

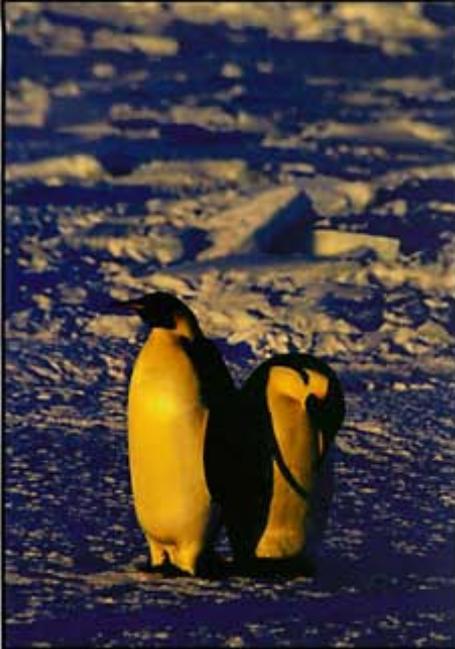
# ANTARCTIC



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## COVER



*A pair of Emperor penguins on the ice near Cape Bird. Photo by Tim Hay (2006).*

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**Editor's note:** Included with this issue of "Antarctic", is a souvenir brochure celebrating the successes of the Commonwealth Trans-Antarctic Expedition. It was produced privately for a recent reunion event held in Christchurch and copies were generously provided for every NZAS member.

# On board the *Explorer*

Chris Dolder tells of his adventures last season working for GAP Adventures

Joining GAP Adventures allowed me back to the ice for my third season in a row, this time as an Assistant Expedition Leader, guide and Zodiac driver aboard the legendary expedition ship, *Explorer*.

Our itinerary covered the South Shetland Islands and the Antarctic Peninsula, crossing the Drake Passage from Ushuaia, southern Argentina. My role is varied, looking after one hundred passengers of 15 nationalities aged between 14 and 91. Yes, you have to be a 'people' person to love this job!

Enthusing passengers is easy, I'm just as excited as they are. I enjoy guiding and get a kick out of enriching my passengers' experience. It's a privilege to experience the history and stunning wildlife and scenery.

I start at 0600 at the bridge to record our position and meteorological observations before sharing an early-bird pastry with other restless sleepers. We're usually close to our first destination of the day and there's an atmosphere of anticipation.

Passengers are (unsurprisingly) keen to see lots of ice, so touring around 'Iceberg Alley' at the end of the Lemaire



Above: Chris Dolder (middle) with other members of GAP crew in Vernadsky bar. Photo by Chris Gilbert.

Channel hits the mark especially when it snows, damping out sound to give a mysterious, enchanted feel.

We're no strangers to the bases around the Peninsula, and the people on the bases love to talk about their research. Base staff gives us a friendly welcome and we provide a few additions to their menu. My favourite base is Vernadsky (Ukraine) station, previously Faraday base (British Antarctic Survey). Amongst other perks, they have a bar to rival the one at New Zealand's Scott Base!

Last season, a crew-member conducted hydrophonic research on Orca whales from our ship. Listening to a pod of Orcas is really special - pods from different



Above: Leopard seal attacking Chinstrap penguin. Photo by Chris Dolder.

populations sound different - like accents of the same language. Expeditions also carry a strong sustainability theme and 'walk the talk' to support fair trade and reduce exploitation and pollution. A full member of the International Association of Antarctica Tour Operators (IAATO), GAP also supports the Save the Albatross campaign.

There's never a dull moment, and there is always the opportunity to learn from the experts at their passenger lectures. I also share my experience, of living in an Antarctic field camp on the Ross Ice Shelf as part of the Gateway Antarctica Graduate Certificate in Antarctic Studies Course.

Whether we're watching Peale's dolphins leaping in *Explorer's* bow wave or getting an introduction to the locals from a Zodiac, there are plenty of special moments. Witnessing Leopard seals hunt alongside colonies of Gentoo and Chinstrap penguins was gripping. I'd never seen something stripped inside out before! Drifting on a huge flat bay, flanked by towering walls of ice, watching a Humpback whale surface to exhale, I realised I'm one of those lucky people who can say 'I love my job'.

Chris Dolder is a graduate of the University of Canterbury's Graduate Certificate in Antarctic Studies (2004/05). Further information about GAP Adventures can be found at [www.gapadventures.com](http://www.gapadventures.com).



