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NEWSLETTER FOR THE

Canadian Antarctic Research Network

Inside

Joint German-Canadian Research on Seafloor Hydrothermal Activity in Antarctica: Sonne Cruise SO-155

Mark Hannington

In February–March, 2001, two Natural Resources Canada (NRCan) scientists from the Geological Survey of Canada travelled to the Bransfield Strait in Antarctica, as part of the German-Canadian global research project on Seafloor Minerals. The project, led by scientists from the German universities of Freiburg and Kiel in cooperation with scientists from the Geological Survey of Canada, is investigating submarine hydrothermal activity in diverse volcanic and tectonic settings on the ocean floor. This work has direct implications for understanding the formation of economically valuable mineral deposits in ancient terranes now preserved on land.

The Bransfield Strait, which lies along the western Antarctic Peninsula in the King George Basin, bordering the South Shetland Islands (Fig. 1), is one of the few locations on the modern ocean floor where active rifting of a continental margin can be observed. Submarine volcanic and intrusive activity from rifting of the basin floor causes widespread geothermal activity (Klinkhammer *et al.*, 1999) which leaves distinctive deposits of zinc, lead and copper mineralization. The deposits form where submarine volcanoes discharge hot (>300°C) metal-bearing fluids onto the seafloor. Many large base metal deposits, like the Bathurst mining camp in New Brunswick, are thought to have formed the same way.

Several hundred million years ago, the Bransfield Strait region was geologically contiguous with the southern Andes. Since then, subduction of the paleo-Pacific ocean beneath the Antarctic Peninsula has caused rifting of the continental

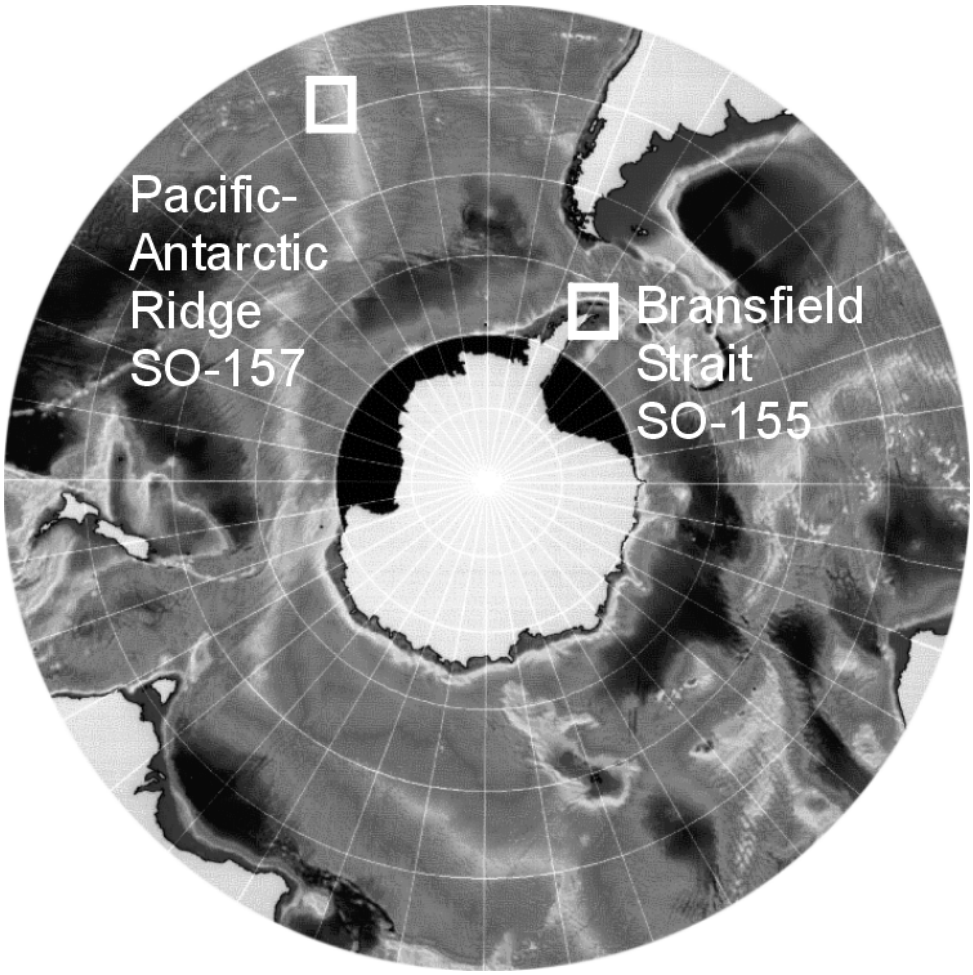

Figure 1
Locations of Sonne research cruises SO-155 (Bransfield Strait) and SO-157 (Pacific-Antarctic Ridge). Predicted seafloor bathymetry from Smith and Sandwell (1997) courtesy of the National Geophysical Data Center (www.ngdc.noaa.gov).

margin and the formation of the Shetland Islands. The volcanic arc was gradually separated from the Antarctic peninsula by the Bransfield Basin. The present-day Bransfield Strait is still an active rift, extending for more than 200 km from Elephant Island in the north to Deception Island in the South. Submarine volcanoes have recently been discovered in a linear array extending along the length of the basin. These volcanoes are associated with active geothermal venting which attracted the research team to the area. (see Fig. 2).

Using the German research vessel *Sonne*, the scientific team, including Prof. Peter Herzig, University of Freiburg, Prof. Peter Stoffers, University of Kiel and NRCan scientists, mapped and sampled the submarine volcanoes and carried out detailed surveys of the seafloor. These included bathymetric mapping of volcanic features on the seafloor, bottom photography and video using towed camera arrays, and sampling with a TV-controlled grab. Deposits of zinc sulfides and barite were located on one of the volcanoes at a depth of 1,100 m. In addition, evidence for older, pre-rift arc-related hydrothermal activity was found at a depth of more than 2000 m in the northern part of the basin. The nearby Deception Island caldera was also investigated. Deception Island is the largest and most active volcano in the region. In the mid-1970s, eruptions in the caldera destroyed a British research station located on the island, but the 300-m

deep caldera is still accessible to ships through a small channel. The team spent several days documenting ongoing geothermal activity on the caldera floor. Through this research, the team has determined that ancient submarine hydrothermal systems responsible for large base metal deposits could have developed in a similar environment.

