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NEWSLETTER FOR THE

Canadian Antarctic Research Network

Inside

Life on Ice

Valérie Villeneuve and Derek Mueller

At first glance, the Antarctic seems a hostile environment to all life forms. This appears particularly true for the region's ice shelves and glaciers. Incredibly, certain types of Antarctic ice provide a habitat where organisms can survive and thrive despite freezing, desiccation and UV exposure.

Our studies have concentrated on two types of icebound ecosystems, or cryo-ecosystems near McMurdo Sound. They reveal a surprising diversity of microscopic life-forms living at the limits of biological existence.

Valérie Villeneuve conducted research on the McMurdo Ice Shelf, a vast expanse of thick, land-fast ice, an area of about 1,200 sq. kilometres floating on the sea at latitude 78°S. For a few weeks each summer a large part of the ice surface melts and hundreds of ponds and streams are formed. This meltwater supports rich and highly pigmented – often red or orange – growths of algae called microbial mats. They form a layer coating the base of the ponds and streams to a thickness of two to 20 millimetres (Fig. 1). and provide a microhabitat for a broad range of organisms including bacteria, protozoa and metazoa – microscopic animals. The McMurdo Ice Shelf is, therefore, an exceptional site for the research on aquatic life in extreme environments.

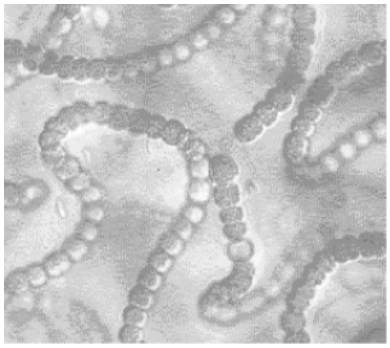

Figure 1
Nostoc and other cyanobacteria (blue-green algae) are often the dominant organisms in Antarctic as well as in Arctic cryo-ecosystems. The filament shown here has a diameter of about 5 micrometres.

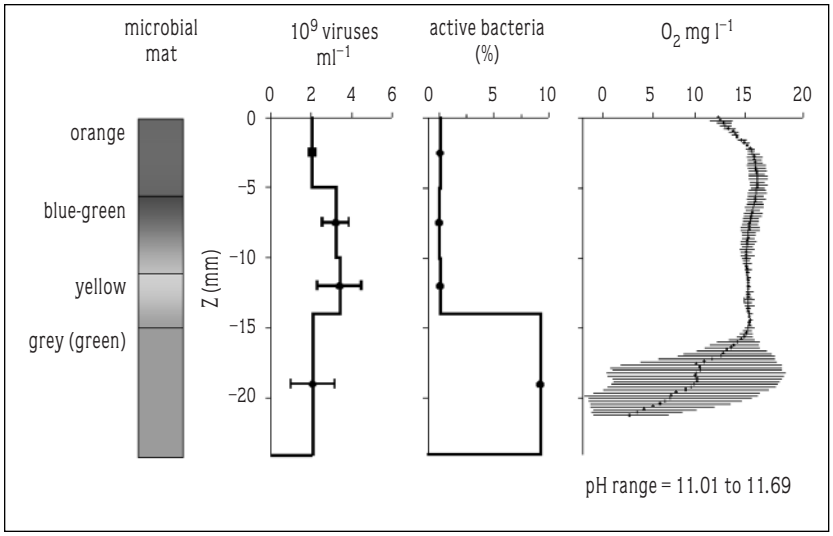

Figure 2

Profiles of the viral abundance, the percentage of active bacteria and of the oxygen concentration down through microbial mats in a pond on the McMurdo Ice Shelf, January 2000 (horizontal bar = standard deviation)

Examining the distribution of bacteria and viruses in the mats was a key element of Valérie Villeneuve's research. Using a novel set of the fluorescent stains SYBR Green and CTC, with epifluorescence microscopy, she found that the populations of these microbes achieved very high concentrations that varied down through the profile (Fig. 2).

Interestingly, the total concentrations of viruses in microbial mats – from 10^8 to 10^{10} viruses per millilitre – are higher than values found in freshwater and marine pelagic zones that are often about 10^6 viruses per millilitre (Wommack and Colwell, 2000).

Derek Mueller conducted research on the Canada Glacier in the McMurdo Dry Valleys. Similar to many glaciers (Mueller *et al.,* 2000), the lower section of the Canada Glacier contains cylindrical holes about 30 centimetres deep. These cryoconite holes contain meltwater and sediments and are formed as small patches of dark dust particles absorb radiation and melt faster than the adjacent ice. The sediments provide a habitat for a complex and diverse community of microorganisms including heterotrophic bacteria, cyanobacteria, eukaryotic algae, protists and microscopic animals – rotifers and tardigrades.

Throughout the year, the cryoconite communities must endure temperatures ranging from sub-zero to near-freezing, and must also tolerate exposure to high levels of UV radiation. Similar conditions exist on the McMurdo Ice Shelf in Villeneuve's study. However, the cryoconite microbial consortia are not structured in cohesive mats because of a lower biomass of mat-forming cyanobacteria. Also, the ice in the cryoconite holes may not melt every summer. Cryoconite communities are isolated from one another so there are major differences in community composition between holes. The microbial ecology of these microcosms reflects physical and biological processes under extreme conditions.