Above left: Zodiac approaching coast. Above right: Chris on snow patrol. Photos by Steven de Rooy.

## ALIENS IN ANTARCTICA

The Australian Government Antarctic Division has been instrumental in leading the way to prevent introduction of non-native species into the Antarctic region. New Zealand has also recently held a workshop on preventing non-native species in the Antarctic. Now the Spring 2006 edition of the *Australian Antarctic Magazine* reports that a new Alien Invertebrate Collection Kit, developed by environmental officers at the Australian Government Antarctic Division, is available on ships and stations to enable expeditioners to collect anything "suspicious".

Alien invertebrates can stow away on personal clothing, baggage, food and in ships' cargo and may eventually make it via these to Antarctica. Antarctica is still relatively pristine and the introduction of non-native species to Antarctica poses a threat to Antarctic animals and plants.

Despite strict quarantine procedures for food, vacuuming of clothing and baggage, and the scrubbing and sterilisation of footwear, aliens will still find their way into Antarctica. As tourist and scientist visits increase, so will the risk of invasion. The alien invertebrate kits provide an efficient collection and cataloguing process that will allow the Antarctic Division to identify the most common aliens carried into Antarctica and where they are coming from. The kits include collection vials, bar codes and instructions for reporting the find on the Antarctic Division's incident reporting system, which enables tracking of the samples in an alien invertebrate database.

## Erebus Chalice Heads South for Another Season

Excerpt courtesy of *The Antarctic Sun*

As this year's summer season was about to get started in Antarctica, an annual ritual was repeated in downtown Christchurch, New Zealand – the asking of God's blessing on all of those heading south to work on the Ice. After this service, which is always the Sunday before the first flight south for the summer season, the Erebus Chalice was handed over, as is tradition, for its trek south to McMurdo Station on Ross Island, Antarctica.

The silver chalice is passed from ChristChurch Cathedral in New Zealand into the care of a Protestant military chaplain from the United States, binding together people of different nations, faiths and walks of life. The chalice then spends the summer season at the Chapel of the Snows, McMurdo Station. That same unifying spirit is embraced by the chaplains who are charged with caring for the chalice and ultimately returning it to its winter home in ChristChurch Cathedral at the close of the season.

The austral summer season always has two chaplains on the Ice – a Protestant from the U.S. Air National Guard and a Catholic priest from New



Above: The Erebus Chalice. Photo from ChristChurch Cathedral archives.

Zealand. Each is on the continent for up to two months, this year three Protestant and five Catholic chaplains will serve together over the course of the season. They are stationed at McMurdo but also make monthly trips to the South Pole. Additionally, they offer their services to nearby Scott Base and have lunch there once a week.

## SNOW DAMAGE TO HISTORIC HUT

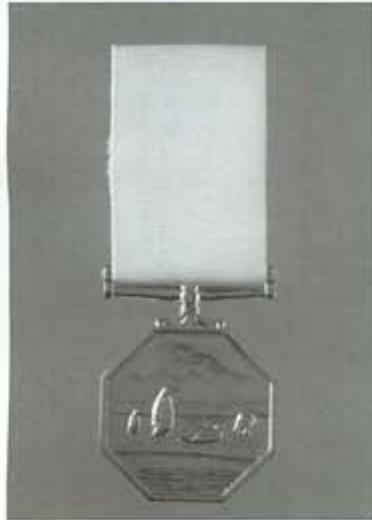
Four Antarctic Heritage Trust (AHT) conservators spent the early part of the summer season digging out Scott's Hut at Cape Evans. John Henzel of *The Press* reported that the hut was being buried under record snow drifts which meant conservators spent a week shovelling 85 tonnes of snow from around the Cape Evans Hut in a bid to prevent more damage to the fragile structure. The drifts appeared to be 1/3

bigger than any around the hut previously.

AHT's Director, Nigel Watson, said that AHT was looking at a range of options to help the site cope better with winter snow accumulation. Any strategy to better manage the problems with snow and ice accumulation would need to be approved before its implementation.

# Royal Approval for New Zealand Antarctic Medal

## FINAL REPORT RELEASED ON ATCM XXIX



The Prime Minister of New Zealand, Helen Clark, announced that the Queen has approved the institution of The New Zealand Antarctic Medal.

