. Entrances with wind locks cannot face the wind and deflectors to reduce zones of stagnating air are necessary.

The importance of sunlight in northern climates cannot be overstated. At higher latitudes, the angle of incoming sunlight remains so low that it reaches its greatest intensity by projecting on vertical surfaces such as walls, rather than the horizontal surfaces like flat roofs, roads, and parking lots, as occurs at lower latitudes. It is very wise to ensure that sunlight is captured and focused by vertical surfaces to create thermally appropriate microclimates. It is also

important to consider that during the summer, the sun reaches most of the horizon's circumference once a day. Therefore, sunlight will reach almost all exposed sides of the building at some point during the day. During the winter, however – when the sunlight is needed most – it is often only available for a couple of hours and only from the south (Strub, 1999).

## DESIGNING SOCIAL HOUSING

The building site for the social housing project was located at the heart of an interesting and diverse part of Iqaluit. Close to the waterfront and across from a visitors' centre, library, museum and a school, it has a gently sloping terrain, a stream that borders its eastern side and a mountainous view at the rear.

Several cultural and lifestyle attributes invoked ideas when I began contemplating an approach to site planning. First, the notion of demarking property does not exist in the north. One will be hard pressed to find a fence surrounding a yard. Residents freely walk or even drive through each other's places. Clusters of homes have a strikingly different appearance to what we are used to in the south. Also, tents are still used as summer dwellings. Due to overcrowding and a need for cool places, the Inuit erect them adjacent to their homes or on the nearby tundra.

Fishing and hunting form an essential part of a household's economy and diet. Fishing gear, hunting equipment, skidoos and a *qamutiik* (sledge) are part of a family's possessions which need to be safely stored. Once the hunt is over, carcasses are processed indoors and the meat stored for consumption over the long winter.

One is also struck by the inherent artistic talent of the Inuit. Behind many homes you can hear the sound of power tools and see locals sculpting soapstone into magnificent works of art. Some large pieces are also displayed in various spots throughout the community. In the north, artwork supports many households' economies and its production must be accommodated in the dwelling's design.

North and south elevations

Drawing of one of the social housing rows

Lack of trees lends northern communities a barren image. Yet, the beauty of the tundra, with its rock formations, flora and fauna, is captivating and can be made part of the landscaping and streetscaping. It is surprising to find the large number of species that survive the harsh weather and carpet the wild landscape.

The need for housing, social housing in particular, in the North is staggering. Iqaluit, for example, saw a 20% population increase in five years, according to Canada Mortgage and Housing Corporation statistics. With a large youth segment of the population and excessively high costs of dwellings, locals have very few shelter options outside social housing. The problem is compounded by high levels of unemployment, overcrowding, and substance abuse. Fostering a strong personal identity, respecting local dwelling culture, and creating a place that embeds itself in the physical landscape were therefore key planning and design objectives.

The orientations of the proposed buildings were woven into the pattern of the old ones, which acknowledged wind direction and solar exposure. Crossing foot and skidoo paths were laid on existing ones, and soapstone sculpting areas equipped with electric outlets and tool sheds were designated at the rear. Where the paths cross, a square and seating arrangement made of rocks were planned. Sites were also allocated for children's play areas, an arctic garden and large-scale sculptures by local artists.

Having individual entrances to homes rather than common ones was meant to foster personalization. Colours present in local art were chosen for the wood siding exterior facades. The roof's parapet, it is hoped, will also have a feature that draws its roots from local culture.

A flexible approach was taken to the design of the interiors of two families' two-storey dwellings. Sun exposure required that north- and south-facing layout prototypes be designed. Within the very same footprints, one- or two-bedroom plans were offered. At the rear, a storage space for hunting and fishing gear with access from the interior was planned. Also, we included in the design a multi-purpose room in which carcasses could be prepared and which allowed for plenty of other storage facilities needed by young families.

Canada's north is changing rapidly. With an increased need for culturally appropriate housing, a vast new territory and opportunities have been opened for architects to explore sensibly.