In June–July 2001, three NRCan scientists participated in a second research cruise (SO-157) to investigate hydrothermal activity along the Pacific-Antarctic Ridge (Fig. 1), where the Pacific and Antarctic plates are actively spreading apart. The expedition located black smoker hydrothermal vents on the southernmost extension of the East Pacific Rise, where it joins the Pacific-Antarctic Ridge. The team is also doing research in the Arctic, investigating the offshore extension of the neovolcanic zone of Iceland.

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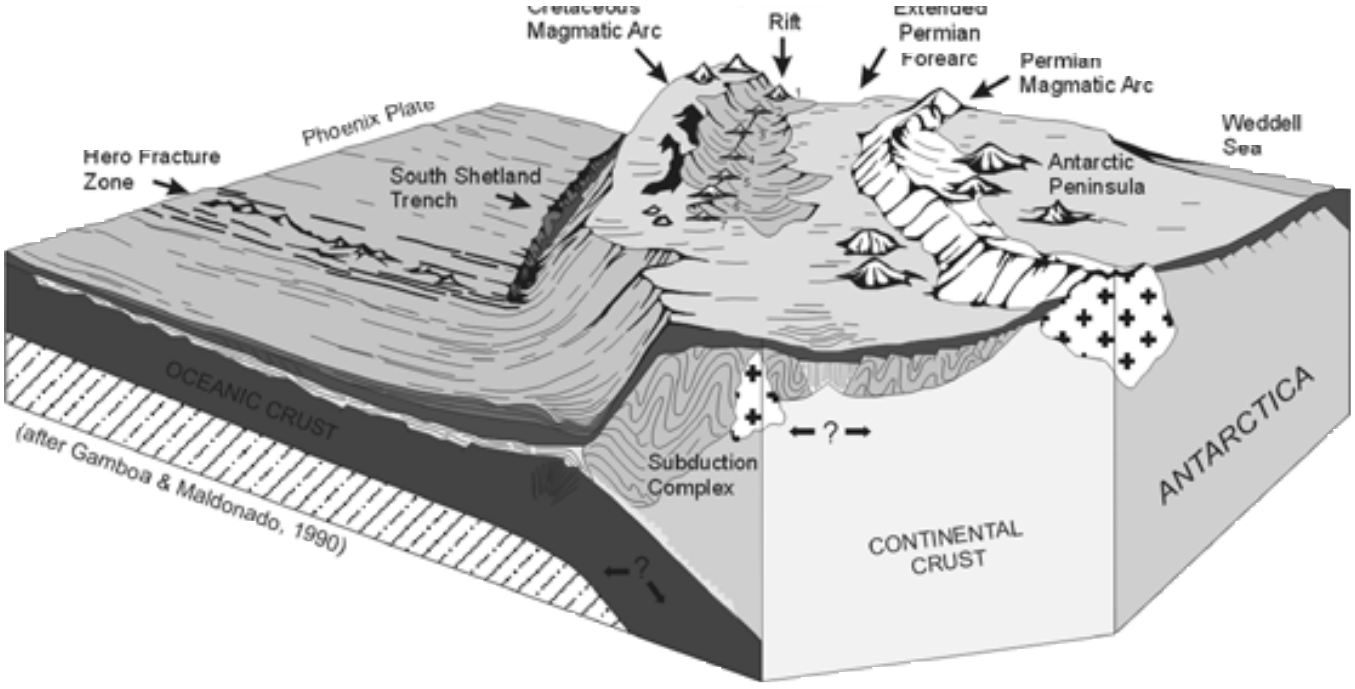
Figure 2

Tectonic model of the Bransfield Strait (modified from Gamboa and Maldonado, 1990), showing the opening of the rifted basin adjacent to the Antarctic Peninsula. For the last 4 million years, the Pacific margin of the Antarctic Peninsula has been a passive margin, but during the Mesozoic-Cenozoic it was part of an active subduction zone. The South Shetland island arc volcanoes were formed by the subduction of the Phoenix plate (proto-Pacific Ocean) along the South Shetland. This convergence ceased when the spreading centre of the Phoenix plate became inactive, about 4 million years ago. In the last million years, volcanism has renewed on at least four of the islands (Deception, Livingston, Greenwich, and King George), coincident with rifting and volcanism in the adjacent Bransfield basin. The newly discovered submarine volcanoes in the Bransfield Strait occur along-strike from Deception Island and are likely centered on the same basement faults.



Understanding the Origins of Antarctic Freshwater Crustaceans

Chris Wilson, Kerrie Swadling and John Gibson

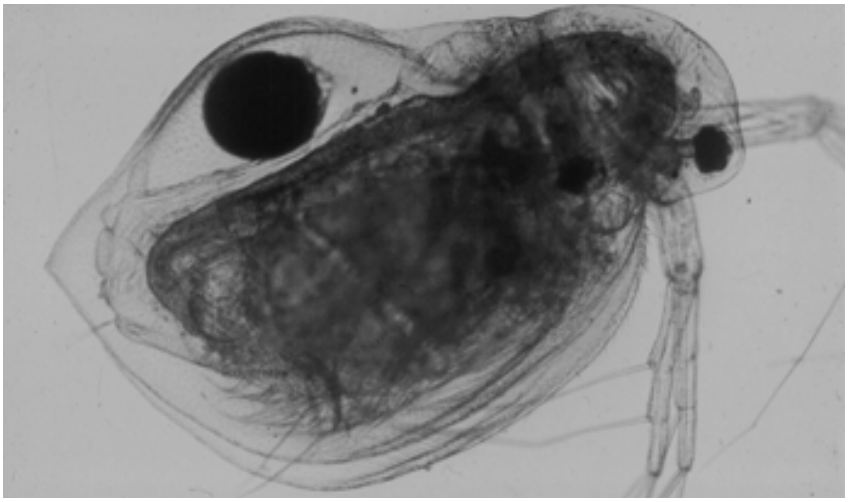
Freshwater lakes located in the limited ice-free areas around the coast of Antarctica generally lack biological complexity, reflecting their low productivity and long zoogeographic isolation both from other Antarctic lakes and from more temperate continents and islands to north. In many cases the only organisms present in the lakes are microbes and protozoans; but in some, notably in areas of east Antarctica, the Antarctic Peninsula and the maritime Antarctic islands, complexity is increased by the presence of one or more species of crustacea, including copepods, anostracans and cladocerans.

