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NEWSLETTER FOR THE

Canadian Antarctic Research Network

Inside

Soils Research in the Antarctic Dry Valleys

E.G. Gregorich

For three field seasons (2003, 2005, 2006), I was part of an Antarctic New Zealand research team conducting soil studies in the Antarctic Dry Valleys. So why would an agricultural scientist decide to work in the Antarctic? The case might be argued using William Lashley's words when he first visited the Taylor Valley in Antarctica in 1902: "What a splendid place for growing spuds!" However, the true reason is that Agriculture and Agri-Food Canada (AAFC) has the largest representation of soils expertise in any federal science department, conducting soil surveys, ecosystem research, and studies on nutrient and water cycling in ecosystems across Canada. Although this research concentrates on agroecosystems, it also looks at soils in forest systems both inside and outside the agricultural zone, as well as in the Canadian Arctic. Such expertise is of great value to international partners investigating similar environments.

Our Antarctic research team comprised experts from New Zealand, Scotland, Denmark, Canada, and the United States (Fig. 1). Our goal in bringing this broad-based team together was to characterize the soil ecosystem function in the Dry Valleys, including the quantity and distribution of organic matter.

What is an Antarctic dry valley? The Dry Valleys are an area of about 5000 km^2 located west of Ross Island (Fig. 2). They are bounded on the western side by the Transantarctic Mountains and to the east by the Ross Sea and Ross Ice Shelf. The U.S. National Science Foundation has a long-term ecological research (LTER) site located in the Taylor Valley, where it has been supporting research for more than 13 years.

The Dry Valleys are dry for two main reasons. First, the Transantarctic Mountains block the polar ice sheet from moving down to the coast. Second, because the ice sheet at the poles is high in elevation, the air from the pole drops as it moves across the continent, producing strong katabatic winds that

Figure 1
Personnel on 2003 field trip (L to R): Phil Dadson (New Zealand), David Hopkins (Scotland), Ashley Sparrow (Nevada, U.S.A.), Bo Elberling (Denmark), Ed Gregorich (Canada), Phil Novis (New Zealand). Not shown, Laurie Greenfield (New Zealand).

scour the Dry Valleys. These cold, dry winds evaporate more water in the Dry Valleys than is replenished by precipitation. The resulting arid conditions are exacerbated by low precipitation relative to sublimation and low surface albedo.

These valleys represent the extreme member of cold, arid terrestrial ecosystems on this planet. They are polar deserts that are extremely sensitive to small variations in solar radiation and temperature. The Antarctic ice sheets on the polar plateau respond to climate change on the order of thousands of years, but the glaciers, streams, and lakes in the Dry Valleys respond to changes in temperature very

Figure 2
Ross Island and McMurdo Dry Valleys in southern Victoria Land (after Waterhouse, 2001, p. 2.5).

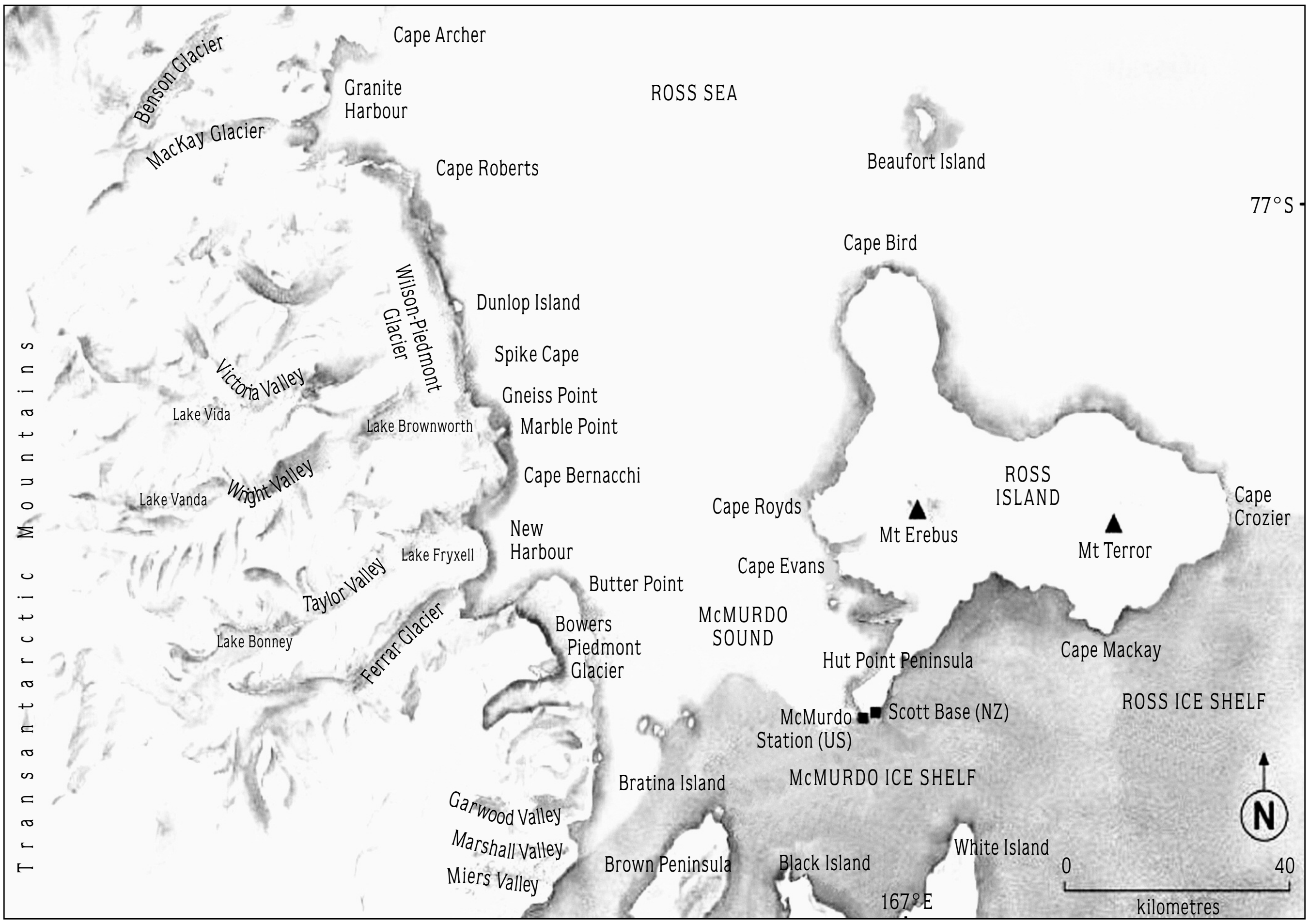


Figure 3

During the austral summer, meltwater runs off the glaciers, down through the valley floor, and out towards the Ross Sea, forming ponds and lakes in the flat areas. The darker area around the lake shore is a mat of *Nostoc commune* (a cyanobacterium), which is a conspicuous terrestrial primary producer here in the Garwood Valley.

quickly. Therefore, the Dry Valleys are particularly useful in the study of climate change.