*Avi Friedman teaches architecture at McGill University, where he also directs the Affordable Homes Program.*

*Credits*

*Architect,* Avi Friedman

*Photos,* Avi Friedman

*Client,* Nunavut Housing Authority and City of Iqaluit, Michelle Bertol, Lands and Planning Director

*Architect team,* Avi Friedman, Jeff Jerome, Fa Xivong Wu

*Environmental engineers,* Rowan Williams Davis & Irwin, Inc.

# ORAL HISTORY IN NUNAVUT: AN OVERVIEW OF ITS PAST AND PRESENT VITALITY

*François Trudel*

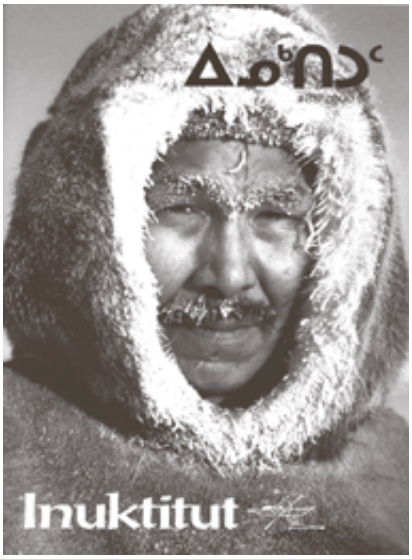
In October 2006 the 15th International Inuit Studies Conference: "Orality in the 21st Century – Inuit Discourse and Practices" took place in Paris. A great success, it has inspired a diversity of papers that will soon offer new insights into this vast and important subject. In the meantime it would be useful to look at one important aspect of the conference theme: the vitality of oral history practice among Nunavut Inuit, both over the recent past and today.


To begin we should look at the difference between oral tradition and oral history. Oral tradition is an old and widely used term that refers to oral messages (narratives, tales, proverbs, legends, myths, etc.) passed down through the generations. These can reveal elements of the past, especially of societies that do not use writing. Oral history, on the other hand, is a term that has been used for only a half a century. It refers to the collection of accounts and reminiscences by interviewing informants about events and situations from their lives. It has several aims, such as deepening the informants' awareness of the importance of their history (empowerment) or as an aid to understanding how a given society constructs or represents its past (social memory).

Numerous links and overlaps connect oral tradition and oral history. Oral tradition often supports and enriches oral history; oral history can serve as a catalyst for oral tradition. Both are essential components of Canadian aboriginal cultures today. They provide perspective on past ways of life as well as on the present and even the future. They are collected, studied, categorized, and preserved by organizations such as schools and other institutions, elders' societies, government ministries, etc. and by many researchers including folklorists, anthropologists, archaeologists, historians, linguists – and most importantly indigenous peoples. Some interpret this interest, which is particularly strong in northern Canada, as a reflection of indigenous societies' desire to document their own perspectives on their past, mainly through elders' oral testimony, in light of the many disruptions to their ancestral way of life, some recent and others dating from years back.

Nunavut Inuit have seen their oral tradition studied since the end of the 19th century by well known ethnologists such as Franz Boas and Knud Rasmussen, and many others. Some contributed to the substantial information on Inuit traditional life featured in Volume 5, *Arctic,* of the *Handbook of North American Indians,* edited by David Damas (1984). Oral history found fertile ground in the major changes to Inuit society over the past half-century: evangelization by missionaries, the move to permanent settlements, schooling, the introduction of new forms of communication (radio, television, internet), and access to self-government. These rapid changes drew the previously scattered and isolated Inuit into the wider current of Canadian and global society. As a result Inuit became increasingly proficient at writing and interested in both recording their ancient traditions and knowing more about their recent history. A variety of oral history publications resulted, of which the following represent only a selection.

The Oblate mission magazines *Eskimo* (1946) and *Inummariit* (1972), the Department of Indian Affairs and Northern Development magazine *Inuktitut* (1959), and the Inuit Tapirisat of Canada's *Inuit Today* (1971), were among the first publications to circulate a growing number of articles on Inuit oral traditions and to give Inuit themselves a chance to publish their stories, sometimes in bilingual and even trilingual form. Combined with local radio and newspapers, and such other publications as autobiographies of Inuit, they contributed to raising interest in oral history and its richness and complexity among Inuit and the Canadian public .