The results from the Canada Glacier and the McMurdo Ice Shelf research supports the "Snowball Earth Hypothesis" (Vincent *et al.,* 2000). This hypothesis states that it is possible that cryo-tolerant microbial mats could have provided refugia for the survival, growth and evolution of many organisms during periods of extensive ice cover.

We have previously conducted research in the Canadian high Arctic and our visit to Antarctica provided a fascinating opportunity to compare the two polar regions. It also placed our northern work in a broader context.

Acknowledgments

We thank our research directors, Prof. Warwick Vincent (Université Laval) and Prof. Wayne Pollard (McGill University) for providing support for this work and our hosts in Antarctica. We have special thanks to the New Zealand Antarctic Programme, Clive Howard-Williams, Ian Hawes and Rob Smith (VV), the United States Antarctic Program, Peter Doran and other members of the McMurdo Dry Valley Long Term Ecological Research site program (DM). Parts of this work were supported by the Natural Sciences and Engineering Research Council of Canada and the Canada Arctic-Antarctic Exchange program.

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Vincent, W.F., J.A.E. Gibson, R. Pienitz, V. Villeneuve, P.A. Broady, P.B. Hamilton and C. Howard-Williams. 2000. Ice shelf microbial ecosystems in the High Arctic and implications for life on Snowball Earth. *Naturwissenschaften*, 87: 137–141.

Wommack, K.E., and R.R. Colwell. 2000. Virioplankton: viruses in aquatic ecosystems. *Microbiol. Mol. Biol. Rev.*, 64: 69–114.

VV and DM conducted their research in Antarctica while Masters students at Université Laval and McGill University, respectively.

Sampling of a Subglacial Lake at South Pole, Antarctica

E.W. Blake, Icefield Instruments Inc., Yukon
P.B. Price, University of California at Berkeley

The proposed *DeepIce Science and Education Center* is planning to use four new instruments to help solve major geoscience, environmental science and microbiological problems in deep Antarctic ice. The four instruments are: a fast 76 millimetres access drill, an *in-situ* fossil air melt extraction device for extracting gases and particles from specific depths, a sterile drill for deploying instruments and extracting water and sediment from sub-glacial lakes, and a fast logger that measures dust and ash concentrations as a function of depth.

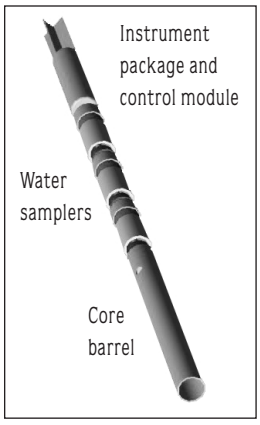
A recent radar survey has confirmed the presence of a subglacial lake about eight kilometres from South Pole at an ice depth of about 3,000 metres. With radar and seismic sounding, we intend to describe various aspects of the lake including water and sediment thickness and isolation of water from other lakes. We also plan to search for other nearby subglacial lakes.

Samples from the lake and sediment will enable us to search for chemical indicators of microbial life as well as cells and viruses. The sediments will also be searched for extraterrestrial particles and supernova radionuclides. To complement the lake study, we will search for microbes able to live at a temperature as low as −50°C in liquid veins in near-surface blue ice, in ice below the firn layer, and in cracks in bedrock. We will use DNA and phospholipid fatty acid analyses, cultivation, metabolic activity, microscopy, and other techniques to identify organisms, and X-ray analysis to determine 3-dimensional structure of psychrophilic enzymes. These studies will lay the foundation for exploration of Lake Vostok and eventually Europa (an ice-rich moon of Jupiter).

For the sterile drill proposal, we will use a hot-water drill with a sonar sounder to bore a 200-millimetre hole, to

a depth of from 10 to 20 metres above the subglacial lake. A deployment bus is connected to the surface by means of a power and communications link. It contains a dock for a completion drill, a winch for a sampling sonde and a control unit. The bus delivers the completion drill and sonde to the bottom of the hot-water hole.

We need to preserve the environmental barrier between the lake and the surface. So, following positioning of the drill at the bottom, the access hole will be sealed from the surface either by natural freezing or by closing the borehole, conceivably by under-pressurizing the access hole by pumping out water. Before closing the hole, hydrogen peroxide or another reagent will sterilize the vicinity of the drill. Once we have sealed and sterilized the access hole, a 500-millilitres sampler on the sonde will take a water sample for cross-contamination studies.