Unlike most other ecosystems, that of the Dry Valleys is dominated by micro-organisms, mosses, lichens, and relatively few groups of invertebrates. Higher forms of terrestrial life are virtually non-existent. Soils in the Dry Valleys have low biodiversity and small biomass. The soil invertebrate population includes nematodes, tardigrades, and rotifiers, though in much smaller numbers than in temperate soils.

What is the origin of the nutrient resources needed to support this food web? Four distinct sources have been proposed:

1) Modern *in-situ* terrestrial autotrophs. A wide range of autotrophs are found in the Dry Valleys, including hypolithic algae, endolithic organisms, and mosses.
2) Spatial subsidies of organic matter from beyond the valleys. Sometimes seals and penguins wander into the Dry Valleys from the sea coast and die there.

3) Spatial subsidies from aquatic environments within the valleys. Lakes and streams, produced by the melting of snow and glaciers in the summer, are important features in many of the Dry Valleys. Algae and cyanobacteria grow in these waters during the summer (Fig. 3).
4) Organic matter deposited in ancient lakes, known as "legacy" organic matter.

Dry Valley soils are shallow and have little structure and low amounts of available water, so both productivity and soil organic matter levels are low. As a consequence, the soil carbon cycle is relatively simple. This feature makes these soils a good model for studying the carbon cycle, particularly the effects of temperature change on soil biological activity.

We conducted our research in the Garwood Valley, a relatively small dry valley (7 km^2), 80 km east of Ross Island. The main water bodies here are streams and a small lake. We sampled at different locations throughout the valley and identified eight different landforms, each with its own unique soil type. We measured a number of soil properties related to biological activity, including water content, organic carbon, nitrogen, and *in-situ* respiration. These properties varied in magnitude by as much as two-and-a-half times across all eight landforms.

We found that soil carbon levels and micro-biological activity were strongly related to soil water content. For example, a strong relationship existed between soil respiration (CO_2 flux) and distance from the lake shore. The large variation in soil properties tells us that the Dry Valleys are spatially heterogeneous. Thus, spatially explicit models are needed to describe biogeochemical cycling in these ecosystems.

If the legacy hypothesis of organic source materials holds true, then the turnover of carbon should be relatively slow. A crude way to estimate turnover time is to divide the total organic carbon pools by total soil respiration throughout the season. To make this calculation, we acquired some long-term soil temperature data sets from the LTER site in the Taylor Valley. We also made basal soil respiration measurements in the laboratory on soils collected from all eight landforms. The response of soil respiration to changes in soil temperature was measured on these samples at temperatures between −1 ° and 12 °C. Together, these data allowed us to calculate the seasonal total soil respiration. These estimates, in combination with soil organic carbon measurements, were then used to calculate soil organic carbon turnover time for each landform. Turnover estimates were all short, ranging up to about 120 years. Much longer times, on the scale of hundreds of years, would have been predicted under the legacy model.

The implications of these fast turnover times obtained with our measurements are twofold: either legacy carbon deposits are about to be exhausted, or legacy carbon is so stable or protected that it contributes little to carbon cycling today in Dry Valley soils. If the latter is true, then carbon cycling today must be sustained largely by modern sources of organic matter.

Our soil respiration measurements told us that soils adjacent to lakes and streams are the biological "hotspots" in the Dry Valleys. This being the case, we measured the fluxes of other biogenic gases besides CO_2, including N_2O and CH_4 (Fig. 4a and b), so we could obtain a snapshot of aerobic and anaerobic carbon and nitrogen processes in these soils. The *in-situ* CO_2 flux measurements confirmed that soil respiration was higher along the lake margin than anywhere else in the valley. The N_2O fluxes were relatively low compared to those in temperate ecosystems, but the fact that N_2O was detected consistently during the summer months suggests that the nitrogen cycle was functioning (*i.e.*, nitrification and denitrification processes were taking place). The CH_4 fluxes were astonishingly high, similar to what would be measured in a bog in Canada in the summer. That all three gases were collected from single cores suggests the presence of aerobic and anaerobic microenvironments within a fairly small volume of soil.

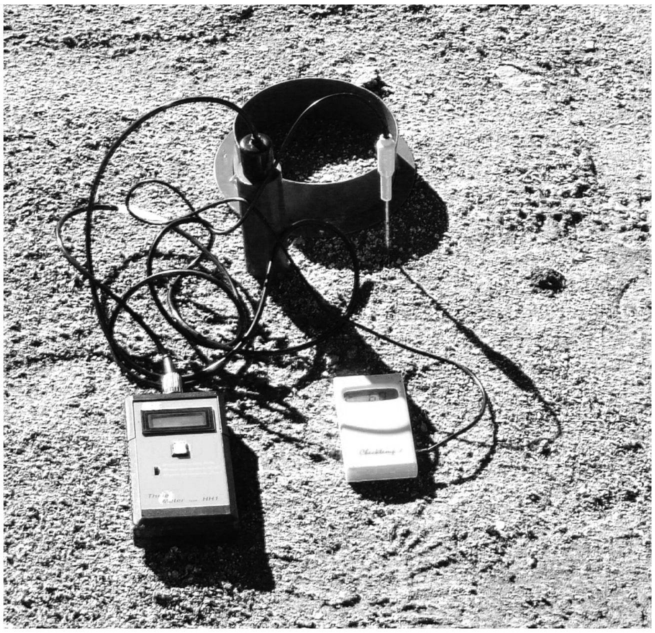
We also conducted an *in-situ* substrate-addition experiment to assess carbon and nitrogen limitations to biological

4a

Figure 4a
In-situ measurement of soil respiration conducted using a LiCor 6200 gas analyzer.

Figure 4b
Surface fluxes of biogenic gases fluxes were made by collecting gases from collars inserted 10 cm into the soil. Soil temperature and water contents were measured at the time of sample collection. Samples were collected in evacuated vials and subsequent analyses were performed in the laboratory on a gas chromatograph.

