

Canada and the Antarctic

In 1988 Canada ratified the Antarctic Treaty as a non-consultative party. As a signatory to the Treaty, Canada agreed to ensure that “in the interest of all mankind Antarctica shall continue forever to be used exclusively for peaceful purposes and shall not become the scene or object of international discord”. In 1994 Canada became an associate member of the Scientific Committee for Antarctic Research (SCAR); and after presenting evidence of continuing interest in science in Antarctica through substantial research there and the formation of a National Committee to communicate with SCAR, became a full member in 1998. The Canadian Polar Commission (CPC) is Canada’s adhering body to SCAR; it maintains contact through its subsidiary, the Canadian Committee for Antarctic Research (CCAR).

The Antarctic Treaty

Scientific activities have been conducted in Antarctica since the early explorers crossed the 60°S parallel in the 18th century, and Canadians have been involved in Antarctic science for a hundred years. During the first half of the 20th century several countries made territorial claims to various parts of the continent. The International Geophysical Year (IGY) of 1957–58, which brought a great increase in scientific activity in Antarctica, presented an opportunity to avoid possible problems with conflicting claims and establish a means to facilitate continued international scientific collaboration. This led to development of the Antarctic Treaty. Signed in 1959 by representatives of twelve countries, the Treaty entered into force in 1961. Its main features include: prohibition of military activity; freedom and international cooperation in scientific research and exchange of information;

suspension of claims of territorial sovereignty; prohibition of nuclear explosions or disposal of radioactive waste. The Treaty, ratified by 45 countries as of July 2002, has established a system of governance for all areas south of 60 degrees south latitude, administered through Antarctic Treaty Consultative Meetings (ATCM), in which all parties to the Treaty are entitled to participate. There are two categories of membership in the ATCM: Consultative (voting) status is open to all parties that have demonstrated their commitment to the Antarctic and the objectives of the Treaty by conducting significant nationally supported research; and Non-consultative Parties, which support the objectives of the Treaty but do not qualify for Consultative status. Canada is a non-consultative party to the Treaty. Canadians and Canadian institutions collectively undertake significant research and business activities in Antarctica and in relation to the Treaty area; but the Canada does not have a national program. Nevertheless, Canada participates in the ATCM. Since 1961, Treaty parties have negotiated three international agreements and more than 200 resolutions and decisions dealing with governance and management of the southern one sixth of the planet. The international agreements are: the Convention for the Conservation of Antarctic Seals (CCAS), 1972; the Convention for the Conservation of Antarctic Marine Living Resources, (CCAMLR), 1980; and the Protocol on Environmental Protection to the Antarctic Treaty, (PEP), 1991. Collectively, the Treaty, the international agreements, the resolutions and decisions are known as the Antarctic Treaty System (ATS).

Convention for the Conservation of Antarctic Seals

Under this Convention, contracting Parties agree to establish a permit system regulating the harvesting of each of the different species of

Antarctic seals, and to report annually on all sealing activities south of 60 degrees south latitude, including the number taken, age, sex, etc. Canada adhered to the Convention in 1990, and as such the Canadian government is obliged to collect this information from the seal-fishing industry.

Convention on the Conservation of Antarctic Marine Living Resources

The Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) is concerned with conservation of all marine resources of the Southern Ocean, from krill to whales to seabirds. It has a permanent Secretariat, an executive body, the CCAMLR Commission, which has formed a Scientific Committee to ensure an adequate knowledge base, and a number of specialized activities such as the CEMP (CCAMLR Ecosystem Monitoring Programme). CCAMLR has some features different from other components of the Antarctic Treaty System. Its area of responsibility includes all waters south of the Antarctic Convergence which is the northern limit of the Antarctic marine ecosystem; it is open to adherence by countries that are not party to the Antarctic Treaty (Namibia and the European Community are examples), and it works cooperatively with the United Nations Food and Agriculture Organization in monitoring and regulating fisheries on the high seas. It can thus have influence and some control over activities of fishing vessels of any nation, whether a party to the Treaty or not. Canada adhered to the Convention in 1988, but has not joined the Commission. Canadian scientists and institutions have been involved in several of the scientific activities. CCAMLR is noteworthy for being the first international resource management agreement to be based on the concept of ecosystem functions and protection as distinct