Sampling sonde

A 10-kilowatt hot-point completion drill will bore a 200-millimetre hole through the remaining 10 to 20 metres of ice into the lake. Once it enters the lake, the completion drill will move to the side, either by floating at the ice-water interface or dropping to the lake bottom. The deployment bus will then slowly lower the sonde for its water-sampling program. The sonde consists of a drop-corer, pressure-vented oxygen-tight water-sampling bags with remotely controlled seals, a pump and graded filter, an instrument package, battery backup, and control computer. Depending on what we learn about depth of water and sediment from seismic sounding, the corer will use spring fingers, a flap valve, and/or a piston core arrangement to hold the core. As the sonde is lowered, the bags will be filled at three depths while instruments − CTD, oxygen, redox potential, pH, camera, etc. − take data. Particles will be collected on the filter from about 100 liters of water. We will remove the microbes in the recirculating meltwater with a 0.2-μm filter. One additional water sample, pressure-sealed, will be taken. Preservation of the pressure of dissolved gases greater than the hydrostatic pressure in the lake, due to exsolution from overlying ice, would permit a search for possible aerobes in the lake.

Following water sampling, the deployment bus will raise the sampling sonde and then drop it by releasing extra cable stored in the sonde. The drop-corer will collect sediment, then the winch will haul the sonde up into the bus. If the sonde gets stuck in lake sediments, the instrument package will separate from the core barrel for retrieval. For redundancy, both the sonde computer and the bus computer will store the data taken by the instruments. The data will then be transmitted to the surface.

Finally, a refrigeration or a similar system mounted on the bus, will seal the hole below the bus. A recovery reamer fitted with anti-torque skates to prevent rotation will drill along the cable and release the bus from the ice. After this, the components will be hauled to the surface and the drill and reamer will be sterilized at the factory. Data telemetry between the sonde and bus will be by way of a serial link, with power and communications sharing the same pair of conductors. Powered by internal batteries, the sonde can carry out a reduced sampling program on its own. Communications between the bus and the surface will allow direct control of the sampling program by on-site scientists.

This proposal calls for a three to four year development and testing program beginning as early as January 2001. The Yukon-based program will culminate in an Antarctic field season at the end of this period. We expect much of the funding to come from the National Science Foundation and hope for some contributions from the Canadian government or other international partners.

Canadian Antarctic and Bipolar Science

Warwick F. Vincent

The Canadian Polar Commission (CPC) and the Canadian Committee for Antarctic Research (CCAR) have recently published the proceedings of a workshop organised by CCAR on Antarctic and bipolar science*. It's now time to consider how best to implement the report's conclusions.

The first observation from the workshop was the impressive breadth of south-polar research activities Canadians have undertaken over the past few years. The report lists more than 80 Antarctic/bipolar scientific publications involving Canadians since 1997. It identifies Canadian institutions working on a wide range of Antarctic themes including human adaptation, landscape evolution, ecology of extreme environments, paleoclimate reconstruction and ice sheet dynamics.

We have an excellent base of cold regions expertise to build on. CCAR will continue to promote this research and help establish the necessary interrelationships and linkages through the Scientific Committee for Antarctic Research (SCAR).

There was general concern that, despite significant commercial operations by Canadian companies in Antarctica, many Canadians are unaware of Canada's obligations and commitments under the Antarctic Treaty. The Protocol on Environmental Protection, a section of the Antarctic Treaty, dedicates the south-polar region to peace and science. This seems like a remarkably "Canadian" perspective on the world! CCAR will continue to work with the Canadian Polar Commission to help develop awareness of Antarctic Treaty issues among politicians, senior government officials and the public.

Workshop participants concluded that Canadian Antarctic research must increase to meet our treaty obligations and develop and share our polar science capabilities. There was no enthusiasm for a Canadian Antarctic base, although cost-sharing of existing facilities was viewed as an attractive option. They agreed that any expansion of Antarctic activity can only be achieved with a strengthening of northern high latitude research. This remains Canada's priority. CCAR is now working with the CPC to finalize a strategy for Canadian Antarctic/bipolar research that recognizes the importance of developing these North-South connections.

Finally, participants expressed considerable interest in setting up a foundation that would help fund Canadian scientists and students to conduct Antarctic/bipolar research and learn more about Antarctic issues and polar science in general. CCAR is currently exploring how best to initiate such a research-learning foundation.

Warwick F. Vincent is Chair of the Canadian Committee for Antarctic Research.

* Loken, O.H., and K. Hall. 2000. Antarctic and Bipolar Science. Report of a workshop held at the Arctic Institute of North America, Calgary, Alberta, October 16, 1999. CPC/CCAR, 45p. (see News in Brief).

The Scientific Committee On Antarctic Research (SCAR) and the New Millennium

Steven C. Bigras
Executive Director, Canadian Polar Commission

SCAR delegates from 26 countries gathered during a sweltering week in Tokyo, Japan for SCAR XXVI. The meeting took place from July 17 to 21, 2000 and one of its tasks was deciding how SCAR should function in the future.

The formal part of the meeting began with SCAR President Dr. R.H. Rutford welcoming their Imperial Highnesses, Prince and Princess Takamado. The Prince was invited to address the meeting.

After the official opening, the delegates got down to business. Reports were tabled by: the Executive Committee, SCAR Group of Specialists, seven SCAR Working Groups, COMNAP and SCALOP. Delegates reviewed and assessed about 100 recommendations and requests for funding submitted by the various groups. They also analyzed financial reports and approved the budgets for 2000. These documents are available on the "members-only" portion of the SCAR web site, www.scar.org.