4b



activity in the soil. Glucose (carbon only), ammonium chloride (nitrogen only), glycine (carbon and nitrogen), and local lake-derived algal material were added to soil at low and high rates. Soil respiration was measured immediately after substrate addition and for several days, and again during the 2005 and 2006 field seasons. There was a significant response to the addition of nitrogen immediately after application, with this response persisting throughout subsequent field seasons. Significant responses were measured for the other substrates as well, but these appeared later.

We concluded that the soil biological system in Garwood Valley is carbon-limited, as in most other soils in the world. However, unlike most other soils, this biological system is also nitrogen-limited. The addition of local algal material produced a greater biological response than the addition of the chemical compounds, suggesting that the system has adapted to its local nutrient source.

Putting all our experimental results together, we were able to construct a subsidy model that describes the redistribution of organic matter from Dry Valley lakes and streams to local soils. Transfer of only a small amount of the organic material held in these water bodies to the soils is enough to account for the soil respiration rates we measured. The cycle is such that photosynthesis peaks during the warmer Antarctic summer, followed by freeze-drying of the organic materials as temperatures cool and water levels subside. Then the wind lifts the dried material and redistributes it throughout the valleys. Soil respiration measurements revealed a distinct gradient, with soil organic matter levels diminishing with greater distance from the water bodies. Results published to date include papers by Elberling and others (2006), Gregorich and others (2006), Hopkins and others (2005, 2006a, b, 2008), and Novis and others (2007).

The movement of organic material from the water to the surrounding landscape is important for two reasons. First, the nitrogen transported supports terrestrial photosynthesis. Second, the transfer of carbon supports soil heterotrophic activity. On the whole, this transfer represents a critical trophic link between the main site of primary production and the otherwise poorly resourced soils, whose biological activity is dominated by heterotrophs. What makes this pathway unique is that nutrient materials move "uphill" from water to land, unlike in temperate systems in which they typically move "downhill" from land to water.

References

Elberling, B., E.G. Gregorich, D.W. Hopkins, A.D. Sparrow, P. Novis and L.G. Greenfield, 2006. Distribution and dynamics of soil organic matter in an Antarctic dry valley. *Soil Biol. Biochem.,* **38**(10), October, 3095–3106.

Gregorich, E.G., D.W. Hopkins, B. Elberling, A.D. Sparrow, P. Novis, L.G. Greenfield and P. Rochette, 2006. Emission of CO_2, CH_4 and N_2O from lakeshore soils in an Antarctic dry valley. *Soil Biol. Biochem.,* **38**(10), October, 3120–3129.

Hopkins, D.W., B. Elberling, L.G. Greenfield, E.G. Gregorich, P. Novis, A.G. O'Donnell and A.D. Sparrow, 2005. Chapter 4, Soil micro-organisms in Antarctic dry valleys: resource supply and utilization. *In* Gadd, G.M., K.T Semple and H.M. Lappin-Scott, *eds. Micro-organisms and Earth systems: advances in geomicrobiology.* Cambridge, etc., Cambridge University Press, 71–84. (SGM Symposium 65.)

Hopkins, D.W., A.D. Sparrow, B. Elberling, E.G. Gregorich, P.M. Novis, L.G. Greenfield and E.L. Tilston, 2006a. Carbon, nitrogen and temperature controls on microbial activity in soils from an Antarctic dry valley. *Soil Biol. Biochem.,* **38**(10), October, 3130–3140.

Hopkins, D.W., A.D. Sparrow, P.M. Novis, E.G. Gregorich, B. Elberling and L.G. Greenfield, 2006b. Controls on the distribution of productivity and organic resources in Antarctic Dry Valley soils. *Proc. R. Soc.* [London]: *Biol. Sci.,* **273**(1602), 7 November, 2687–2695.

Hopkins, D.W., A.D. Sparrow, E.G. Gregorich, P. Novis, B. Elberling and L.G. Greenfield, 2008. Redistributed lacustrine detritus as a spatial subsidy of biological resources for soils in an Antarctic dry valley. *Geoderma,* **144**(1–2), 15 March, 86–92.

Novis, P.M., D. Whitehead, E.G. Gregorich, J.E. Hunt, A.D. Sparrow, D.W. Hopkins, B. Elberling and L.G. Greenfield, 2007. Annual carbon fixation in terrestrial populations of *Nostoc commune* (Cyanobacteria) from an Antarctic dry valley is driven by temperature regime. *Global Change Biol.,* **13**(6), June, 1224–1237.

Waterhouse, E. J., *ed.,* 2001. *Ross Sea region 2001: a state of the environment report for the Ross Sea region of Antarctica.* Christchurch, N.Z., New Zealand Antarctic Institute, 274 pp.

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Antarctic Sea Ice – the Odd Down South