Some of these crustaceans are marine in origin, having been trapped in saline water bodies that were progressively isolated from the sea by post-glacial isostatic rebound. Other species occupy freshwater lakes, their occurrence in Antarctica more of a mystery. These species must have survived the Quaternary glaciations, when the Antarctic ice sheet covered most of the low-lying land, in continental refuges, or reached the lakes by invasion from islands and continents to the north. In East Antarctica, only four species of freshwater crustaceans have been recorded: the cladoceran *Daphniopsis studeri,* the calanoid copepods *Gladioferens antarcticus* and *Boeckella poppei,* and the cyclopoid copepod *Acanthocyclops miryni.* We are using genetic methods to resolve where these species and populations came from, as well as their evolutionary and ecological history.

To date, our work has focused largely on the genetic structure and diversity of *Daphniopsis studeri* (Fig. 3), which occurs in lakes of coastal east Antarctica. This species also occurs in lakes on sub-Antarctic islands in the Indian Ocean, including îles Kerguelen, îles Crozet, Prince Edward Island, Marion Island and Heard Island (Fig. 4). We set out to determine whether this species been a long-term resident of Antarctica that somehow survived the glacial periods, or whether it is instead a recent invader from islands to the north. With the help of many colleagues we have assembled a collection of *Daphniopsis studeri* from the Vestfold Hills, the Larsemann Hills, the MacRobertson Land coast, Heard Island and îles Kerguelen. Most samples have come from the Vestfold Hills, a 400 km^2 area of rock that contains numerous freshwater lakes, many of which harbor populations of *Daphniopsis studeri.*

A pilot study of the genetic biodiversity of *Daphniopsis studeri* succeeded in extracting and amplifying DNA from preserved specimens. DNA sequence analysis of several mitochondrial genes (cytochrome oxidase c subunit I, ATPase subunits 6 and 8, and the 12S ribosomal RNA subunit) from populations from the Vestfold Hills, Larsemann Hills, and îles Kerguelen has so far shown only minor intraspecific variation, suggesting a recent common ancestry for all sampled populations. This is consistent with the post-

Figure 3
Daphniopsis studeri reaches a maximum length of about 2.5 mm.



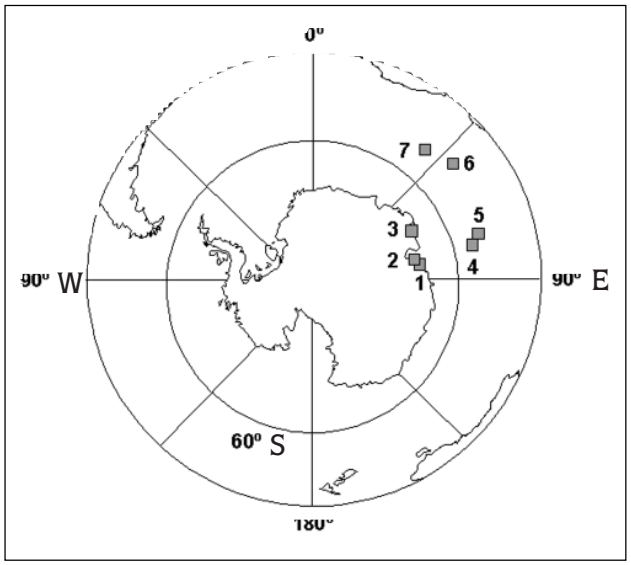


Figure 4
Known distribution of Daphniopsis studeri on southern Indian Ocean islands and the Antarctic continent:

1. Vestfold Hills
2. Larsemann Hills
3. MacRobertson Land coast
4. Heard Island
5. îles Kerguelen
6. îles Crozet
7. Prince Edward Islands.

glacial dispersal of *Daphniopsis studeri* from a sub-Antarctic island to the continent, and implies the current Antarctic populations have only occupied the continent for a relatively short time.

Comparison of the 12S ribosomal RNA sequence of *Daphniopsis studeri* with those of other species of *Daphniopsis,* however, tells a different story. This evidence suggests that *Daphniopsis studeri* separated from its closest relatives, which occur in Australia, approximately 50 million years ago. This is the period when the Australian and Antarctic continents separated during the break-up of Gondwanaland, suggesting that *Daphniopsis studeri* is an endemic Antarctic species that existed in Antarctic lakes well before the onset of glaciation approximately 15 million years ago.

The genetic separation of *Daphniopsis studeri* from other members of its genus, combined with the limited genetic variation of extant populations, suggest that the species' history has been complex. It appears that the species is an Antarctic endemic, but that relatively recently it has passed through a genetic bottleneck, in which only limited populations survived. It may well be that *Daphniopsis studeri* has survived by being able to make use of extra-continental refuges, though how the animals or eggs are transported from the continent to the islands and eventually return is uncertain. However, it is also possible that genetically-distinct populations will be found in the future that will indicate a more complex history. Further studies of genetic structure and breeding characteristics of populations of *Daphniopsis studeri* are continuing using combined allozyme and mtDNA analyses. These ongoing genetic analyses will provide valuable information on the evolutionary history and palaeobiogeography of *Daphniopsis studeri,* and should provide insights into how this species is able to disperse and flourish in Antarctic lakes.

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Chris Wilson is a Research Scientist with the Ontario Ministry of Natural Resources (Trent University). Kerrie Swadling (University of Tasmania) and John Gibson (CSIRO Marine Research) were post-doctoral fellows at Université Laval and are now living in Tasmania, Australia.

Acknowledgments

We thank expeditioners from the Australian National Antarctic Research Expeditions, the Chinese National Antarctic Research Expeditions and the L'Institut Français pour la Recherche et la Technologie Polaires for helping to collect Daphniopsis studeri. Dr. J. Laybourn-Parry provided the picture of Daphniopsis studeri. This work was supported in part by the Linnean Society of New South Wales, and the Australian Antarctic Division provided logistical support.

Contaminants in Freezing Ground Conference: April 14–18, 2002, Hobart, Tasmania

Peter J. Williams

One hundred people from thirteen countries attended the Third International Conference on Contaminants in Freezing Ground in Hobart in April. The conference dealt with polar and other cold regions, and was hosted by the principle sponsor, the Antarctic Division of the Australian Federal Government. Fourteen industrial, international and academic organizations also lent their support. The Canadian government, through the Department of Foreign Affairs and International Trade, provided each participant with a three-volume set of the just-published Proceedings from the previous Conference.

The Hobart conference took place at the Commonwealth Scientific and Industrial Research Organisation Laboratories, in sight of the Antarctic Research vessel *Aurora Australis.* Eleven Canadians participated, and of the 71 papers presented in oral sessions 12 had at least one Canadian author. Papers ranged from cutting-edge scientific research, through field applications and reports of current projects, to a few papers on legal or political questions.