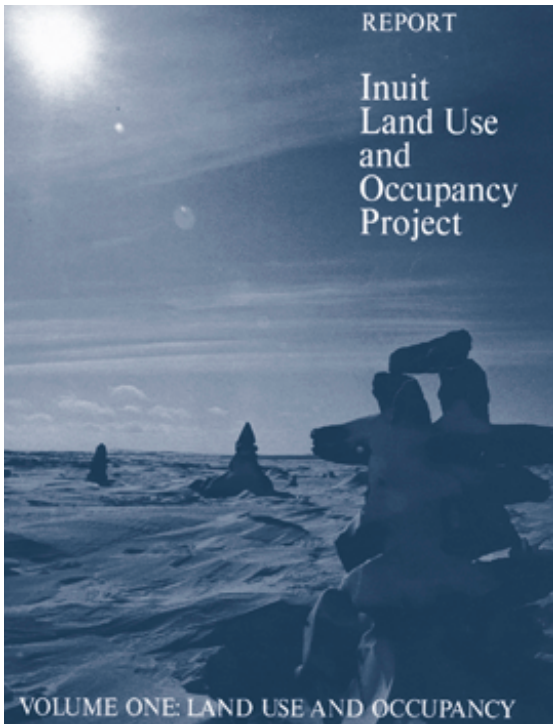
Also important is the Inuit Land Use and Occupancy Project, initiated by the Inuit Tapirisat of Canada to support Inuit land claims in the Northwest Territories. The report, produced under the direction of Milton Freeman, was published in 1976. The investigation needed to deal with the terrestrial and marine environments, with the present and the past, and to produce a clear statement, by the Inuit themselves, of their relationship to the land. It also had to prove unequivocally that Inuit had used this area "from time immemorial" and that they were still doing so.

Many Inuit from all NWT communities, including what is now Nunavut, participated in in-depth interviews with researchers on a wide range of topics: archaeology, history, ethnography, toponomy, geneology, cartography, hunting and trapping, fishing, and life stories. An extensive indigenous memory project on ancient and recent history, it drew on the knowledge of active adults and elders in each community and produced major oral archives and detailed reports on the occupation and use of the land. In addition to providing a basis for settling the land claims it helped familiarize Inuit and researchers with many aspects of oral history research, and also stimulated interest in doing further research.

Another major investigation that drew on oral history was the Royal Commission on Aboriginal Peoples (1992–96), which produced, for the first time, a detailed image of historical and contemporary relations between aboriginal and non-aboriginal peoples in Canada. The Royal Commission held public hearings in about one hundred communities across the country, and gathered many statements from Inuit on diverse aspects of their interactions with southerners, including relocation by the Canadian government of several Inuit groups in the Canadian Arctic, as well as the treatment of young Inuit in church-run residential schools.

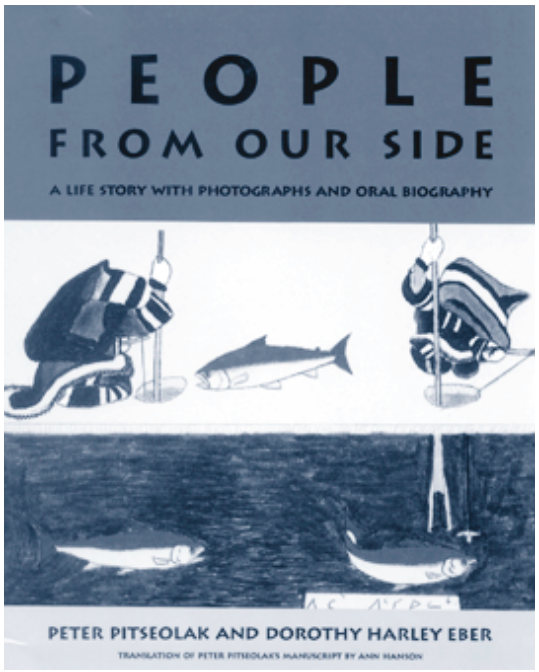
The Royal Commission also sponsored research on a variety of subjects involving aboriginal oral tradition and oral history, both from the recent past and the present. Anthropologist Nancy Wachowich researched the perspectives of three Pond Inlet women of different generations in an effort to record Inuit oral tradition but also to show how it differs from that of the many other research efforts carried out in the region by specialists. The resulting book, *Saqiyuq* (2000), describes in detail the methodology used to transform the women's spoken words into writing. The author brings to the fore such characteristics of Inuit oral tradition as its poetic quality, oscillation between past and present, ellipses of memory, and complexity of narration, as well as the difficulties of retaining originality. The book presents not so much three life histories, as was originally intended, but rather 117 short narratives in roughly chronological order, with a section for each narrator including a short biography and a thematic description. The book has no conclusion.