Christian Haas

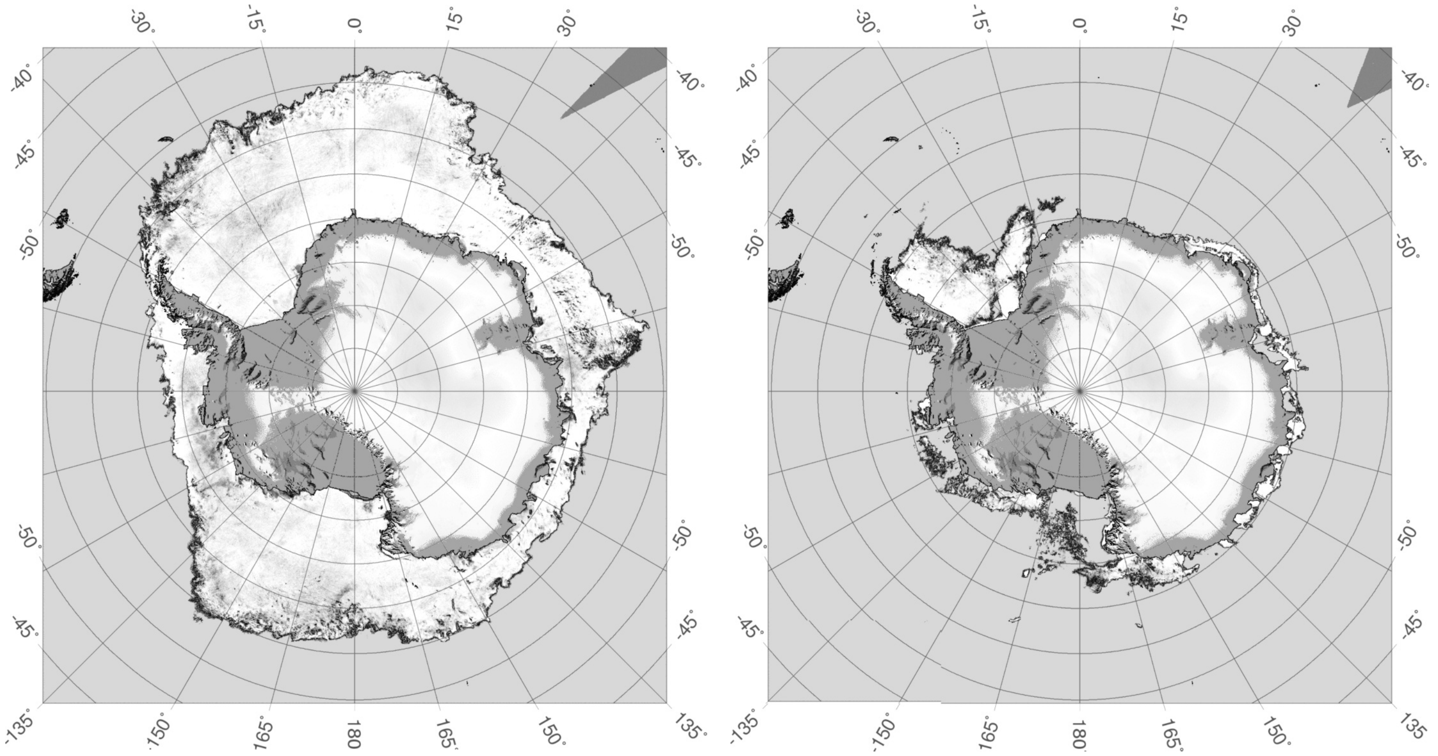
The rapid shrinkage of Arctic sea ice is viewed as one of the most dramatic and most well-documented consequences of present climate change. The disappearance of sea ice during summer will have fundamental consequences for the environment and economy of the Arctic. It will also affect weather and climate in lower latitudes, and possibly worldwide through various feedback processes. Observing and modelling programs are in place to understand and predict these changes in the Arctic; including recent efforts at the University of Alberta. The difficulty of understanding and predicting changing Arctic sea-ice cover, in light of global air-temperature increases, becomes obvious when comparing sea-ice trends in the Southern Ocean around Antarctica. The public discussion often ignores the fact that Antarctic sea ice is increasing, both in winter and summer (Fig. 1), while air temperatures are decreasing over most parts of the continent (Thompson and Solomon, 2002). Thus a thorough understanding of the fundamentally different climate systems of the Arctic and Antarctic is required.

Here, I summarize some investigations to better understand the nature and role of Antarctic sea ice, performed with the RV *Polarstern* while I was still with the Alfred Wegener Institute for Polar and Marine Research in Bremerhaven, Germany. Continuing this research at the University of Alberta provides opportunities and challenges for Canada to intensify research in and around Antarctica, and to become an equal partner in the international Antarctic research community.

Snow and biology

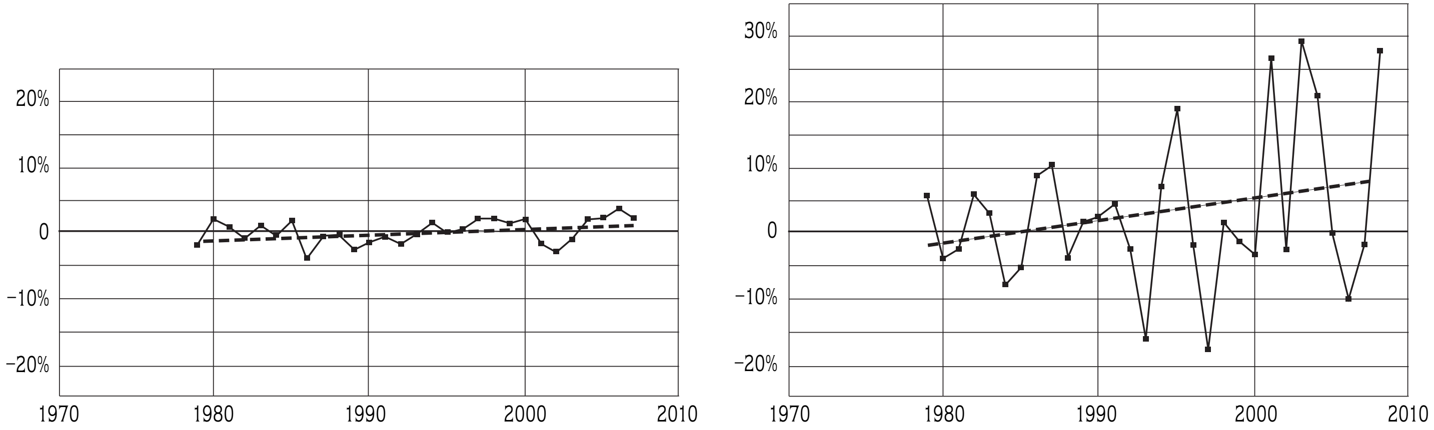
In contrast to the Arctic, and despite its comparatively low-latitudinal extent, the surface of perennial Antarctic sea ice does not melt strongly during summer (Nicolaus and others, 2006); hence melt ponds typically do not occur at the surface. However, ice and snow do warm during the summer and the snow is frequently at the melting temperature, leading to internal melt and the percolation and refreezing of meltwater; resulting in highly metamorphic snow and the widespread occurrence of superimposed ice (Haas and others, 2001). Due to the presence of superimposed ice, the absence of large amounts of liquid water within the snow, and the high degree of snow metamorphosis and iciness, radar backscatter increases during summer (*e.g.,* Haas, 2001; Willmes and others, 2006); in stark contrast to Arctic sea ice, where it typically drops sharply at the onset of summer melt due to the many melt ponds (Fig. 2). The different microwave properties of Antarctic and Arctic sea ice are not fully understood, but have to be considered in satellite retrieval algorithms, *e.g.,* for ice concentration, drift, or snow thickness.