Research studies for cleaning up Antarctic sites received much attention. The Antarctic Treaty has essentially kept military and industrial contamination out of Antarctica, and yet, compared to the extent of contamination, a great deal of contamination research has been done there by Australia and New Zealand, who have considerable interest in the subject and also had the most participants at the conference.

Bioremediation (the use of bacteria to break down contaminants in soil) was the hottest topic. Bethan Stallwood and colleagues from the University of Wales and the British Antarctic Survey presented a remarkable British-Australian paper on the cloning of a DNA fragment which in certain bacteria leads to accelerated breakdown of hydrocarbons at freezing temperatures.

In the conference banquet speech the Hon. Dr. Sharman Stone, M.P., Parliamentary Secretary to the Minister of the Environment announced millions of Australian dollars for Antarctic clean-up. The *Tasmanian Mercury* reported that "Tasmanian firms could reap millions of dollars in contracts as Australia commits to a major Antarctic clean-up ...". Dr. Stone said that this would be the first systematic approach and added that Tasmanian businesses were well positioned to win contracts as part of this work. Conference organizers hope that an appropriate portion of the monies will go to continuing and expanding the necessary research. *(Editor's note: On May 14, 2002, Dr. Stone announced that $102.3 million [approx. $89 million Cdn.] would be allocated to "protect the Australian Antarctic Territory" in 2002–03.)*

Contaminant remediation is a growth industry, as the conference showed. It was evident that Australian companies were seeking international contracts. At the moment countries doing the most potentially rewarding research appear to be Russia, Norway, United States, Britain, Australia and New Zealand; this list is neither exclusive nor a ranking. Little funding has been available for Canadian research and training in this specialist area and Canadian firms are thus not well prepared to compete with the latest technologies.

In contrast to the extensive research being done in the South, in the Northern Hemisphere billions of dollars are being spent on remediation with little regard to the research that could reduce costs. The research required is basic, and often similar in the various locations. There are concerns over pipeline construction in Russian and North American permafrost regions and the significance of possible pipeline failure. Nuclear waste disposal and other constructive industrial activities in the Northern hemisphere require a more

sophisticated knowledge of the physics, chemistry and thermodynamics of freezing ground in order to limit contamination events. Freezing of soil represents such a fundamental process of change that treatment of contaminated ground in temperate lands with winter freezing (Southern Canada, United Kingdom, parts of France, the Scandinavian countries, Italy and elsewhere) requires specific consideration of its effects. Russia, with the most costly contamination to deal with and probably the greatest knowledge in the relevant scientific fields, will certainly welcome international financing and foreign company involvement.

The international media showed considerable interest in the conference. As International Chairman for the Conferences the undersigned had 16 officially-recorded media contacts. In addition to the official news conference, participants were interviewed by ABC television, Associated Press, and by radio journalists in English, French, Italian and Norwegian. Although the National Post interviewed several participants, there have been no known "sightings" of any Canadian media exposure.

It is clear that cold region contaminant issues are becoming more topical. Participation at the Conferences is steadily increasing: attendance at the first, in 1997, was 33; at the second, in 2000, 59 (both were organized by Carleton University's Geotechnical Science Laboratories in association with the Scott Polar Research Institute); and as mentioned above, 100 attended the Hobart conference. The next Conference will take place in Alaska in 2004, and over 200 participants are expected, as is substantial industrial and governmental support.

For further information see www.freezingground.org. For additional information contact: Peter J. Williams, Distinguished Research Professor, Carleton University, Ottawa, Ontario. E-mail: pjw1005@magma.ca.

Prof. Williams is also Chair, International Committee for the Conferences on Contaminants in Freezing Ground.

Some Recent Canadian Contributions to Antarctic and Bipolar Science

(Names of Canadian co-authors are underlined.)

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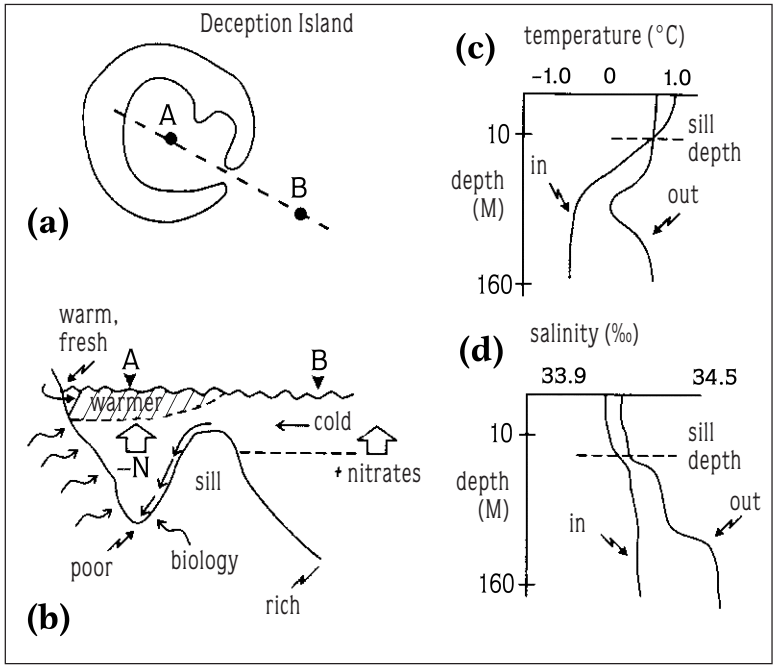
Students on Ice Cruise Affords Opportunity for Research at Deception Island

Kathy Conlan and Eddy Carmack

"Students on Ice" is an Ottawa-based polar teaching expedition that gives teenagers the opportunity to experience the Antarctic and the Arctic in a learning environment. Two-week cruises are offered to the Antarctic Peninsula in December–January and to the Canadian High Arctic and Greenland in August. Although tight itineraries limit the amount of time at a location, the education team members make scientific measurements, which provide an opportunity for student involvement. In December 2001, Eddy Carmack and Kathy Conlan took advantage of a four hour visit to Deception Island off the west coast of the Antarctic Peninsula to assess the water masses and marine biota inside and outside the volcanic island's caldera. Following is an account of their findings.