Most oral history research in Nunavut takes place in a quite different context from that of public enquiries. The work of Dorothy Eber, a former journalist interested in Inuit research, was supported by a 1970s Canadian Museum of Civilization (its current name) program to record oral histories of Canadian ethnic groups often ignored by official and academic histories. The program spawned many publications featuring the knowledge and perspectives of these groups. One, published in 1975, with a new version in 1993, was a collaborative work between Peter Pitseolak and Dorothy Eber. Eber met Pitseolak while doing biographical research on Cape Dorset artists. Later she was pleasantly surprised to receive by mail from Pitseolak a history of his people which he had written in Inuktitut syllabics. She used this manuscript, translated into English, as a starting point for recording Pisteolak's knowledge of "old Inuit ways" before they were forgotten. Assisted by interpreters she taped over 150 hours of interviews with him, and had them translated into English in Cape Dorset. Substantial extracts, translated more fully, were published in *People From Our Side* along with as complete a version as possible of Pitseolak's life-story manuscript. This book, published two years after Pitseolak's death, is one of the rare works on Canadian Inuit that combines an autobiographical manuscript with an oral biography and distinguishes clearly between the two genres. This opens windows on several aspects of history and individual and collective Inuit memories, including the richness and complexity of oral tradition and history compared with written material.




Another book by Eber (*When the Whalers Were Up North,* 1989) focusses on Inuit recollections of the whaling era in the

Eastern Arctic. While holding an identification session of photos from the 1940s to 1960s in Cape Dorset in 1981, Eber showed her informants a photo from 1881, thinking no one would know the Inuk it portrayed. To her complete surprise they easily recognized him as Johnnibo, who had been taken to Connecticut by whalers as a court witness. Through archival research in New England, Eber discovered the extent of American whaling activity in Hudson Bay and Hudson Strait and the degree to which Inuit participated. She doubted, though, that there would be many Inuit recollections left of the time. Subsequent research in several arctic communities enabled her to learn of the many stories, family traditions, and rumours regarding the American and Scottish whalers going back to the whaling era (1850–1910).




Some elders had only superficial knowledge of the subject, while others could discuss it in substantial detail. Little by little, using interviews and archival photographs, Eber succeeded in stimulating sufficient Inuit recollections to paint a broad picture of the history of contacts between Inuit and whalers. This book of oral history lets the Inuit voices speak for themselves, devoting considerable space to Inuit reminiscences and placing them in context using historical information. The author has chosen to present this information as a resource only, without analysis or comment.

Other oral history projects are being undertaken by elders' societies in Nunavut, assisted by northern residents and specialists, and with support from governments and other organizations. As one of these, the Igloolik Oral History Project – from one of the communities most intent on preserving and using Inuit culture and knowledge in contemporary Nunavut – was the subject of a previous article in *Meridian* (Fall/Winter 2001), we will look briefly at another, the Iqaluit Oral History Project, sometimes called the Oral Traditions Project. This is a collaborative project of Nunavut Arctic College and the Iqaluit Elders' society.

This project, supervised by Susan Sammons, a northern resident and coordinator for the Nunavut Arctic College Inuit Studies and Interpreter/Translator programs, was first a cooperative effort between the college and European academic institutions to "stimulate research on oral traditions" and develop books and manuals useful to the students of the College. It began in 1996 as a Nunavut Arctic College course on oral traditions that invited elders to be interviewed in Inuktitut by students who were helped by academics described as "facilitators". The formula proved so interesting and productive for all involved that it was decided to continue and develop it into a more structured oral history project involving close collaboration from Canadian and international universities. So far it has given rise to a large number of bilingual publications (Inuktitut and English) in four series of works entitled *Interviewing Inuit Elders, Inuit Perspectives on the 20th Century, Memory and History in Nunavut* and *Life Stories of Northern Leaders.* Distributed by the college, these are also available for consultation on the college web site. All books in the series draw on the memories of Inuit elders on a host of themes and subjects related to traditional life and change: traditional justice, child-rearing practices, cosmology and shamanism, dreams and their interpretation, the military presence in Iqaluit, etc.