from management of commercially valuable species. To carry out this principle successfully, it is necessary to have adequate scientific knowledge and continued research and monitoring. This principle is now the basis of Canada's Oceans Act. Current major issues being addressed by CCAMLR include: regular reporting of catches of krill, finfish, and sea mammals; illegal, unregulated and unreported fishing in the Convention area; development of an internationally recognized fisheries management plan for each main area of the Southern Ocean, and the development of an international Catch Documentation Scheme to control the marketing of fish; synoptic surveys of the biomass of the krill food base in key areas of the Southern Ocean; issues of seabird by-catch in longline fisheries (which are threatening the survival of some major species of birds); and issues of marine debris.

The Antarctic Convergence is the boundary between the cold surface waters that circulate around the Antarctic continent and the main water masses of the Pacific, Atlantic and Indian Oceans. It is a major biological boundary in the world ocean: its position is subject to seasonal and long-term changes, but for legal purposes, it is deemed to be an irregular line that follows meridians and parallels around Antarctica. It follows the 60°S latitude in a large section, but in others it is as far north as 45°S.

Protocol on Environmental Protection to the Antarctic Treaty

Although the text of the Antarctic Treaty, written in 1959, does not include the word environment, environmental protection has from the outset been a major concern of Treaty parties. In 1991 more than 30 countries, including Canada, signed the Protocol on Environmental

Protection to the Antarctic Treaty, and it entered into force in January 1998 after ratification by all consultative parties. Signatories to the Protocol agree on the need to protect the Antarctic environment and dependent and associated ecosystems, and have designated Antarctica as a natural reserve devoted to peace and science. Activities shall be planned and conducted so as to limit adverse impacts on the Antarctic environment. The Protocol sets out a number of guiding principles dealing with the conduct of activities in Antarctica, and AT parties that have ratified it pass domestic legislation to enforce its provisions. The Committee for Environmental Protection (CEP), which reports directly to the ATCM, oversees implementation of the Protocol. It provides advice and recommendations to the parties, and monitors the environmental effects of the implementation, including environmental assessment activities and the management of protected areas. Canada ratified the Protocol in 2003, and is therefore entitled to CEP membership.

Scientific Committee on Antarctic Research (SCAR)

The Scientific Committee on Antarctic Research (SCAR) is a committee of the non-governmental International Council for Science (ICSU). Originally formed to plan and coordinate the Antarctic science programs for the IGY (1957–58), it was restructured in 1958, and thus predates the Antarctic Treaty. The purpose of SCAR is to initiate, promote and coordinate scientific research in Antarctica. SCAR is an interdisciplinary organization that can draw on expertise of an international mix of specialists from many scientific disciplines. It is a key forum for coordination, information exchange, and planning the scientific aspects of major Antarctic research programs. Upon request, SCAR also provides international, independent scientific advice to the