Deception Island is a 14 km wide, horseshoe-shaped island 115 km west of the Antarctic Peninsula. It is volcanically active, and the centre is a water-filled crater, known as a caldera. The 7 km wide caldera, named Port Foster, is accessible through a narrow breach, called Neptune's Bellows. Deception Island has had a long history of human activity, including exploration, sealing and whaling, aviation, scientific research, and tourism. In 2000–01, 7,065 tourists landed at Whalers Bay in Port Foster, one of the most popular sites in Antarctica. Argentina and Spain have summer research bases there, and Chilean and British stations were abandoned after volcanic eruptions around 1970. Deception Island is of interest to scientists because of its volcanism, numerous penguin colonies, natural harbour, geology, and surface permafrost. Our marine interest was to determine

Figure 5
Deception Island site characteristics.



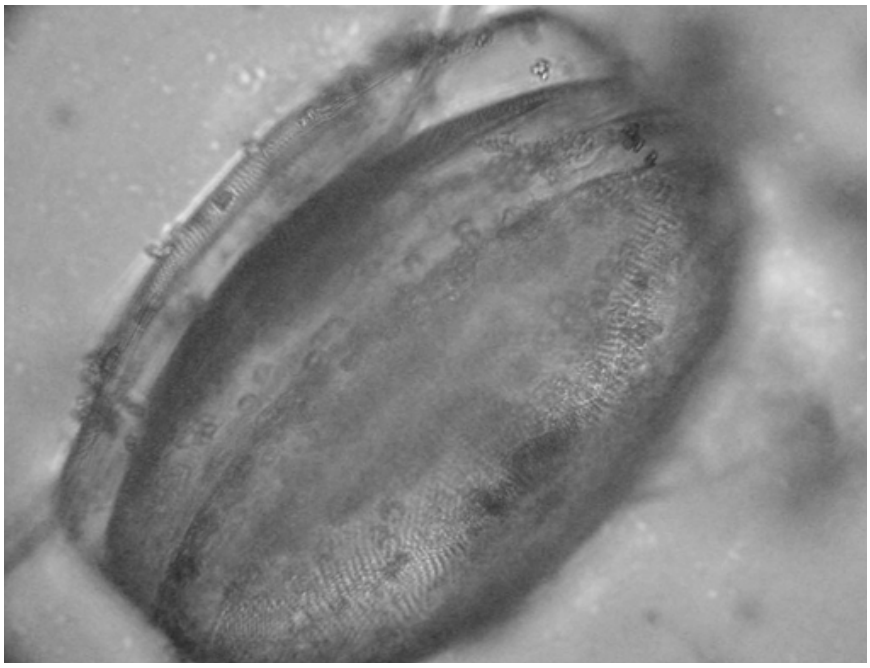


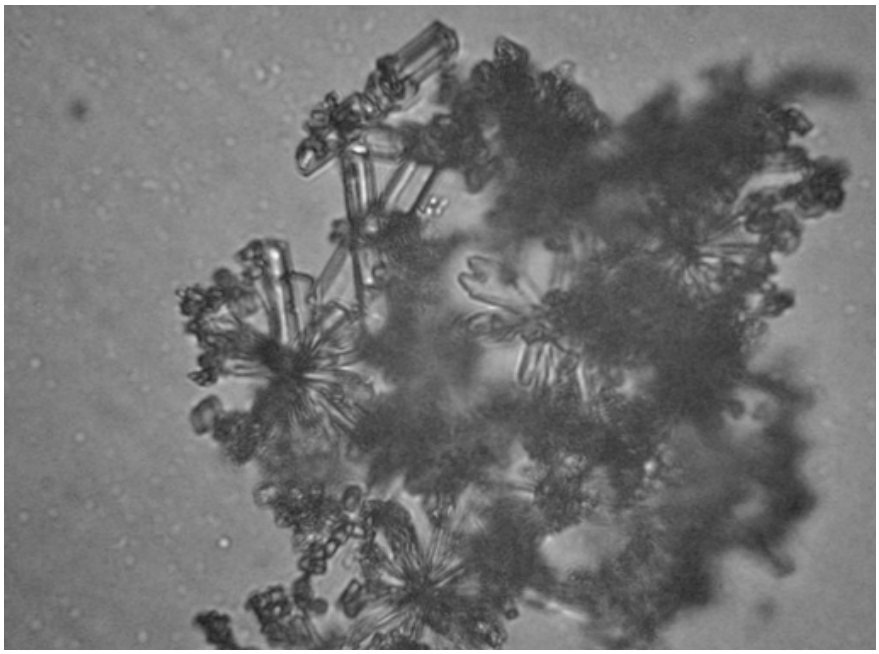
Figure 6
Diatoms inside the caldera: Coscinodiscus sp. is a large, round diatom. Shown here are the top and bottom "lids". Diameter about 40–50 µz

how diverse was its biota, given the nearly enclosed bathymetry of the caldera. Our hypothesis was that the water in the more than 300 m deep caldera must receive reduced flushing from open water because the single access through Neptune's Bellows is narrow and about 20 metres deep. We also wondered whether the hydrothermal activity would influence water temperatures within the caldera, given that beach temperatures in some areas reach 99°C (Dykes *et al.,* 2001).

Water masses

Figure 5a shows a sketch of Deception Island and the location of our water sampling stations inside and outside the caldera. Figure 5b shows a profile through Neptune's Bellows and the location of the shallow sill. Graphs of temperature and salinity versus depth are shown in Figures 5c and 5d. Surface waters inside the caldera are warmer than those outside, and vice versa for waters at depth; from this comparison there is no obvious signal of geothermal heating inside the caldera. Surface waters inside the caldera are fresher (and thus less dense) than those outside, and would therefore be expected to exit the caldera as a shallow surface flow. Waters at depth inside the caldera have the same salinity as those of surface waters outside. From this, we conclude that the deep waters inside the caldera are drawn from surface waters outside. These deep waters might be expected to be lower in nutrients than outside because they will become stratified (although we did not measure nutrients to confirm this hypothesis). If so, it may follow that algal production

Figure 7
Nitzschia sp., a crystal-shaped diatom, was abundant attached to clumps of sediment suspended in the water column. Length about 10 µ.