As the organizational review exercise is very important to member countries and national committees, SCAR delegates spent a great deal of time and energy in deliberations dealing with the ad hoc Group's report on SCAR Organization and Strategy. This article deals with the results of the delegates' assessment and conclusions.

Delegates to SCAR XXV in Chile in 1998 decided to launch an internal review of SCAR operations (CARN Newsletter #7). The goal of this review was to ensure SCAR continues to be effective in initiating and coordinating Antarctic research and advising the intergovernmental Antarctic Treaty System on scientific issues. To accomplish this, the SCAR executive appointed an ad hoc group on SCAR Organization and Strategy. This group reviewed current SCAR method of operating and reported their findings to the Tokyo meeting. In the report, the *ad hoc* group made 20 recommendations designed to improve SCAR effectiveness. The 20 recommendations are grouped into four areas.

1. Operation of SCAR

According to the ad hoc group, the following four areas of the SCAR mission require attention:

- developing an outreach program to attract young scientists;
- providing the highest level of advice on Antarctic scientific issues;
- being more proactive in analyzing the impact of global change on Antarctica and its contribution to the understanding of global change; and
- enhancing dissemination of knowledge about Antarctica and SCAR.

The ad hoc group favours greater delegate involvement in SCAR activities. They propose to establish two delegate-level committees each chaired by a SCAR vice-president. The SCAR executive should continue to deal with operational business and act between sessions on advice and recommendations from the delegate committees.

2. Restructuring of the Planning and Decision-Making Process

The scientific-level structure of Working Groups and Groups of Specialists has served SCAR effectively. However, the ad hoc group suggested that Operating Groups will be able to respond effectively to emerging scientific opportunities once they replace these group structures.

Documents and reports should be circulated in a timely manner, the ad hoc group strongly suggested. They also recommended that meetings should be scheduled to allow delegates time to make informed decisions.

The executive and delegate committees must give immediate attention to high-priority issues and increase internal and external communications.

The ad hoc group suggested that the new operating groups meet three months before the SCAR delegates meeting to allow delegates sufficient time to prepare and review group documents. Everyone understood that a separation of the delegate and operating groups would help resolve the timing issue but some delegates felt that a space of several months between the meetings was not necessarily good for SCAR. In any case, this change will not be implemented for the SCAR XXVII meeting in 2002. Some variation may be in place by SCAR XXVIII in 2004.

3. Increase Capacity of SCAR Secretariat

To become an effective organization, the SCAR secretariat must be upgraded to an executive office with an executive director. In addition, the new executive office will require more space and an adequate IT infrastructure. Hopefully, this can be provided by the Scott Polar Research Institute. If this isn't possible, member nations will be invited to tender detailed proposals to host the SCAR secretariat. The Executive Committee will set a deadline for submitting and evaluating tenders.

It is important to resolve the SCAR secretariat issue soon so that the recommendations can be implemented by the SCAR XXVIII meeting in 2004.

4. Renewing Commitment to SCAR at the National Level

This revitalization can become a reality only if national bodies that are SCAR members are committed to creating a SCAR for the 21st Century. They must reflect a commitment to SCAR's future by encouraging a new generation of scientists to become engaged in Antarctic research.

SCAR must also seek increased funding to promote SCAR and expand the Secretariat's operating budget. Delegates should seek greater funding from national bodies while the executive seeks funds from philanthropic sources for other activities.

During the meeting there was an intense sense of purpose. The delegates agreed that the process of change must start immediately and, as the meeting drew to a close, they wanted assurances that the momentum would not be lost.

Before wrapping up, delegates agreed that a transition task force be established to analyze all the information provided by the SCAR delegates, and to recommend a new operating group structure. The task force will circulate its ideas for comment before a final draft is considered by the SCAR executive committee in 2001.

The aim is to have a new structure at the operating level instituted at SCAR XXVIII in 2004.

Report on COMNAP meetings in Tokyo, Japan, July 2000

Bonni Hrycyk, Director, Polar Continental Shelf Project

The Tokyo meeting of the Council of Managers of National Antarctic Programs (COMNAP) set the stage for closer linkages between the southern and northern polar logistics communities.

As a follow-up to a recommendation from last April's meeting of the Forum of Arctic Research Operators (FARO), the Chair of FARO reported in Tokyo on its establishment and objectives. FARO, which comprises Arctic logistics operators, has similar objectives to COMNAP.

At the meeting, COMNAP accepted FARO's invitation to exchange information at each other's annual meetings. They agreed to seek opportunities to work together as a community to help support polar research more effectively. COMNAP and FARO are already linked to each other's web sites.

COMNAP members are already planning the 50th anniversary of the IGY in 2007–08. They are considering how best to mark this event in a way that will help bring a more global focus on the Arctic and Antarctic regions. This will likely be picked up by FARO at its next meeting in Iqaluit in April 2001.