Antarctic Treaty System. Canada joined SCAR as an associate member in 1994 and became a full member in 1998. SCAR operates through a series of Standing Scientific Groups dealing with the life sciences, physical sciences, and geosciences. The current flagship research programs include: Antarctic Climate Evolution; Evolution and Biodiversity in the Antarctic; Interhemispheric Conjugacy Effects in Solar-Terrestrial and Aeronomy Research (ICESTAR); and Subglacial Antarctic Lake Environments (SALE). When SCAR was formed, Antarctic research operated mainly through national programs based at stations built and run by the respective countries. International coordination of observing programs ensured effective synoptic coverage, but exchanges of personnel were rare and multinational programs were few. Now, by contrast, international exchanges have become the norm and there are many multinational multi-disciplinary and globally connected projects. As an example, the first station built as a multinational rather than national facility is under construction at Concordia Dome by France and Italy. The distinctions between national and international programs have blurred; nevertheless, because funding for research must come from national budgets, the concept of "national programs" remains important within SCAR. Originally SCAR was mainly a regional scientific coordinating mechanism, but with the advent of remote sensing, telecommunications, and the increasingly common perception of the world as a global ecosystem, other world wide scientific programs – in meteorology and oceanography, for example – have become increasingly interested in Antarctica. As a result, SCAR is involved in some global science programs that include both polar regions, notably the International Geosphere-Biosphere Program (IGBP) and the World Climate Research Program (WCRP). Political developments in Europe also manifest themselves in

Antarctica. The European Science Foundation, for instance, sponsors the European Polar Ice Coring Antarctica Program (EPICA). SCAR is currently reviewing its operations to ensure it remains effective in initiating and coordinating Antarctic research and in advising the intergovernmental Antarctic Treaty system on scientific issues.

Council of Managers of National Antarctic Programs (COMNAP)

COMNAP, formed in 1988, is an independent body federated with SCAR and ATS that coordinates and ensures the efficiency of logistics and operational support systems. It plays a key role in developing flight information systems for Antarctica, safeguards to limit environmental impacts, new and improved technologies for polar operations, an Antarctic Shipping Code, and in several other areas including emergency response, telecommunications protocols and personnel selection. COMNAP, sometimes in cooperation with SCAR, provides important expert technical advice to the Antarctic Treaty Meetings, and thus contributes to effective governance of Antarctica. Canada became a full member of COMNAP in 1998, with the Polar Continental Shelf Project of Natural Resources Canada as the adhering body. Canada withdrew from COMNAP in 2005.

Antarctic Science

The Antarctic Treaty requires that adhering parties demonstrate a continuing interest in conducting scientific research in the region; the Environmental Protocol identifies Antarctica as a region of 'peace and science'; SCAR's mandate is to promote and coordinate scientific activities, and finally, COMNAP's role is to ensure effective, efficient and environmentally responsible logistical support for scientific programs in Antarctica. During the International Geophysical Year

(1957–58), 12 nations operated a record 55 scientific stations within the Treaty area. Since then, the number of stations has declined, but the number of countries involved has increased, and during the austral winter of 2001, 18 countries operated 34 over wintering stations (Argentina had 6, Australia 3 and the USA had 3, including the South Pole Station). Some 200 scientists and support staff spend the winter at these sites. During the summer period when access is easier, the level of activity increases and several summer-only field stations and research vessels are activated, and it is estimated that close to 4,000 scientists and support staff work onshore and offshore in the treaty area during a typical summer season. The number of field stations is an indicator of the level of activity in Antarctica and in surrounding waters, but they do not reflect the whole story. With recent advances in satellite and communications technology, an increasing tendency to share field data and samples among scientific groups around the world, and the increasing extent to which study of the Antarctic is a part of global research, it is now possible to conduct some forms of Antarctic research from almost anywhere. Significant investments are required to sustain these activities. The US National Science Foundation's Antarctic budget is in the order of US\$ 225 million/year, and in addition other US agencies spend an estimated \$15 million/year. Other countries also invest significant amounts in Antarctic research each year. For example, Italy (which does not operate a winter base) spends some US\$ 50 million/year, Finland US\$ 1.2 million/year, Korea US\$ 5.5 million/year and the Netherlands US\$ 1.2 million/year. The scientific activities cover a wide range of disciplines within the physical, biological and social sciences. Examples of multinational Antarctic research relevant to the rest of the world include: work on ozone depletion in the upper atmosphere, first