The new Medal replaces the British Polar Medal and continues the tradition begun in 1904 of recognising the significant contribution which New Zealanders have made, and continue to make, to the protection and knowledge of Antarctica. Helen Clark said that the criteria for the award of the Medal were developed in close consultation with those organisations with a close interest in the Antarctic.

The Medal may be awarded to New Zealanders and other persons, who either individually or as members of the New Zealand programme, have made an outstanding contribution to either exploration, scientific research, conservation, environmental protection, or knowledge of the Antarctic region, or in support of New Zealand's objectives or operations, or both, in Antarctica.

"The New Zealand Antarctic Medal is an important addition to New Zealand's honours system. The

first recipients will be announced in the 2007 New Years Honours list.

"In keeping with the importance to New Zealand of the Antarctic region, the new Medal will enjoy a precedence comparable to that of the Queen's Service Medal. Recipients will be entitled to use the post-nominal letters "N.Z.A.M." and, in addition, will receive their awards at the regular investitures at Government House.

"The new Medal will be made of Sterling Silver, and retains the famous octagonal shape and white ribbon of the Polar Medal. The reverse design shows a group of four Emperor Penguins on an Antarctic landscape with Mt Erebus in the background. The obverse bears an effigy of the Queen and the inscription Elizabeth II Queen of New Zealand. The Medal was designed by Phillip O'Shea, CNZM, LVO, New Zealand Herald of Arms," Helen Clark said.

Further information may be found on the Honours Secretariat website "<http://www.honours.govt.nz/>" [www.honours.govt.nz](http://www.honours.govt.nz)

The English version of the Final Report of the XXIX Antarctic Treaty Consultative Meeting (ATCM), held in July in Edinburgh Scotland, was printed in October 2006.

The Antarctic Treaty Secretariat has distributed almost 200 copies to more than 50 ATCM Parties, Observers and Experts throughout the world.

The report includes all the measures adopted by the ATCM in Edinburgh between 12 and 23 June 2006.

With 563 pages and more than 15 coloured maps, the book is organised in four main parts: the report of the meeting; the Measures, Decisions and Resolutions adopted by the Parties to the Treaty; a series of additional reports, and supplementary documents such as lists of participants and national contact points.

An online version of the book is available free of charge in the documents section of the Secretariat's website [www.ats.aq](http://www.ats.aq), under Final Report.

In the Silver Jubilee year of India joining the Antarctic Treaty, New Delhi will host the ATCM for the first time. The ATCM will take place from 30 April to 11 May 2007.

## NEW CHART FOR BALLENY ISLANDS

The Balleny Islands hydrographic chart has been produced by LINZ. A digital copy can be downloaded from: <http://www.hydro.linz.govt.nz/charts/catalogue/catalogue.asp?chart=14912&page=index.asp>

Further information can be found at [www.linz.govt.nz](http://www.linz.govt.nz).

# Appointments made in Public Affairs and Antarctic Programme

In November, Antarctica New Zealand welcomed Public Affairs Advisor Keiran Bleach to the team.

A Cantabrian, Keiran has returned to Christchurch to live after 11 years in Wellington, where she worked as a journalist for several years. She fulfilled a childhood dream of becoming a sports reporter when she landed a job with *The Evening Post* newspaper. After a two-year stint overseas travelling and working for London-based *New Zealand News UK*,



Keiran returned to Wellington to work as a sub-editor and then a sports reporter for *The Dominion Post*.

Three years ago she made the move from journalism into communications and public relations. Keiran worked as media advisor to Hon Annette King, who was then the Min-

ister of Health. She said this provided plenty of challenges because health is such a controversial topic, and the media were always keen to tackle the Minister about the latest perceived problem or controversy within the health system.

Keiran has also gained broad experience in public sector communications, working for government departments such as Land Information New Zealand (LINZ) and the Ministry of Agriculture and Forestry (MAF).

Keiran said she is delighted to be working for such an interesting and dynamic organisation. She is looking forward to spreading the word about the significant scientific and environmental work being done by New Zealanders in Antarctica, particularly as the 2006-07 season is expected to be one of the busiest ever. Keiran will provide media liaison services during the 50<sup>th</sup> anniversary celebrations related to Scott Base.