While SCAR debated its future and structure at the Tokyo meetings, COMNAP working groups were asked to review their usefulness and effectiveness to ensure all are still required and remain active. COMNAP executive gave marching orders to each working group and, where activities had lagged, the group discussed how to get the less effective or inactive groups back on the rails.

While no new working groups were created, all existing groups will continue given the evolving requirements in the full range of areas including shipping and air operations, tourism, emergency response practices, issues related to liabilities, training and outreach initiatives, and energy technologies among others.

The next COMNAP meeting will be held in Amsterdam in August 2001; the 2002 meeting is scheduled for Shanghai, China.

For further information about COMNAP: www.comnap.aq.
For further information about FARO: www.iasc.no/faro/index/htm.

SCAR Working Groups – Meetings in Tokyo, July 2000

All SCAR Working Groups met in Tokyo as part of the July 2000 SCAR XXVI meetings. Canada was represented at several groups.

Meeting reports will appear in the next CARN issue, but for those who may wish to contact any of the participants sooner, here are the names and contact information for the Canadian participants:

- *W.G. on Biology:* Dr. Kathleen Conlan, Canadian Museum of Nature, kconlan@mus-nature.ca
- *W.G. on Geology:* Prof. Wayne Pollard, McGill University, pollard@felix.McGill.ca
- *W.G. on Glaciology:* Steven Bigras, Canadian Polar Commission, substituting for Roy Koerner, bigrass@polarcom.gc.ca
- *W.G. on Human Biology and Medicine:* Prof. Peter Suedfeld, University of British Columbia, psuedfeld@neuron3.psych.ubc.ca

Prof. Wayne Pollard also attended parts of the W.G. on Geodesy and Geographical Information meeting where he presented the proposed Cybercartographic Atlas of Antarctica prepared by Prof. Fraser Taylor, Carleton University, Ottawa, Canada and Dr. D. Vergani, Puerto Madryn, Argentina (See News in Brief).

The Twelfth Antarctic Treaty Special Consultative Meeting (XII SATCM)

Fred Roots

As readers of the Newsletter will recall (CARN Newsletter #10, p. 8), at the 1999 Antarctic Treaty Consultative Meeting in Lima, Peru, it was announced that it would not be possible to hold the next meeting in Poland, as had been planned. However, activities in the newly-formed Committee on Environmental Protection (CEP) were proceeding so vigorously that it was considered necessary to have a meeting of that Committee in the year 2000. International discussion led to a decision to hold a Special Antarctic Treaty Consultative Meeting (the Twelfth Special Meeting since the Treaty came into force, or XII SATCM) at The Hague, Netherlands from 11–15 September, 2000. It was not to be a full ATCM, but would provide an occasion for the Third meeting of the CEP, and to receive its report. It would also be an opportunity for representatives of consultative parties to have further discussions on the as yet uncompleted Liability Annex to the Environmental Protocol.

The meetings were held at the Royal Ministry of Foreign Affairs, The Hague and hosted by the Ministers of Foreign Affairs and Agriculture, Nature Management and Fisheries.

Representatives of all 27 consultative parties to the Treaty and 10 non-consultative parties were present. In addition, Antarctic Treaty subsidiary organizations and NGO's attended the meeting. Canada was represented by Ms. P. Bruns from the Department of Foreign Affairs and International Trade, as well as the author.

The main item on the agenda was the third meeting of CEP. These discussions continued for four days and a wide range of topics related to the Antarctic and polar environments were discussed. Highlights of interest to Canada:

- A multi-nation intercessional group, that included Canada and was co-ordinated by New Zealand, produced guidelines for the establishment and management of protected areas and for development of an Antarctic conservation strategy. Although the work is not finished, the group made a significant step forward in international conservation of areas beyond national jurisdiction.
- An Environmental Monitoring Handbook was published by COMNAP/SCAR. It's also available on CD-Rom and describes techniques for chemical and physical monitoring of stations and operations, and guidelines for monitoring programs.
- The feasibility of a "systematic geographical framework" for assessing values and risks to the environment in polar regions was discussed. No conclusions were reached, however.
- Delegates discussed environmental assessment procedures that focused on present and planned and deep drilling projects in the ice sheet. Some of these projects are at the forefront of science, technology and environmental knowledge. As the proponents themselves are the persons most knowledgeable in these subjects, some interesting questions of "international environmental assessment" arose.
- Important issues were raised by the CCAMLR reports on Southern Ocean fishing. Reported catches of krill are up from previous years, mainly from South Atlantic areas where there is little information on the resident biomass. Evidence is accumulating that increased UV-B radiation may adversely affect krill and other key populations. Illegal, unregulated and unreported (IUU) fishing for Patagonian Toothfish was estimated to be about four times the legal quota. The Toothfish are caught mainly in the southern Indian Ocean by non-registered or undercover companies believed owned in Chile. They land their catch in Mauritius and Namibia and sell it through the Japanese markets, with some of it reportedly passing

through Canada. There is concern that the IUU, if not checked, may seriously affect the entire Antarctic marine ecosystems. CCAMLR has instituted a new Catch Documentation Scheme (CDS) that, it's hoped, will help to control IUU. Canada, with other countries, will be asked to co-operate.