The purpose of this ongoing project, which was outlined in the introduction to the series *Interviewing Inuit Elders* (1999–2001), concerns the need to preserve oral tradition and traditional knowledge in the context of the creation of Nunavut in 1999, in order to incorporate them into Nunavut government structures, and also for reasons of "identity and morality". Another fundamental reason is the importance for Inuit to publish knowledge in their own language from the perspective of their own culture and values to act as a counterweight to studies by non-Inuit, mostly in English, that frequently contain inaccuracies. The Iqaluit Oral History Project objectives include providing academic and practical training to Nunavut Arctic College students, awakening their interest in both Inuit and western perspectives on oral traditions, collecting and recording oral traditions from elders invited into the classroom, developing structured group research with chosen themes, producing the interview transcripts themselves, either in syllabics or roman orthography, and undertaking analysis and writing reports on their research.

The more general methodology of this project consists of inviting academics into class to familiarize the students with the basics of their research and with the fundamentals of oral history research (developing questions, interview techniques). Once the relatively short training period is completed,

elders are invited into class to be interviewed by students directed by facilitators, who also discuss the nature and progress of the research with students.

Part of the course includes transcribing and translating interviews under the supervision of the college instructors. Students also write brief analytical essays on the interviews.

Since its beginning this project has been stimulating thought on the nature of Inuit knowledge and how it is produced and transmitted. It has shown that orality remains the principal means of knowledge transmission and expression among Inuit, despite their adoption many years ago of the syllabic writing system and the focus on writing in the educational system; and there are other stimulating ideas here that merit lengthy discussion. The project suggests that Inuit knowledge is so personal and linked to the elders that it cannot constitute a homogenous body of knowledge, contrary to the views of many specialists. This knowledge appears so personal and linked to its social context and its individual sources that it loses all meaning and significance when separated from its context and the people who carry it.

Another large-scale oral history project culminated a few years ago in the book *Uqalurait: An Oral History of Nunavut* (2004). Initiated in 1993 by David Webster, a long-time arctic resident, this project, supported by Parks Canada, had several objectives: a) to produce a history of Nunavut for the inhabitants of Nunavut, written from their perspective; b) to make this history and its perspective known outside Nunavut; c) to provide an account of the fundamentals of Inuit culture before sustained contact with Europeans; d) to offer a view of the close relationship between Inuit and their land; and e) to bear witness to the complexity of the Inuit way of life. To reach these objectives a steering committee of Inuit from across Nunavut was formed, and two professional researchers were invited to undertake the research and to organize and produce the book, which is original in many ways.

The book is essentially a compilation of a great many Inuit oral accounts from Nunavut's three regions on the many elements of their traditional way of life. Most of these accounts had been collected, some many years earlier and others more recently, by a wide variety of Inuit and non-Inuit researchers: Inuit interested in local history, ethnographers, employees of Inuit organizations, land claims researchers, missionaries, and government employees. Some were collected by the project researchers.

This book presents authentic Inuit culture. In the title the word *uqalurait* refers to snowdrifts Inuit use as direction finders when travelling. In the foreword, Inuit refer to its contents as *Inuit Qaujimajatuqangit,* that is, ancestral knowledge that has been crucial to Inuit survival. Organized to reflect the objectives listed above, the book uses the structure of a *qamutiik* (sledge) as a metaphor. Just as a *qamutiik* has two main parts, the runners, *Uqalurait* has two main sections: Inuit Identity, which describes 23 elements common to traditional Inuit culture in Nunavut (from naming children to preparing skins and making clothing); and Regional Identity, which uses seasonal rounds specific to four groups (Ahiarmiut, Arviligjuarmiut, Amitturmiut, Inuinnait) to show cultural variations. Like the cords that hold the *qamutiik*'s crossbars to its runners but allow it to bend, the themes of flexibility, sacrifice, social control, sharing, and respect – the values that have held together and maintained Inuit society for millennia – run through the book.