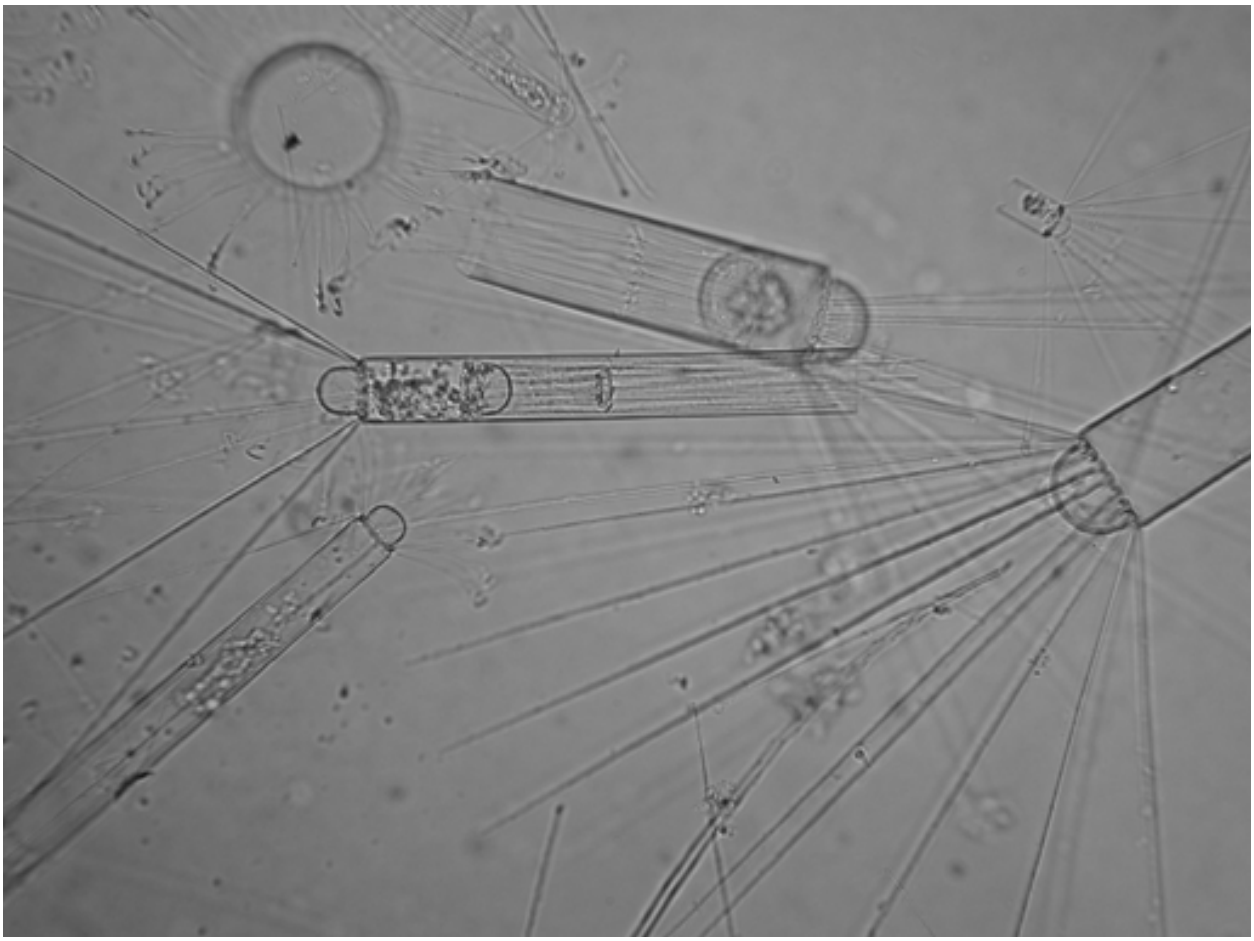
inside the caldera is actually less than in the surrounding ocean.

Biota

Vertical plankton tows taken inside and outside the caldera showed a contrast in diatom content (see figures). Diatoms are single-celled, glass-covered protists, typically a few hundredths of a millimetre in diameter, that are widely consumed by krill, copepods, and bottom-living animals. Krill and copepods are the essential food of penguins, sea birds, seals and whales. Like plants, diatoms employ chlorophyll to manufacture starches and sugars using the sun's energy, and are thus the foundation for the ocean food web. Chlorophyll levels were much higher outside the caldera than inside. This was due to the dominance of the large tubular diatom *Corethron criophylum.* Although diatom biomass was lower inside the caldera than outside, abundance was about equal, due to the large number of *Nitzschia* sp. attached to suspended sediment particles. The large, circular diatom, *Coscinodiscus* sp., also typified the phytoplankton inside the caldera. The chain-forming, spiny diatom *Chaetoceros* sp. was rare but present both inside and out.

Copepods were the most common zooplankton found with the diatoms, both inside and outside the caldera. However, krill could have easily avoided the slow-moving net, and are known to be common diatom-feeders in the caldera

Figure 8
Diatoms outside the caldera: Corethron criophilum dominated the diatom biomass in the water column outside the caldera. It is a large tubular diatom with a ring of long spines at either end that aid in floatation. The circle in the upper left is an end-on view. Diameter about 10–15 µ.



along with salps (http://smithlab.ucsd.edu/erupt_man/Ron_files/frame.htm). Arrow-worms (chaetognaths), and the swimming snails *Limacina antarctica* and *Clione antarctica* also occurred outside the caldera.

A benthic dredge at 10 m depth along the coast of Whalers Bay brought up an abundance of the finger-shaped macroalga *Halosaccion* sp. and the sea urchin *Sterechinus neumayeri.* Detritus-feeding and scavenging amphipods were especially abundant, along with the deposit-feeding clam, *Yoldia eightsi.* Numerous other macroalgae were found washed up on the beach of Whalers Bay, indicating that this is a rich environment. Pictures of all these organisms can be seen on the Students on Ice web site, www.studentsonice.com/cip/ index.cfm/main,28,en,212,1819,1687,0,3.

Ken Smith and his colleagues at Scripps Institute of Oceanography (http://smithlab.ucsd.edu/Antarctic/Antarctic%20Ecology.htm and http://smithlab.ucsd.edu/) have established a large research program in the Deception Island caldera to determine seasonal changes in response to ice cover. Their findings show that nutrient levels are high in the thermally warmed coves. The pelagic marine life varies in abundance with depth and season and the bottom-living fauna are diverse and typical of Antarctic coasts.

Conclusions

Our brief look at the physical and biological oceanography of Deception Island raised more questions that it answered.

Figure 9
Chaetoceros sp. infrequently occurred both inside and outside the caldera. It consists of a chain of diatoms, each cell with two spines. Diameter about 15–20 µ.