- Urgent discussions took place concerning the SCAR proposal for international cooperation in restricting or controlling the private commercial collection and sale of meteorites from Antarctica. The prices and profits have reached absurd heights, and the potential loss to science, and damage to the environment, could be considerable. Not surprisingly, there was interest in Canadian policies concerning the exploitation of fragments from the meteorite that landed in the Tagish Lake area in January 2000.
- IAATO reports on Antarctic tourism demonstrated a steady increase in visits since 1992. The only exception was a slight drop in 1996–97. In the 1999–2000 season about 14,762 people visited Antarctica for commercial or private tourist and recreational purposes. Of these, 139 took part in land-based interior expeditions and 221 sailed along the coast on yachts. In addition, there were about 4,500 passengers on commercial sightseeing overflights from Australia and Chile.
- The exchange of information between tour operators has improved and they are "rationing" visits to the most popular destinations. They are also submitting environmental evaluations as well as developing procedures for environmental protection including the prevention of importation and spreading of diseases. They are also developing emergency measures. For the first time, the tour operators' association has placed a member on probation for irregularities.
- The question of large cruise vessels with more than 400 passengers visiting Antarctic waters is still of considerable concern.
- A Canadian development presented in XII SATCM Information Paper 24 aroused wide interest. This report outlined the development of a Cybercartographic Atlas of Antarctica at Carleton University's Geomatics and Cartographic Research Centre. The report and a brief explanation by the undersigned were well received. The fact that the topic had been introduced at the SCAR meeting in Tokyo paved the way for the paper's positive reception. In its final report to the SATCM, the CEP included a statement (paragraph 9) noting that such an atlas of Antarctica "could supplement and be of assistance to the various information and databases presently used, and assist the CEP in its work".

Toward the conclusion of the CEP-III meeting, Dr. Olav Orheim of Norway was re-elected Chair for another two years. The vice-chairs remain Gillian Wratt of New Zealand and Jorge Begruno of Chile.

At the time of CEP-III legal experts held a three day informal discussion on the Liability Annex to the Environmental Protocol under the chairmanship of Don Mackay of New Zealand. There were no final decisions but the discussions made progress, according to the legal experts. The previous deadlock between the American position of wanting separate liability provisions for different situations and a group of other countries who were in favour of a comprehensive liability annex seemed to have been broken. Most of the participants, including the chair, were confident a draft consensus Annex could be concluded at the next ATCM.

The SATCM reconvened on Friday afternoon, September 15, and the report of the CEP-III was approved with

minor editorial change. Canada was again requested to state its position concerning ratification of the Protocol on Environmental Protection. My careful reply was accepted, and the statement in the CEP report was read aloud in full:

> *"The Czech Republic, the Ukraine, Canada, and Romania informed the CEP that they are still working to ratify the Protocol. It is hoped that these Parties will ratify the Protocol before the next ATCM."*

At the end of this discussion, in accordance with an intervention by the United Kingdom, the SATCM report included the following:

> *"(15) The CEP Chairman also noted that several non-Consultative Parties had yet to ratify the Protocol. The Meeting urged these Parties to ratify before the next ATCM, and drew attention to Resolution 6 (1999), particularly the importance of ratification by Non-Consultative Parties which are involved in organizing tourist activities."*

This resolution is, of course, aimed at Canada only.

Before the close of the SATCM, Russia confirmed that it would host the twenty-fourth ATCM in St. Petersburg in May, 2001.

A more complete report on XII SATCM and CEP-III is in preparation. Copies of the meeting's final reports, the 25 working papers and 45 information papers meetings are available.

Contact Dr. Fred Roots, fred.roots@ec.gc.ca, *or telephone (819) 997-2393, for more information.*

Geographical Names Board of Canada Approves Antarctic Geographical Name

The Geographical Names Board of Canada (GNBC) recently approved a proposal to name an Antarctic ice stream in honour of Canadian explorer Hugh Blackwall Evans, who in 1898–1900 was a member of the first party to over-winter on the continent (CARN Newsletter #7). The Blackwall Ice Stream, at approx. 82°50'S, 35°20'W, is about 400 kilometres long and 20 kilometres wide and flows northward on the east side of the Argentina Range to join the Recovery Glacier.

The ice stream was one of two previously unknown ice streams discovered using the Canadian satellite RADARSAT during the Antarctic Mapping Mission supported by the Canadian Space Agency and NASA. Proof that the features are indeed ice streams was provided by the ice motion analysis of Dr. Laurence Gray and colleagues at Canada Centre for Remote Sensing working with Dr. Ken Jezek and a team of US scientists from The Ohio State University.

Several landscape features in Antarctica have been named after Canadians, some still living. These names were always submitted to and approved by naming agencies in a foreign country. The Blackwall Ice Stream is the first Antarctic place name ever to be approved by a Canadian naming agency.