discovered in Antarctica and now causing concern in all high latitude regions; meteorological and ocean circulation studies, important in understanding global circulation systems and their links to global climate change; studies of ice sheet ice cores, which yield important data on past climatic conditions; investigations of the ice sheet volume changes that affect global sea level; and geological and geophysical studies that improve our understanding of global geological processes. Biological studies range from investigations of the adaptation of bacteria and viruses to extreme conditions, to the population dynamics of economically important large marine mammals that help in establishing sustainable harvest limits and maintain a healthy oceanic ecosystem. Antarctic evolutionary biology is of particular interest in view of the continent's isolation from other land masses. Studies of life forms in very cold environments contribute to our understanding of evolution and of mechanisms that prevent freezing. Recent discoveries of bacteria that suggest life may exist in subglacial lakes beneath the ice sheet have attracted much attention, and further studies are planned. Research in human biology and medicine explores human low-temperature physiology, changes in circadian rhythms under conditions of prolonged natural light and darkness, nutrition and metabolic processes, viral infection in small isolated groups, and the common dysfunctions of Antarctic winter groups. Because of the extreme and isolated nature of Antarctic living, it is important to investigate how the living and working environments can be structured to minimize stress and maximize comfort and efficiency; to study the course of human adaptation at the individual and group levels; and then to apply the results to improve personnel selection and training, stress prophylaxis and intervention, and re-entry to the home environment at the end of deployment. Some aspects of the natural

environment of Antarctica are regarded as analogous to planetary environments (*e.g.*, on Mars). For this reason, space agencies view, support, and conduct studies in Antarctica as a prelude to planetary exploration. The Polar Regions offer excellent opportunities for ionospheric studies that, in view of man's quest for space, help us understand and predict the important 'space weather'. The high latitude, and high altitude of Antarctica offer a unique 'porthole' for astronomical and astrophysical studies. Antarctic science is very relevant to Canada because high-latitude science in both hemispheres deals with similar ecosystems, weather dynamics, seasonal variations on land, in the sea and in the atmosphere, and with operations in remote localities. The astrophysical and geomagnetic aspects of the high latitude geospace are linked, and to understand them and to make predictions, research in both polar regions is essential. There is also a growing realization of the need for a global perspective on issues such as ocean and atmospheric circulation patterns. Canada therefore has much to gain from participating in Antarctic science, as it will give our scientists new insights about our own arctic regions. The expertise and experience that Canadian scientists and researchers bring from our North will in turn help advance Antarctic science, to the benefit of all humanity.

Scientific Activities

Canadian scientists have contributed to Antarctic research over many years in fields including human psychology, marine and fresh water biology, microbial ecology of extremophiles, geology, geomorphology, stratospheric studies, and remote sensing studies of glacial rebound. Canadian scientists have typically worked as part of the national programs of other countries, and over the last few years Canadian

scientists have cooperated with more than a dozen countries in this way. These foreign Antarctic programs continue to provide generous field support to Canadian scientists, and have contributed significantly to the development of Canadian competence in Antarctic science. The fact that so many Canadian scientists have been invited to participate in national Antarctic programs shows that Canadian expertise is valued within the Antarctic science community. Since participation by Canadians in Antarctic research activities has mainly been on an individual basis, expertise is scattered among many universities and government institutes across the country. This situation provides for a wide diversity of interest and perspectives, which should be preserved, but it lacks the stability and the capacity for long-term planning required for an institutional commitment to Antarctic science. There was no such commitment at all until an Act of Parliament in 1991 established the Canadian Polar Commission with a bipolar, as distinct from Arctic, mandate. This was a major step forward, but the CPC remains an advisory body and has no funds to support Antarctic research activities. When Canada became a party to the Antarctic Treaty, the Government did not provide for financial support for a national scientific effort in Antarctica. The CPC, on behalf of Canada became an associate member of SCAR in 1994 and a full member in 1998. As a condition of full membership the Canadian Committee for Antarctic Research (CCAR) was established in 1998, under the sponsorship of CPC to which it reports. Primary responsibilities of the CCAR include: providing information and advice to CPC on Antarctic and bipolar scientific matters; coordinating and reporting on Canadian activities in SCAR working groups; fostering and facilitating cooperation among Canadian scientists working in Antarctica; and serving as a communications link between the Canadian and