A complete overview of the vitality of oral history in Nunavut over the recent past and today would require discussing many more of the great variety of related publications and projects than it is possible to mention here. This article, however, does illustrate a few aspects of oral history practice in Nunavut, which is just one of the many aspects of historical and ethnohistorical research taking place in that vast territory.

Oral history in Nunavut draws on a vast reservoir of oral traditions developed and maintained over the centuries by ancient Inuit and their descendants. Influenced by the disruptions to the Inuit way of life over the past half-century, oral history took root in the 1970s, grew steadily during the 1980s, and has blossomed since the beginning of the 1990s. It is an integral part of research in Nunavut and seems destined to continue, at least into the foreseeable future.


This oral history – of which very few of its supporters attempt a rigorous definition – is practiced by Inuit and non-Inuit, sometimes in cooperation, in a variety of contexts and for a multiplicity of reasons.

For Nunavut Inuit the main motivators are those of identity. This means recording the oral traditions of their elders, especially those who knew the traditional way of life which has now nearly disappeared, and writing it down, thus preserving and making it available to present and future generations, whether in school or other contexts (such as the Nunavut government). This also increasingly means promoting through oral history their own perspectives on history, which they view as having been neglected, and even misrepresented, for too long by non-Inuit. This is a form of empowerment.

Many non-Inuit recognize and share these aims of Inuit oral history practice, but

also see other uses. For some, oral history is a source of complementary research data (in archaeology, history, and social and cultural anthropology, for example), sometimes providing information crucial to a complete study. For others, oral history practice among Nunavut Inuit is a way to better understanding of social memory, or a way to construct the history of the Inuit involved, if not of all Inuit.

Thanks to a number of oral history research projects carried out over several decades in Nunavut, much more is now known about Inuit social memory, which in general resembles the indigenous perspectives of history described by the Royal Commission on Aboriginal Peoples. There are nonetheless many other questions to explore in the vast area of Inuit orality at the start of the 21st century, including the effects of writing it down, its use in the structures of modern Inuit life, and its future role as a hallmark of Inuit identity.

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## BOOK REVIEW

*John Bennett*

***Essential Song: Three Decades of Northern Cree Music***, by Lynn Whidden. Foreword by Eric Robinson, Afterword by Stanley L. Louttit. Wilfrid Laurier University Press, 2007. $85.00 Cloth, 190 pp., with audio CD. ISBN: 0-88920-459-4.

*Essential Song* explores the world of Cree music Lynn Whidden came to know through her research in Chisasibi, Quebec and Thompson, Manitoba. Cree hunting songs have a fundamental place in subarctic hunting life, and the hunters who composed, sang, and passed them down through the generations considered them essential hunting tools. Part prayer, part prediction, and part hunting manual, these highly original sung poems with their many layers of meaning are now fading from memory as intergenerational links weaken and the influence of mass-media entertainment grows. The author has created this work, which includes an audio CD, "in the hope that young people will recognize that they have a music heritage, that they will cherish their song tradition, and that they will build upon it to create songs for the youth of the twenty-first century" (page xvi).

One of the strengths of this book is its view of Cree music, past and present, as integral to the lives of the people who have created and used it. In the prologue, "The Cree Come to Campus", which is dedicated to her students, the author sets the stage with a series of observations from three decades of teaching music in northern teacher-education programs. These include the mixed results of attempting to teach western approaches to music, and music evaluation, to students with a very different relationship to music; the cooperative and quiet classroom atmosphere her Cree students created in the 1970s and 1980s; how they did tasks "when the time and feeling were right" and how wise educators learned to wait until all students had arrived before starting class; her assertion that "the Native personality has been a poor fit with an institution where performance is assessed largely by the ability to meet deadlines" (page xii); and how by the 1990s her students had become more

punctual, outspoken, and consciously proud of their heritage.