After returning from Antarctica, Hugh Blackwall Evans settled in the Vermilion River Valley, Alberta where he raised cattle and farmed for more than four decades. He died in 1975 at the age of 100. A daughter, Ms. Eleanor Evans, still lives in Vermilion. She described the GNBC decision as "an exciting tribute to my father's work".

For additional information contact Dr. O.H. Loken, oloken@sympatico.ca, *or telephone (613) 225-4234.*

News in Brief

The **SCAR Group of Specialists on Antarctic Neotectonics** held several meetings and a day-long symposium at the European Geophysical Society (EGS) meeting in Nice, France in April, 2000. ANTEC was formed in early 1999 to address neotectonics research in Antarctica. Based on discussions at EGS and earlier informal meetings and e-mail exchanges, it was decided to define the ANTEC scientific programs in five broad categories: Antarctic plate-scale kinematics; Antarctic lithospheric stress; active regional deformation; surface processes; and volcanic processes. ANTEC offers many interesting challenges that Canadian university Masters and PhD students could pursue. For further details, visit the ANTEC web site at www.scar_ggi.org.au/geodesy/antec/antec.htm, or contact **Thomas James** at Geological Survey of Canada, 9860 W. Saanich Rd., Sidney, B.C. V8L 4B2, telephone (250) 363-6403, or at james @pgc.nrcan.gc.ca, for a complete report on the meetings.

Prof. Fraser Taylor, Carleton University, Ottawa, and Dr. D. Vergani, Puerto Madryn, Argentina have proposed to develop a cybercartographic atlas of Antarctica. The atlas is based on methodology used by their international team to create a web-based atlas of South America. Endorsed by CCAR, the proposal was presented to the SCAR Working Group on Geodesy and Geographical Information by Prof. Wayne Pollard in Tokyo last July. The proposal was well received and will now be developed further in view of feedback from that meeting. See the previous article by Dr. Fred Roots.

Two recent reports are expected to enhance Canada's role in Arctic, and bipolar science:

1. The Department of Indian Affairs and Northern Development released **Northern Science and Technology in Canada: Federal Framework and Research Plan April 1, 2000 – March 31, 2002.** This report describes the key programs and activities of federal departments and agencies that support Northern science and technology, and how they are implemented. Copies can be obtained by contacting the Canadian Polar Commission, mail@polarcom.gc.ca, telephone (613) 943-8605, fax (613) 943-8607.
2. NSERC and SHERC jointly published **From Crisis to Opportunities: Rebuilding Canada's Role in Northern Research.** This is the final report of the Task Force on Northern Research and contains several recommendations aimed at strengthening university based science programs. Copies are available from NSERC, telephone (613) 995-5992, fax (613) 943-0742.

In October 1999, CCAR held a workshop in Calgary to consider the discussion paper **Antarctic and Bipolar Science: A Strategic Plan for Canada.** The workshop report presents an overview of current Canadian participation in Antarctic and bipolar science. It also included a bibliography of Canadian contributions to Antarctic and bipolar science since mid 1997. The bibliography contains 86 items. The discussion paper has since been modified according to the comments received. Both documents can be obtained by contacting the Secretary, oloken@sympatico.ca, or telephone (613) 225-4234; or from the Canadian Polar Commission, telephone (613) 943-8605, fax (613) 943-8607.

The Second International Conference on Mars Polar Science and Exploration was held in Reykjavik, Iceland in August 2000 with the Geological Survey of Canada (GSC) as one of the sponsors. Some 110 planetary and terrestrial scientists from more than 20 countries participated. Results from the Mars Global Surveyor (MGS) mission were a highlight of the meeting. The study of the Mars Ice Caps as "terrestrial type" ice masses is attracting some attention after early work by GSC scientists in this field. The team that worked on the failed Mars Polar Lander mission was well represented and the enthusiasm of the PhD and M.Sc. students linked to the program has survived the mission failure. **The third in this series of conferences** will be held in Canada in 2002 or 2003. For further details contact **David Fisher,** Geological Survey of Canada, fisher @nrcan.gc.ca, telephone (613) 996-7623.

Toronto based **World Cruise Company Inc.** that operated in Antarctica, declared bankruptcy last May and has ceased operations. **Marine Expeditions Inc. (MEI),** an associated company also based in Toronto, was recently restructured and now operates as **Marine Expeditions (MEX).** A group of former managers acquired key MEI assets and formed the new company with **Dougald Wells** and **Patrick Shaw** as respectively chief executive officer and president. Both men have spent several years with MEI. This summer MEX will operate two tour vessels making 19 individual voyages to the Antarctic Peninsula area. MEX will continue to support science and environmental activities in Antarctica, such as, the Students On Ice expedition this summer. MEX will also continue its association with the VIEW Foundation and the research base clean-up programs.