Another widespread Antarctic sea-ice phenomenon is the flooding of the snow/ice interface. This results from the weight of a relatively thick snow cover depressing the floating ice sheet below the water level. The resulting slush is often inhabited by large amounts of algae. More significantly, a well-defined porous gap layer often develops during summer, due to the general warming of the upper ice, and the layered structure resulting from flood–freeze cycles and



a) September 15, 2007

b) February 15, 2008



c) Southern hemisphere extent anomalies, September 2007

d) Southern hemisphere extent anomalies, February 2008

1979–2000 mean = 18.7 million km^2
Slope = 0.8 (+/−0.8)% per decade

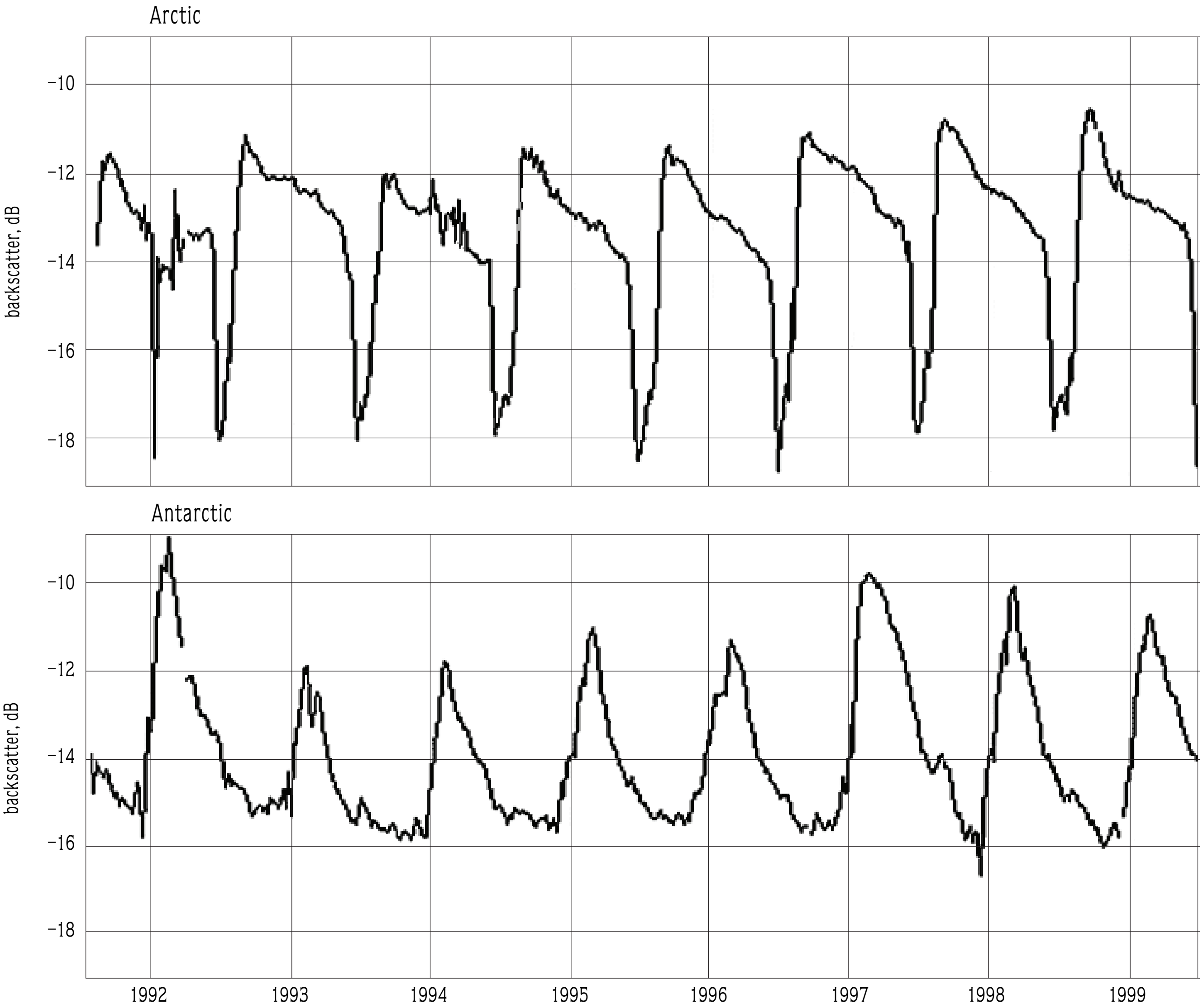
1979–2000 mean = 2.9 million km^2
Slope = 3.4 (+/−5.0)% per decade

Figure 1
Seasonal variation of maximum (a: September 2007) and minimum (b: February 2008) Southern Ocean sea-ice concentration, and time series of September and February 1979–2008 ice extent anomalies. Maps and data courtesy of G. Spreen and L. Kaleschke, University of Hamburg (http://www.seaice.de), and F. Fetterer and K. Knowles, National Snow and Ice Data Center, Boulder, Colorado (http://nsidc.org).

superimposed ice formation. These warm layers receive more solar radiation than the ice close to the bottom and provide shelter from predators, therefore creating an ideal habitat for a rich biological community. Chlorophyll a concentrations of >400 μg/L have often been observed (Thomas and others, 1998). When released into the water by further melt, this biomass nourishes abundant populations of krill, penguins, seals and whales on, under, and close to the sea-ice regions (Fig. 3). During the Ice Station Polarstern (ISPOL) project in late 2004, the RV *Polarstern* was anchored to an ice floe for five weeks to support observations of physical–biological processes during the onset of summer in the western Weddell Sea (Hellmer and others, 2006).

The role of snow in the sea-ice mass balance, with respect to flood–freeze cycling and superimposed ice formation, might be one of the reasons for the different behaviour of Antarctic sea ice under present climate conditions. These

Figure 2
Contrasting time series of radar backscatter of perennial Arctic and Antarctic sea ice obtained from the ERS-1 and 2 satellites (Haas, 2001).