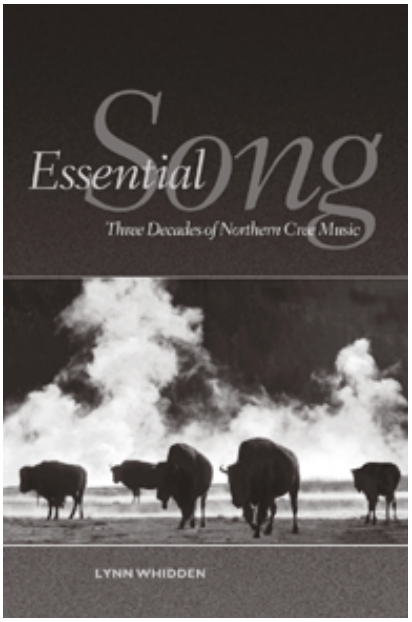
While hunting songs are at the core of this book, it also traces the Cree's adoption of other music as they encountered outside influences. Ethnographic and historical information – the list of sources and the bibliography are substantial – provide context. The author uses music notation and analysis only where necessary to explain changes in Cree music over time and to show how the Cree altered music they adopted from other traditions.

Most of the music discussed in the book and heard on the accompanying CD consists of hunting songs sung by six elderly men who lived in Chisasibi in the early 1980s. Short profiles and photographs hint at the personality behind each voice. Samson Lameboy, for example,

> *admired his mother, who lived to be a hundred and was very wise. (...) [He] had a profound knowledge of the hunting way of life. (...) His songs focused on the hunt. He began by saying that it was hard living off the land, so the people were always fit, mentally and physically. When the hunting was poor, the people starved. He joked that now "the store doesn't run away from you.* (page 11)

Cree used these songs for a variety of purposes: ceremonies, healing, hunting, physical and spiritual protection, and more. Their context is the subarctic bush, where each sound is significant, where hunters know how to use both sound and silence to advantage – and where, in spine-chilling stories from James Bay, evil announces its presence through sound: the night shattered by an indescribable scream, heavy footsteps approaching a *tipi* through the darkness, the sound of a coarse hand touching a canoe.

These songs can have multiple meanings, partly because the polysynthetic Cree language lends itself to word play. This, combined with the obscuring effect of language change over time and the highly individual nature of the songs means that many of the words are enigmatic, and most songs untranslatable. The singers, well aware of this, preface each song with a short explanation like this one:




> *This is a toboggan song, how it was used for travelling*
> *This was the only way we travelled a long time ago*
> *This song tells a story with pictures, you could almost see them*
> *I learned this song from my father and taught it to my elder sons*
> *When we were trapping in the fall*
> *We sing about each way of travelling – canoe or toboggan*
> (George Pepabano, page 57)

The author uses these introductions to discuss the meanings and significance of the songs, and also comments on song presentation, including rhythmic elements, form, melodic elements, the highly individual styles of the singers, and the Cree sound ideal – the distinctive Cree sound that colours their adaptations of other kinds of music.

Next the book traces the history of outside influence on Cree music: hymns, Scottish dance music, gospel, country, and finally powwow, including why and how Cree adopted music from these traditions. The section on hymn singing is preceded by a concise account of missionary activity among the Cree, and which elements of Christianity appealed to them. The author discusses the syllabic writing system, created in the 19th century from Pitman shorthand by the Methodist missionary and linguist James Evans, which revolutionized communication among the Cree and Inuit and enabled the quick spread of both Christianity and literacy among them. The adaptation of Cree syllabics to the Inuit language was made, not by the Inuit themselves as the book states (page 38), but rather by Anglican missionaries John Horden and E.A. Watkins.

Also mentioned is the Scottish dance music that the Cree heard from traders and learned to play on the fiddle. They changed the regular metre and phrasing of the Scottish originals by adding and subtracting beats (Inuit musicians have also done this), followed their hunting song tradition of unique individual versions and constant alterations, and generally introduced enough innovations that author considers the result a new genre of music. An example of Cree fiddling would have been a welcome addition to the CD, as the transcription of the reel "Soldier's Joy" (page 42) has a regular metre and is little different from versions played elsewhere. The chapter also describes an elegant Cree adaptation of the Scottish sword dance using scarves.