Professor Stephen Hicock, Department of Earth Sciences, University of Western Ontario will return to The Ice this summer to study outcrops and obtain cores from the Sirius Group of glacially formed rock formations in the Trans-Antarctic Mountains near McMurdo Sound. The work is a joint effort with scientists from Victoria University in Wellington, N.Z. Prof. Hicock is an Honorary Research Associate at the university and is co-supervisor of **PhD student Philip Holme, from North Vancouver.**

Dr. Evonne Tang, NSERC-PDF at the University of Western Ontario, has been selected as a Canadian participant in the **NSF McMurdo Biology Course for January 2001.** Dr. Tang is a specialist in algal ecology and physiology. She has previously worked in the Canadian Arctic and obtained her B.Sc. at the University of Ottawa, her M.Sc. at McGill University, and her doctorate at Laval University.

Ninety Canadians will start on a two-week educational journey to Antarctica on December 27, 2000. The high school students from across the country with teachers and staff will be a part of the Students on Ice expedition organized and led by Geoff Green. Partners of the program include **Canadian Geographic, Canadian Committee for Antarctic Research, Canadian Museum of Nature, Canadian Ecology Centre,** and **Canadian Space Agency.** The educational staff consists of well-known polar scientists like Dr. Fred Roots, Dr. Roy Koerner and Dr. Warwick Vincent, as well as Jonathon Shackleton, cousin of the Sir Ernest Shackleton, and Alex Boston from the David Suzuki Foundation. See the web site at www.studentsonice.com.

Some Recent Canadian Contributions to Antarctic and Bipolar Science

(Names of Canadian co-authors are underlined, except where all are Canadians)

Hall, K., J. Arocena and J. Smellie. 2000. Weathering rinds as paleoenvironmental indicators: Evidence from the Cape Roberts drill core (CRP-3). *Terra Antarctica.*

Hicock, S.R. 2000. Mesoscopic analysis of semi-consolidated, non-oriented core of diamictite. *Journal of Sedimentary Research,* 70: 967–969.

Suedfeld, P., and G.D. Steel. 2000. The environmental psychology of capsule habitats. *Annual Rev. Psychology 2000,* 51: 227–253.

Vincent, W.F. 2000. Evolutionary origins of Antarctic microbiota: invasion, selection and endemism. *Antarctic Science,* 12, 374–385.

Research Opportunity in Antarctica

Dr. J. Terhune, University of New Brunswick, Saint John, N.B., expects to have an opening for a hardy male or female M.Sc. student to study Weddell seal vocalizations in Antarctica. The research will examine the vocal behaviours of the seals before the breeding season to determine if calls are used to attract mates or form herds. The student will begin classes at the University of New Brunswick in Saint John in September 2001 and overwinter at the Australian Mawson station in 2002.

Prospective applicants should go to www.antdiv.gov.au and view the "southbound" and Mawson pages.

Contact Dr. J. Terhune, terhune@unbsj.ca, *or telephone (506) 648-5633 for further details.*

CCAR/CCRA Members and Advisers

Warwick Vincent (Chair)
Departement de biologie
Université Laval
SAINTE-FOY, QC G1K 7P4
Tel: (418) 656-5644
Fax: (418) 656-2043
warwick.vincent@bio.ulaval.ca

Olav Loken (Secretary)
1170 Bonnie Crescent
OTTAWA, ON K2C 1Z5
Tel. & Fax.: (613) 225-4234
oloken@sympatico.ca

Eddy Carmack
Institute of Ocean Sciences
Fisheries and Oceans Canada
P.O. Box 6000, Stn. Main
SIDNEY, BC V8L 4B2
Tel: (250) 363-6585
Fax: (250) 363-6746
CarmackE@pac.dfo-mpo.gc.ca

Kathy Conlan
Canadian Museum of Nature
P.O. Box 3443, Stn. D
OTTAWA, ON K1P 6P4
Tel:(613) 364-4063
Fax: (613) 364-4027
kconlan@mus-nature.ca

Kevin Hall (Antarctic Adviser, CPC)
Geography Programme
University of Northern B.C.
3333 University Way
PRINCE GEORGE, BC V2N 4Z9
Tel: (250) 960-5864
Fax: (250) 960-5539
hall@unbc.ca

Wayne Pollard
Department of Geography
McGill University
805 Sherbrooke St.
MONTREAL, PQ H3A 2K6
Tel: (514) 398-4454
Fax: (514) 398-7437
pollard@felix.geog.mcgill.ca

Fred Roots (Antarctic Adviser, CPC)
Environment Canada
351 St. Joseph Boul., First Floor
OTTAWA, ON K1A 0H3
Tel: (819) 997-2393
Fax: (819) 997-5813
fred.roots@ec.gc.ca

Peter Suedfeld
University of British Columbia
2136 West Mall
VANCOUVER, BC V6T 1Z4
Tel.: (604) 822-5713
Fax: (604) 822-6923
psuedfeld@cortex.psych.ubc.ca

CANADIAN POLAR COMMISSION
COMMISSION CANADIENNE DES AFFAIRES POLAIRES

CARN Newsletter

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Please send correspondence to:
Editor, CARN Newsletter
Canadian Polar Commission
Suite 1710, 360 Albert Street
Ottawa, ON K1R 7X7
Tel.: (613) 943-8605
Fax: (613) 943-8607
mail@polarcom.gc.ca
www.polarcom.gc.ca/ccarhome.htm