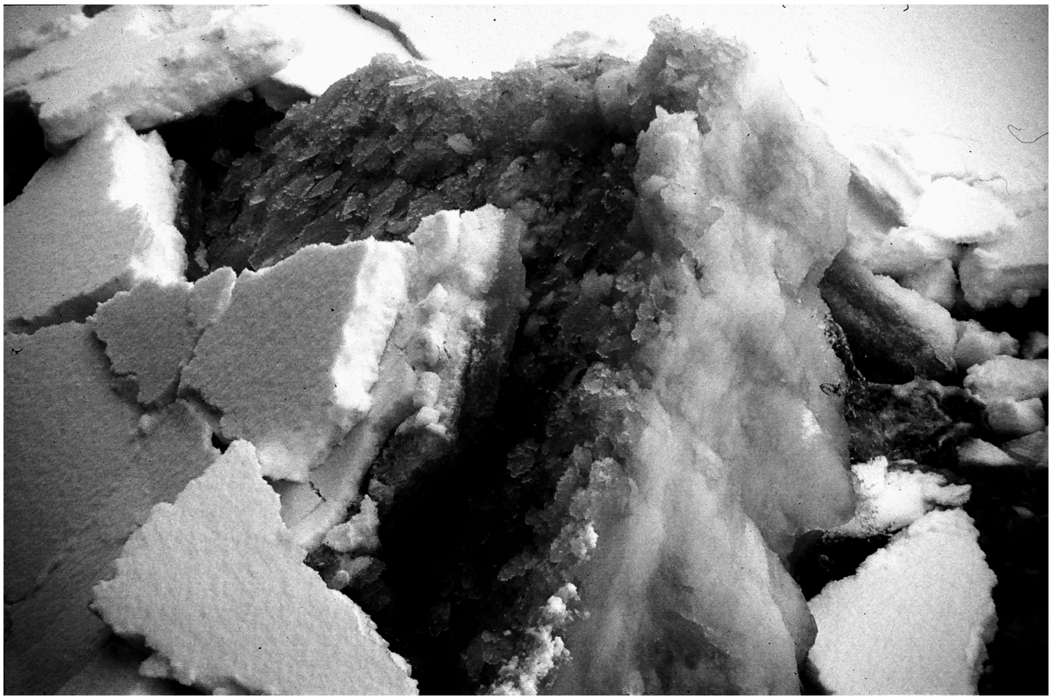


Figure 3
Tilted floe broken by an ice-breaker, showing the layered structure of Antarctic sea ice in summer. Discolorations of the porous gap layer are a result of high algal standing stocks.

processes might become important for Arctic sea ice as well, should snow accumulation increase and the Arctic Ocean become predominantly covered by seasonal sea ice.

Sea-ice mass balance and the Antarctic Peninsula

The thickness of Antarctic sea ice and its changes are still largely unknown. There are only few data from drilling and moored ice-profiling sonars. In 2004 and 2006, we performed extensive helicopter-borne electromagnetic-inductive (EM) ice-thickness surveys in the western Weddell Sea. These not only revealed very thick second-year ice with modal and mean total thickness >2 and 3 m, respectively, but provided important information for validating satellite radar imagery (Haas and others, 2008). The close proximity of different regimes of first- and second-year ice and their origin could be demonstrated by this combination of *in-situ* and satellite data.

The Larsen Ice Shelves, along the eastern Antarctic Peninsula, have experienced dramatic collapse in recent years. Since their disintegration, large amounts of new ice are formed in, and exported from, polynyas in the resulting bays (Fig. 4). It is likely that this extensive new ice formation will affect the characteristics and circulation of Weddell Sea Bottom Water, one of the major components of the global meridional overturning circulation. During *Polarstern*'s Winter Weddell Outflow Study (WWOS) in September and October 2006, we mapped the thickness of this new ice and derived the exported ice volume. Figure 5 shows that most of the first-year ice was rather thick with modal thicknesses of 1.2 m. Adjacent to the polynya there was a narrow band of younger, 0.5 m thick, ice.

At present, we are analyzing our *in-situ*, satellite, and hydrographic data to derive salt fluxes and assess the importance of the region for Weddell Sea ocean and ice circulation since the break-up of the Larsen A and B ice shelves. The *in-situ* data are very important for interpreting satellite radar imagery, used to study the long-term variability of ice dynamics in the western Weddell Sea. For this research, ice-drift observations by buoys deployed by international partners of the SCAR/WCRP International Programme for Antarctic Buoys (IPAB) will be included. The University of