Another change at Antarctica New Zealand, will see Erik Barnes take on the role of Manager Antarctic Programme. Erik is currently Programme Support Manager with Antarctica New Zealand and has worked in Antarctica continuously since 1999 as Field Safety and Training Instructor for the US Antarctic Programme and since 2004 as Programme Support Manager for Antarctica NZ (See *Antarctic*, Vol 23, no 3. 2005).

## MISSION ACCOMPLISHED

Antarctica New Zealand Chief Executive Lou Sanson reported that it was "mission accomplished" for the winter works programme in Antarctica and that all the staff at Scott Base were in fine spirits in October, as Mainbody, the summer season of regular flights in and out of Antarctica began.

"A number of large projects had now been successfully completed at Scott Base in preparation for the start of one of the busiest seasons ever. I was delighted to see the progress that's been made with the construction of the new science lab at Arrival Heights. The Scott Base staff have been working hard over the winter on a complete fit-out of the new lab which will be ready to house science programmes commencing this season."

For the past 45 years, the laboratory at Arrival Heights has provided scientists with a wealth of data on upper atmospheric physics and boundary layer air sampling studies. The area represents an electromagnetic and natural "quiet site" offering ideal conditions for the installation of sensitive instruments for recording minute signals associated with upper atmospheric programmes. However the previous facility was located in area prone to snow build-up making the structure difficult to maintain. The new building is a low maintenance design similar to the existing buildings at Scott Base.

This was also the first winter that Antarctic Heritage Trust (AHT) conservation specialists have wintered over in Antarctica with an international team of experts from Australia and Britain working on the extensive artefact collection left by the great explorer Sir Ernest Shackleton.

# Craig Potton: Floating on Ice

Craig Potton, one of New Zealand's most successful nature photographers, will display, for the first time, his photography of Antarctica's Ross Ice Shelf.

Untouched landscapes are a source of inspiration for Craig's work and the Antarctic provided him with a great deal of inspiration.

Craig said that from the moment he first saw others photographs of "this huge, flat expanse of frozen ocean I was hooked, and dreamed of going there". It is one of the largest untouched, unvisited wildernesses on earth, and for some thirty years Craig had been involved in campaigns to preserve it from mining, over-fishing, and other human impacts. When he finally flew over and then landed at Scott Base, he was well and truly primed to feel an immense sense of gratitude that this wild, unmodified landscape existed. He says though, "I wasn't prepared, however, for how stunningly beautiful the white ice and blue sky were, as well as the grey storm skies, or how strange it felt to be standing on the frozen ocean looking at the immense

horizon. I remember standing by the plane, laughing and thinking, I'm going to start photographing right now; the plane and me on this great white tabletop of ice sitting on the ocean. Each day before we went into the Dry Valleys, I'd walk out from Scott Base and just stand on the frozen ocean and the ideas and images started coming."

Craig first visited Antarctica in 1993, before the Antarctic Arts Fellow Programme was established. But he wanted to return to do more photography in the Dry Valleys, with a view to publishing a book on that phenomenal area, and also to visit Cape Crozier where Emperor penguins breed on the edge of the Ross Sea. So Craig convinced Antarctica New Zealand to set up a special project for him for the 2000/01 season. The results of his Antarctic journeys can be viewed at the Tait Electronics Antarctica Gallery at the Christchurch Art Gallery until 9 April 2007.

Visit <http://www.christchurchartgallery.org.nz/> for more details.

## US NAVY'S FIRST FLIGHT TO THE POLE IS CELEBRATED

A significant date in the history of the United States Antarctic Program and in military history was celebrated on 31 October 2006.

At 8:34 a.m. on 31 October 1956, Lt Commander Conrad "Gus" Shinn and crew of eight made the first aircraft landing at the South Pole in a ski-equipped US Navy aircraft, R4D-5 (the Navy version of the DC-3) named "Que Sera Sera". With temperatures hovering near minus 60F, Shinn kept the engines running while Adm. George Dufek stepped out of the plane and became the first person to stand at the South Pole since Robert Falcon Scott's party, more than four decades earlier.

Although their stay at the South Pole was less than an hour, they proved to the world that landing an aircraft at the Pole was indeed possible. This milestone set in motion the massive transport of personnel, equipment and supplies that led to America's enduring presence at the South Pole and construction that continues on the third and newest scientific station at the National Science Foundation Amundsen-Scott South Pole Station.