The Cree first heard country music on the radio in the 1930s thanks to powerful commercial radio transmitters in the southern US. Later, northern stations broadcast country music and messages to trappers in the bush from their families. The author discusses the reasons this music became popular with Cree as their society changed further, and the way popular performers like Ernest Monias of Cross Lake, Manitoba, as well as many lesser known local singers, have used it to express their own feelings, at

the same time striking chords in the hearts of their listeners.

Finally the book deals with the recent use by some northern Cree of powwow music, which originated in southern Plains culture and has no relation to Cree music. While the music and other aspects of the highly structured and competitive powwows are foreign to Cree ways and traditions, their affirmation of Indian identity and promotion of a healthy life free of addictions find strong appeal.

The first appendix lists hymns frequently sung in Chisasibi; the second lists the 86 songs the author recorded there in 1982 and 1984, with the singers' explanations and interpreters' comments. The accompanying 52-track CD includes 44 of these songs, as well as hymns, country songs, gospel songs, and powwow songs.

In this lucid and engaging work Lynn Whidden has created a valuable resource for young northern Cree who seek to strengthen their communities by building more elements from their own culture into their lives; and, for anyone with an interest in subarctic cultures, in the music of the Canadian north – or in Cree expression of the universal human need for song – *Essential Song* is essential reading.

*John Bennett is editor of* Meridian.

## NEW BOOKS

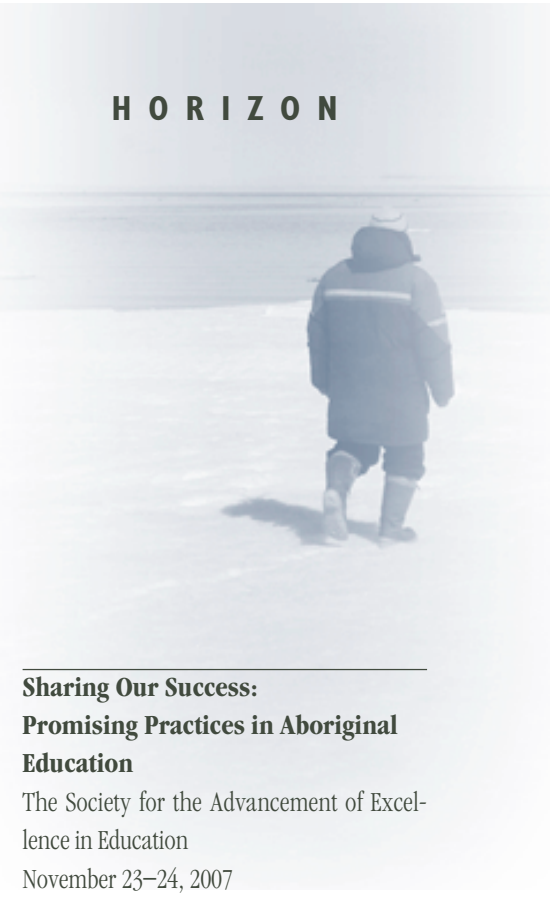
***Arctic Hell-Ship: The Voyage of HMS Enterprise 1850–1855,*** by William Barr. University of Alberta Press, 2007. ISBN: 0-88864-472-8.

In 1850, Richard Collinson captained the *HMS Enterprise* on a voyage to the Arctic via the Bering Strait in search of the missing Franklin expedition. Arctic Hell-Ship describes the daily progress of this little-known Arctic expedition, and examines the steadily worsening relations between Collinson and his officers. William Barr has based his research on a wide range of original archival documents, and the book is illustrated with a selection of vivid paintings by the ship's assistant surgeon, Edward Adams.

***Cold Comfort: My Love Affair with the Arctic,*** by Graham W. Rowley. Second Edition. McGill-Queen's University Press, 2007. ISBN: 9780773530058.

This new edition of *Cold Comfort,* a memoir of the British Canadian Arctic Expedition (1936–39), contains the beginnings of the author's planned sequel. It includes chapters on Operation Musk-Ox and the Canadian Defence Research Board, and an afterword by Susan Rowley and John Bennett on the author's involvement in the north.

## HORIZON



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