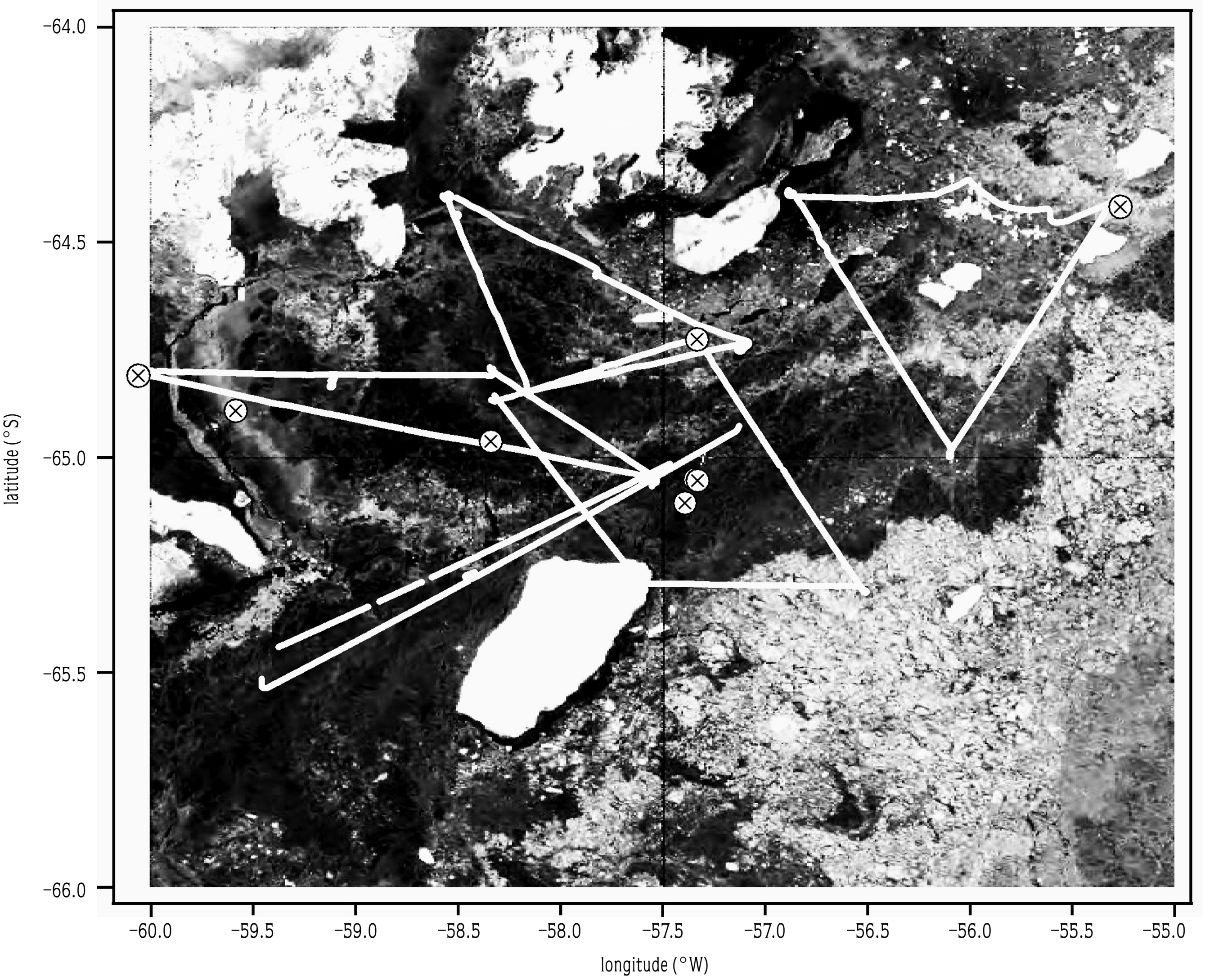


Figure 4
Envisat-SAR image of the Larsen A region on October 5, 2006. Straight lines denote helicopter EM ice-thickness profiles, and symbols mark locations of ice-core retrievals. Bright sea-ice signatures represent thick second-year ice, while dark ice is first-year ice with low backscatter.

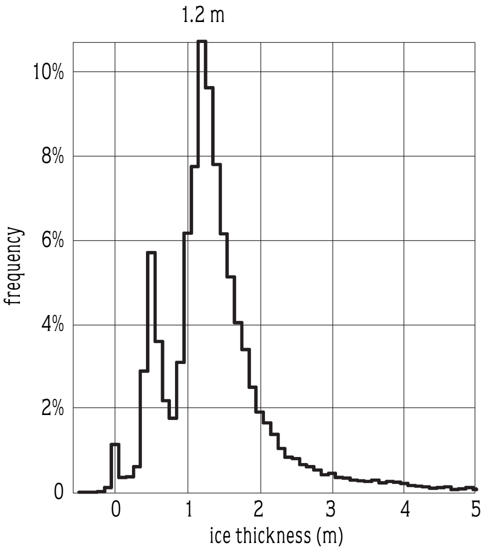


Figure 5
Ice-thickness distribution of the northern leg of the Larsen-A flight (*cf.*, Fig. 4).

Alberta is presently coordinating IPAB together with the Alfred Wegener Institute.

We are also heavily involved in validating ice-thickness measurements for the upcoming European CryoSat mission, to be launched in 2009. We have been invited by partners in New Zealand to jointly perform one of the few sea-ice validation campaigns in the Southern Ocean in December 2009 and 2010.

Challenges and opportunities for Canada

The main difficulty of Antarctic observational research is access to the study regions. The vastness and remoteness of the Southern Ocean and Antarctica hinders most nations from performing long-term, systematic research in larger regions of the Antarctic. The research performed at individual research stations is often only local and focused on a few individual disciplines. Clearly, with icebreakers, vast regions can be studied and space can be provided for large, truly interdisciplinary research teams. Canada should establish a program of Antarctic research cruises, where the ship could not only be used as a research platform, but also as a base for the operation of helicopters or unmanned aerial and underwater vehicles to extend the operational range

Figure 6
The author with a group of locals who are always very interested in the work underway. They look forward to learning more about Canadian research in Antarctica.

and to include non-marine study regions, and for the maintenance of automatic stations both at the seafloor and on land or ice. An ideal target region would be the Larsen region of the eastern Antarctic Peninsula and the western Weddell Sea, a key region for shaping global climate, and a region of past and ongoing change in all spheres, where geological, biological, oceanographic, meteorological, and glaciological work could be performed.

An alternative, but equally powerful, research platform would be a long-range aircraft like a Basler BT67 converted DC-3. This plane is ideal for long-range, low- and high-altitude land- and sea-ice glaciological work and other remote-sensing applications, as well as for meteorological and air-chemistry research. With its skis, it could be used to deploy and support field parties on land and ice and other logistics operations, and contribute to the small pool of internationally operated aircraft over Antarctica. At the Alfred Wegener Institute, this plane is very successfully used both for logistics and research, and a sea-ice thickness EM bird is even now being integrated on it. During the Antarctic winter, the same plane could support research and logistics in the Arctic. Canada should consider developing a program that can operate and provide this research infrastructure for all Canadian researchers, similar to or extending the capabilities of the ArcticNet program. With such tools in place, Canada could become an equal partner or leader of both Antarctic and Arctic research.

References

Haas, C., 2001. The seasonal cycle of ERS scatterometer signatures over perennial Antarctic sea ice and associated surface ice properties and processes. *Ann. Glaciol.*, **33**, 69–73.

Haas, C., D.N. Thomas and J. Bareiss, 2001. Surface properties and processes of perennial Antarctic sea ice in summer. *J. Glaciol.*, **47**(159), 613–625.

Haas, C., M. Nicolaus, S. Willmes, A. Worby and D. Flinspach. 2008. Sea ice and snow thickness and physical properties of an ice floe in the western Weddell Sea and their changes during spring warming. *Deep-Sea Res. II*, **55**(8–9), 963–974.

Hellmer, H.H., C. Haas, G.S. Dieckmann and M. Schröder, 2006. Sea ice feedbacks observed in western Weddell Sea. *Eos, Trans. AGU*, **87**(18), 173, 179.

Nicolaus, M., C. Haas, J. Bareiss and S. Willmes, 2006. A model study of differences of snow thinning on Arctic and Antarctic first-year sea ice during spring and summer. *Ann. Glaciol.*, **44**, 147–153.

Thomas, D.N., *and 7 others*, 1998. Biological soup within decaying summer sea ice in the Amundsen Sea, Antarctica. *In* M.P. Lizotte and K.R. Arrigo, *eds. Antarctic sea ice: biological processes, interactions and variability.* Washington, DC, American Geophysical Union, 161–171 (Antarctic Research Series 73).

Thompson, D.W.J., and S. Solomon, 2002. Interpretation of recent Southern Hemisphere climate change. *Science*, **296**(5569), 895–899.

Willmes, S., J. Bareiss, C. Haas and M. Nicolaus, 2006. The importance of diurnal processes for the seasonal cycle of sea-ice microwave brightness temperatures during early summer in the Weddell Sea, Antarctica. *Ann. Glaciol.*, **44**, 297–302.