We could – and should – learn more about the oceanography and biology of such systems with further observations. Our sparse measurements can hardly be representative of the system. What is the magnitude of seasonal and interannual variability? Clearly, scientists such as us participating in innovative programmes such as "Students on Ice" benefit from the logistics of reaching isolated regions, but more importantly we benefit from the wave of curiosity that comes with students experiencing the polar regions for the first time.

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Acknowledgements

Paul Hamilton of the Canadian Museum of Nature identified the diatoms. Photographs are copyright Kathy Conlan, Canadian Museum of Nature.

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Book Review: *Antarctica*, by Pat and Rosemarie Keough

Alan Morantz

Antarctica, Pat and Rosemarie Keough. Salt Spring Island, B.C., Nahanni Productions, 2002 (Explorer Series; v. 1, 336 p.). Limited edition of 950 books, signed and numbered, plus 45 artist's proofs and 5 production proofs, in linen and velvet presentation box. ISBN 0-9692557-5-6, $2,500 US.

I have been reviewing books since my high school journalism days some thirty years ago, everything from photo books meant to sit unopened on a coffee table to wildlife guides designed for tramping through a tide pool. But I have never been asked to critique a book that costs $2,500 US, weighs 27.6 pounds, and has a print run of a mere one thousand copies. Until now.

The "book", which is rather an inadequate word to describe this product, is titled *Antarctica,* and is the creation of photographers Pat and Rosemarie Keough of Salt Spring Island, B.C. It features a workmanlike essay on the luminous qualities of the polar region that serves as an introduction to 330 photographs showing the region's natural history and designs, wildlife, and human contact both past and present. As beautiful as the images are, *Antarctica* is as much about astonishing production values as editorial qualities. It is, in fact, hard to assess the book in classic terms: as a compendium of ideas, images, and information. Rather, you must first confront the physicality of the object itself, and as such it is a sumptuous affair.

Once it is unpacked from the delivery box, you notice a hand written card that offers instructions on how to take out the book from its linen and velvet protective case. It reads: "To remove *Antarctica* once the presentation box is open, take hold of the book halfway down the spine with the left hand. Slide the book about 2 inches (5 cm) to the left until the right edge can comfortably be grasped at the

mid point. Lift the book out with two hands. In this manner the book will have cleared the support block. To replace the book, the reverse is necessary."

You follow instructions, find the notch, lever out the book, run your hand over the luxurious goatskin, then in you go. You are greeted by flocked velvet doublures and fly leaves. The tactile experience continues as your eyes run over the razor sharp images printed on 100-lb enamel-coated cover stock (the Keoughs say the paper was custom-made to ensure the paper grain of the finished pages would run parallel to the book spine). The book opens flat with confidence thanks to the careful hand-sewn binding with Irish linen thread.

Everything about the production says this is a work of high craftsmanship. But is it also a work of high editorial impact? The ungainly bulk of the book, and its cost, can discourage you from cracking it open while curling up on a couch, unless you want to risk intestinal bruising. The pages are so thick that you find yourself continually checking if you have turned two or three rather than one. But even when you rest the book on a sturdy table and gingerly turn the pages you cannot help but be drawn in by the freshness of the images, their beauty and drama. On one spread, for example, you are confronted by two startling photographs: a pack of Adélie penguins cavorting in krill-stained excrement and a detailed study of water-sculpted stone at tide line on Two Hummock Island.

The 330 photos cover a wide range of moods and conditions: the absurdity of climbers scaling an iceberg in Penola Strait; a leopard seal rising from icy depths; butting images of red and green snow algae; tendrils of blue ice at the base of Mount Geissel; skuas over shattered panes of ice floes; remains of an Adélie picked over by birds; penguin quills in meltwater; first light casting an electric blue tinge on an iceberg off Brabant Island; the hull of the steaming Rotterdam emerging from behind an iceberg. Spare captions allow the images to command the pages. Perhaps they are too commanding; the book would actually have more editorial impact with at least 50 fewer photographs. The repetition is something to be expected, and perhaps indulged, in so personal a project. Some odd pacing decisions are harder to understand: images of the whalers' station at Whalers Bay, for example, are separated by two hundred pages.

Antarctica is the first in what the Keoughs are calling the "Explorer Series". All net proceeds from the sale of the book will go to support the conservation and restoration of albatross populations around the world. Nationalists would be happy to know that this massive project was executed by Canadians and printed and bound in Canada. This should be considered a significant publishing milestone in this country.

It is also significant testimony to one of the oddest places on Earth. After reaching the final page, you come to realize that Antarctica the crafted book is in fact a fitting tribute to Antarctica the enveloping and crackling environment. You want to meet both with your mind engaged, but in worlds such as these, the intellectual or philosophical approach seems wholly inadequate. Faced with goat-leather binding or katabatic winds whipping glacier-encrusted mountain ranges, there really is little time to think. Experience is all.

Former editor of Equinox magazine, Alan Morantz is a writer and editor based in Kingston, Ontario. His book on maps and Canadian identity will be published by Penguin Canada this fall.

Ordering information

Antarctica, by Pat and Rosemarie Keough; Nahanni Productions Inc., 400 Meyer Road, Salt Spring Island, B.C. V8K 1X4; tel. 250 653 4993; fax 250 653 4994; keough@saltspring.com; www.keough_art.com.

News in Brief

Allan Rock, Minister of Industry and Dr. David Strangway, President of Canada Foundation for Innovation recently announced funding "**... for a research icebreaker for Canadian scientists to study the changing Arctic Ocean and global climate change issues.** Canada will now have its own state-of-the-art dedicated research icebreaker to navigate the ice-locked waters of the Arctic. This ship − a national facility − will be home to world-class Arctic scientists doing research in Canada, with Canadians and for Canadians. This essential infrastructure will provide the platform for the training of the next generation of arctic researchers and will help build a bigger, stronger Arctic research community in Canada. Researchers and graduate students will in particular be looking at the effect of global warming on marine life and on ocean processes and the weather. The ship and its high technology equipment will generate an enormous amount of interest globally and **will enhance Canada's international partnerships in this key area of research." Congratulations to Dr. Louis Fortier, Université Laval and the team that prepared the application.**■

A workshop to plan the further development of the **Cybercartographic Atlas of Antarctica Project** (CAAP) was held at Carleton University in Ottawa from May 22−24, 2002. Prof. Fraser Taylor, Director of Carleton's Geomatics and Cartographic Research Centre (GCRC), and the Canadian representative on the SCAR Working Group on Geodesy and Geographical Information (WG-GGI), chaired the workshop which was attended by delegates from Argentina, Australia, Canada, China and the United States. The CAAP was formally adopted as an official WG-GGI project at a meeting of project coordinators in Siena in July, 2001 and more detailed plans were developed at a workshop in Puerto Madryn, Argentina in November 2001. The focus of the recent workshop was on further developing the concept and content of the atlas, and on how to present these to the forthcoming XXVII SCAR meetings in July 2002.