international Antarctic science communities, and with other Canadian scientists. In line with Canada's role as an AT party and its full membership in SCAR, CCAR has taken a leadership role in developing a more assertive Canadian role in Antarctic science. The "opportunistic" ways through which Canadian scientists have been involved until now have meant, with few exceptions, that individual Canadian scientists, in concert with scientists from countries with national Antarctic programs, become part of scientific projects whose importance and priorities are recognized, accepted, funded and decided by other countries. Increasingly, Canadians now seek to participate in defining the scientific issues and in developing new projects, especially with regard to projects of bipolar nature that are of special interest to Canada. To achieve this requires support for a more proactive Canadian approach to Antarctic science. Leading Canadian scientists, with the backing of appropriate Canadian institutions, and adequate financial support, should participate in defining the scientific issues and planning activities in Antarctica that are important to Canada and to which Canadian scientists can contribute. Some recent science support programs can help in this respect. But it is not sufficient just to be involved in the planning phase: Canadians must be able to influence the research plan, and to participate in the research itself. This requires human and financial resources – which must come from Canadian sources. A communication and coordination structure is needed to unite Canadian activities in a national Canadian Antarctic Research Program (CARP). There is no current source of funds for this; although the CPC provides support for CCAR activities and related coordination, publication and publicity, people with other principle responsibilities furnish the substantive and scientific input into CCAR and coordinate Canadian Antarctic activities, on a voluntary or ad hoc

basis. The Canadian Arctic/Antarctic Exchange Program (CAAEP) was established in 1996 to encourage Canadian participation in Antarctic research. The program provides preferred access to logistical support for foreign scientists wishing to study in Arctic Canada, in return for access to Antarctic facilities for Canadian scientists. Operated by the Polar Continental Shelf Project (PCSP) in consultation with CCAR, the program has received some financial support from DFAIT, and typically supports 3–4 scientists each year.

Commercial Activities

Several Canadian companies are active in Antarctica. Most prominent are the tour operators and the air charter companies. From the mid 1980's Canadian tour operators have played a key role in developing ship-borne tourism and in establishing private sector tourist facilities for mountain climbing, trekking, and other activities in the interior of the continent. Canadian air charter companies with extensive experience in arctic conditions continue a long tradition of providing air services, usually by Twin Otter, to the national Antarctic programs of several countries. In addition, several companies supply goods and services such as: housing and buildings, snow vehicles, coldweather gear, airport construction, and RADARSAT imagery. There are no firm figures on the value of Canada's Antarctic-related trade – but Canada is widely considered to be the only country that makes a net commercial profit from Antarctic operations. According to the Environmental Protocol the Government of Canada must ensure that the activities of tour companies based in this country remain consistent with the Protocol.

Activities within ATCM

Because Canada is a non-consultative member the representatives of one of the largest polar countries in the world cannot participate fully in ATCM activities. The other ATS parties express concern about Canada's status within the ATCM. Canada is a very active participant in environmental programs under the auspices of the Arctic Council and has developed considerable expertise in polar environmental affairs. Among the eight Arctic countries, all but Iceland are parties to the Antarctic Treaty, and except for Denmark and Canada all are consultative members. Canada has not played a significant role in similar Antarctic issues where its expertise and experiences could contribute significantly to the protection of the Antarctic environment in the common interest of humanity. A similar situation exists in regard to Antarctic marine living resources. Canada is not a member of the CCAMLR Commission, in spite of the Canada's role in some international fisheries issues, *e.g.*, in the UN debate on international fish stocks, and the ecosystem approach to resource management that underlies both the Canada Oceans Act and the CCAMLR. Canadian membership in the Commission would lend political as well as technical support to CCAMLR.