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News in Brief

There have been some changes in the membership of the Canadian Committee on Antarctic Research during the past year. **Wayne Pollard,** who served as Chair of CCAR, and **Serge Demers** chose to step down after their term of appointment was up. **Kathy Conlan** and **Marianne Douglas** have been reappointed and the latter has taken over as Chair. New members include **Thomas S. James,** of the Geological Survey of Canada (*CARN Newsl.* **24,** November 2007, pp. 1–7), **Émilien Pelletier,** of ISMER at the Université du Québec à Rimouski (*CARN Newsl.* **21,** April 2006, pp. 11–16), and **Peter L. Pulsifer,** of the Geomatics and Cartographic Research Centre at Carleton University (*CARN Newsl.* **19,** May 2005, p. 12).■

Professor **Patrick J. Walsh** joined the Biology Department at the University of Ottawa in 2006, after 22 years at the University of Miami (pwalsh@uottawa.ca). This past austral summer (2007–08) he made his first trip South to McMurdo to work on an NSF-funded study into the effects of CO_2 absorption in salt water, particularly as it impacts the tiny marine organisms known as pteropods. The principal investigators are Vicky Fabry, an oceanographer at the California State University at San Marcos, and Brad A. Seibel, comparative animal physiologist at the University of Rhode Island. Pat is interested in obtaining support to continue his work in this area.■

With the death of **Roy (Fritz) Martindale Koerner** on 26 May 2008, Canada has lost not only an outstanding glaciologist and Arctic scientist, but also a strong link to the Antarctic. Born in Portsmouth, U.K., on 3 July 1932, he joined the Falkland Islands Dependencies Survey in 1957, spending 2 1/2 years on the Antarctic Peninsula as senior meteorologist and glaciologist at Hope Bay; the nearby Koerner Rock was named after him. As a research associate at Ohio State University, he spent the 1966–67 austral summer in Dronning Maud Land, at the U.S. Plateau Station, studying snow stratigraphy; Koerner Bluff in Marie Byrd Land was named for him. Following his participation in Wally Herbert's successful 3620-mile Trans-Arctic Expedition, he joined the Polar Continental Shelf Project of the Department of Energy, Mines and Resources in Ottawa. He and his colleagues have been monitoring the mass balance of ice caps in the High Arctic for the last 40 years and have been compiling evidence of climate change through the analysis of ice cores taken from Devon, Ellesmere and Baffin Islands. He was an integral part of the Students on Ice team, the program and its success. His most recent Antarctic visit, with the 10th SOI expedition, marked the 50th year since his first trip to Antarctica.■

Professor **Thora Martina Herrmann,** holder of the Canada Research Chair in Biodiversity Conservation and Ethnoecology at the Université de Montréal (thora.martina.herrmann@umontreal.ca), is preparing for fieldwork on King George Island, South Shetland Islands (starting in December 2008), where she will investigate Pygoscelid penguin colonies in the Maxwell Bay region, in cooperation with the University of Jena. The seabird community in this region is diverse and of exceptional biological interest; it being one of the few places where the three species of Pygoscelid penguins, Gentoo (*Pygoscelis papua*), Adélie (*Pygoscelis adeliae*) and Chinstrap (*Pygoscelis antarctica*) breed together sympatrically.

Recent studies show biological and ecological changes that may reflect direct and indirect responses to regional climate change. However, the changes the penguins might face under predicted future climate change remain largely unknown.

Her project will investigate: (a) differences and similarities in the genetic identity and population dynamics between different island populations of penguins; (b) patterns of conflict, and changes in foraging distribution and interspecies competition for prey as a result of global warming; and (c) the effect of climate change on penguin-colony population trends, breeding success and the spatio-temporal dynamics of environmental conditions.■

We are delighted to hear that long-overdue recognition was accorded **Geoffrey F. Hattersley-Smith** by the United Kingdom with the award of the Polar Medal, with Arctic and Antarctic clasp, in 2006. It started life as the Arctic Medal, in 1857, to honour those exploring the Northwest Passage. With expeditions in the early 1900s targeting the Antarctic, it became known as the Polar Medal. Today it recognizes distinction in exploration and the acquisition of knowledge of the polar regions. Geoffrey was Base Leader and glaciologist with the Falkland Islands Dependencies Survey at the Admiralty Bay station, King George Island, from 1948–50. In 1951, he joined the Defence Research Board in Ottawa, leading a joint Canadian–U.S. expedition to Ellesmere Island in 1953–54. From 1957–73, he carried out research on Ellesmere Island, at Lake Hazen, the Ward Hunt Ice Shelf, and latterly at Tanquary Fiord, before retiring as head of the Geotechnical Section in 1973. He returned to England where he has continued his involvement with the Antarctic.■

Canada will be well-represented at the forthcoming SCAR meetings and Open Science Conference being held in Russia in July 2008. The Chief Delegate will be **Steven Bigras** (CPC), assisted by **Simon Ommanney** (CCAR). Representatives to the Standing Scientific Groups will be **Wayne Pollard** (Geosciences), **Kathy Conlan** (Life Sciences); **Tom James** (Physical Sciences) and **Simon Ommanney** (Antarctic Geographic Information). The preliminary program indicates eight Canadian presentations on Antarctic or bipolar themes:

Wayne Pollard (McGill, invited lecture) – The effects of climate change in the poles: permafrost, geology, and geomorphology;

Donald Danskin (GSC) – Space weather events detected by globally-distributed riometers;

Leigh Gurney (UBC) – Defining ecosystem boundary size at the sub-Antarctic Prince Edward Islands;

Christian Haas (Alberta) – Sea ice thickness and ice production in the Larsen polynyas, Weddell Sea;

Christian Haas (Alberta) – The international programmes for Arctic and Antarctic buoys: cornerstones of coordinated polar observing systems;

Brian Hunt (UBC) – Seasonal inertia of macrozooplankton communities in the Lazarev Sea;

Evgeny Pakhomov (UBC) – Antarctic pelagic tunicates: could salps be an attractive prey?; and

Warwick Vincent (Laval) – Exploration of Antarctic subglacial aquatic environments: environmental and scientific stewardship.■

G.A.P. Adventures, of Toronto, has announced the relaunch of its Antarctic cruises following the purchase of the M/S *Expedition*, to replace the M/S *Explorer* that sank last November. The new ship, built by Helsingor Skibsvaerft, Denmark, in 1972, has been operating in Scandinavian coastal waters for the last 15 years. It is ice-strengthened with a Swedish/Finnish classification of 1B, meaning it was designed to operate year-round in the Baltic Sea. The 105 m-long vessel, which can accommodate 120 passengers and has a top speed of 16 knots, will undergo a $15M refurbishment and retrofit (www.gapadventures.com/expedition-cruises). The first of the Antarctic cruises is scheduled to start 4 January 2009 and will include the Falkland and South Shetland Islands. Following the Antarctic cruises, the M/S *Expedition* will head north for a summer of Arctic cruises.■

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