Dr. Taylor mentioned that production of the Atlas will be greatly facilitated by building infrastructure and equipment obtained through a **$4.5 million grant from the Canadian Foundation for Innovation (CFI) to Carleton's Human Oriented Technology Lab,** one of the GCRC's partners. The GCRC has obtained significant development funding for the preparation of a major proposal that will be submitted to the Social Science and Humanities Research Council of Canada (SSHRC) under its new Initiatives on the New Economy program. If successful, a portion of that funding will be used to produce the CAAP.

The workshop was supported by grants from the Canadian Department of Foreign Affairs and International Trade and the Social Sciences and Humanities Research Council of Canada. For details contact Dr. Fraser Taylor. E-mail: Fraser_Taylor@carleton.ca.■

Prof. Julia Foght, Department of Biological Sciences, University of Alberta, has won a **Petro-Canada Young Innovator Award** (YIA) for her study of **"Potential for 'self-cleansing' of fuel-contaminated Antarctic soils".** Her team has discovered non-photosynthetic nitrogen-fixing bacteria with the ability to degrade spilled fuel hydrocarbons. Prof. Foght is investigating the potential these bacteria may have for natural bioremediation in fuel-contaminated soils in the Ross Sea Region. The annual Petro-Canada awards recognize and support outstanding young faculty researchers from across Canada whose academic work "enhances the learning environment in the department in which they study and has the potential to be significant to society". Congratulations, Julia!■

Warwick Vincent, Past CCAR Chair (1999−2002) has been elected a **Fellow of the Royal Society of Canada.** The Royal Society fellowship is Canada's most prestigious acade-

mic honour. Prof. Vincent's citation from the Society reads: "Warwick Vincent, Canada Research Chair Professor of Aquatic Ecosystem Studies at Laval University, is a world leader in polar microbial ecology. He has pioneered unique insights into microbial interactions that link the structure and functions of communities at the base of aquatic food chains in the Subarctic, Arctic and Antarctica. He has made novel observations and experiments to reveal the responses and adaptations of microbial communities and cryo-ecosystems to underwater light and temperatures changes, and their mechanisms of acclimation to changes in UV radiation. His research and ability to synthesize studies from different parts of the world are having a major influence in international polar science. Much of this is by his leadership of multi-nation research initiatives. He has published several books and more than 150 scientific articles in leading journals." Congratulations, Warwick!

Dr. Vincent joins two other CCAR members/advisers who are already Fellows: **Dr. Fred Roots** and **Prof. Peter Suedfeld,** who for almost six years (1993–99), chaired the Canadian Antarctic Research Program that preceded CCAR.■

In early April 2002, Hamilton College, Clinton, New York hosted a **NSF sponsored workshop on "Antarctic Peninsula Climate Variability: A Historical and Paleoenvironmental Perspective".** About 120 academics and students from eleven countries participated, including **Prof. Robert Gilbert (invited speaker) and Dr. Randy Dirszowsky from Queen's University.** The very rapid disintegration of the Larsen Ice Shelf on the east side of the Peninsula, especially in 1995 and 2002, focused lively discussion on the importance of an interdisciplinary approach to understanding the impact of the unprecedented climate warming that has occurred in this region. Two keynote speeches set the stage for 12 oral presentations and 25 posters. Topics included glacimarine geology, oceanography, glaciology, climatology, geomorphology, and marine biology. Abstracts are available on the conference website: http://academics.hamilton.edu/workshops/antarctica/. The American Geophysical Union will publish full papers from the conference by mid 2003. For further details, contact Prof. R. Gilbert, e-mail: gilbert@lake.geog. queensu.ca.■

Workshop on Modelling Antarctic Ecosystems at University of British Columbia, April 14–17, 2003. The UBC Fisheries Centre will host an international workshop to focus on the problems and potential in modelling marine Antarctic ecosystems. Sessions are planned on:

- capturing the critical features of Antarctic ecology in models;
- models of Antarctic ecosystems;
- forecasting the impacts of fisheries and climate change on Antarctic ecosystems;
- management issues for Antarctic fisheries;
- mapping the status of Antarctic ecosystems.

Focus will be on krill, fish, marine mammals and seabirds. Edited proceedings from the workshop will be published as a Fisheries Centre Research Report. For more details contact: events@fisheries.ubc.ca.■

***Antarctica: "... to a lonely land I know",* by Ken Pawson, of Calgary,** was recently published by Whippoorwill Press, www.whippoorwillpress.com. ISBN 0-9681675-1-9, $28 Can. In the 314-page well illustrated book (about 70 b&w photographs), Ken describes the two winters (1948 and 1949) he spent in Antarctica with FIDS (Falkland Island Dependencies Survey), where he served first as meteorological observer at Port Lockroy, and then as surveyor at the Admiralty Bay base. The book is a **vivid testimony to a young man's excitement over Antarctica** during an era only imagined by most current Antarctic field scientists. After returning from Antarctica, Ken worked as a surveyor in several parts of the world before taking up a position as Land Surveyor for the City of Calgary in 1961.■

"Canadian Antarctic Research Activities 2000–2002" will be presented to the Scientific Committee on Antarctic Research (SCAR) at its meetings in Shanghai, July 14–26. The report describes briefly the activities at various government agencies, universities, and in the private sector and lists 62 scientific and technical papers published by Canadian scientists during the last two years. The report is available on the web site of the Canadian Polar Commission (www.polarcom.gc.ca) under Antarctic. Hard copies can be obtained from the CPC offices, Ottawa. Tel: (613) 943-8605, or E-mail: mail@polarcom.gc.ca.■

Paul Landry of NorthWind Arctic Adventures, Iqaluit, NU, led a three man **"Ski South Pole"** party from Hercules Inlet to the South Pole, where they arrived January 28, 2002 after a 58-day trek. Adventure Network International arranged the tour.■

At least **three Canadian companies plan voyages to Antarctica** during the 2002–03 tourist season: Fathom Expeditions Inc, Toronto (www.fathomexpeditions.com), Students on Ice Ltd., Ottawa (www.studentsonice.com), and Polar Star Expeditions, Oslo/Halifax (www.polarstarexpeditions.com).■

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