The first flight to the South Pole in October 2006 was a commemorative flight, recognizing the opening of the South Pole and the 50th anniversary of the first aircraft landing.

Colonel Ronald Smith, Deputy Commander Joint Task Force, Support Forces Antarctica and the National Science Foundation Senior Representative, Mr. Brian Stone, were on the flight. They took part in a ceremony at the South Pole that coincided with a ceremony at the Navy Museum in Pensacola, Florida USA, that included representation from the National Science Foundation, National Guard Bureau and the 109th Airlift Wing from New York.

### CRAIG POTTON PUBLICATIONS INCLUDE:

Improbable Eden : the dry valleys of Antarctica (Green, Potton 2003)

Earth, sea, sky: images and Maori proverbs from the natural world of Aotearoa New Zealand (Grace, Waiariki, Potton 2003)

Wild and scenic New Zealand (2000)

Above New Zealand (1997)

World of WearableArt (World of WearableArt Ltd, Potton 2006)

# New Research Bases for Belgium and India

The Russian cargo ship *Ivan Papanin* departed Oslo, Norway, on October 28 with material and equipment needed to build the new Belgian Antarctic research station.

The vessel will unload in Breid Bay (70°15' S 24°15' E) in January 2007. The shipment includes logistics equipment and vehicles, garage building material, fuel supplies, tools and spare parts, shelters for the construction team, and wind turbines.

All this material will be taken to the base site via a land route established in late 2005. The station will be set up at 71°57'S 23°20'E on a relatively flat granite ridge, approximately 1 km north of Utsteinen Nunatak.

The station is designed for optimal use by 12 people with a surface area (living, technical, research, storage) of 800 m. The use of a station "extension" will make it possible to accommodate another 8 to 18 people.

The station has a hybrid design, with the main building above ground-level and anchored onto snow-free rock area. The garage/storage building is located nearby and is mainly constructed under the surrounding snow surface. The

buildings are interconnected.

With the closing of Asuka Station in 1992, the new station will reoccupy a stretch between the Japanese Syowa station and the Russian Novolazarevskaya station. The new Belgian research station will replace the former Belgian Roi Baudouin base, built in 1958 at Breid Bay in Dronning Maud Land, closed in 1967 and buried under metres of snow.

India also announced plans to build its own Antarctic research base in the Larsemann Hills area, a stretch of ice-free rock around Prydz Bay.

The base will be India's third in the Antarctic and the 60th on the Ice. India argues that the Larsemann Hills site offers distinct scientific advantages, allowing for studies of marine biology, glaciology and geological research related to Gondwana break-up.

The three nations with bases already in the same area, Russia, China and Australia, expressed their concerns regarding the building of a new base in the region at the Antarctic Treaty Consultative Meeting (2006) in

Edinburgh and an intersessional group has meet to discuss options. Australia offered to share its station, Davis, with India. India declined this



Above: Map of area near new Indian base site.

offer and is pressing ahead with its plans for a new station.

The India Ministry of Earth Sciences has announced that the design for the base will be done by a consultant.

See the National Centre for Antarctic & Ocean Research, Ministry for Earth Sciences, India, website at "[www.ncaor.org](http://www.ncaor.org) for more information on India's plans.

## WILD OR MARSHALL...

In the latest issue of *Bergy Bits*, the UK Antarctic Heritage Trust newsletter, a plea has gone out for direct descendents of those on the *Nimrod* Expedition.

### The article reads:

Shackleton Centenary Expedition 2008: To mark the centenary of the *Nimrod* Expedition, a group

of direct descendents of the original party is planning to retrace the original route of the 1908/09 expedition and then complete the last 97 miles and place the team at the South Pole.

Planning, fundraising and training is well underway but direct descendents of Wild and Marshall are still being sought –

we have a Shackleton and an Adams.

If anybody knows of any descendent to Wild or Marshall, however distant, could they please get in touch with Henry Worsley by email at: [henryworsley@hotmail.com](mailto:henryworsley@hotmail.com).

# Icebergs spotted from New Zealand

In November, a flotilla of icebergs made their way north to spend the Austral spring in New Zealand waters. The icebergs, which ultimately floated 70 kms north of Christchurch, South Island, New Zealand, were probably once part of a much larger iceberg from the Ronne Ice Shelf, on

Somewhere along the way, A-43A has broken into smaller pieces. 'We have a satellite report from 30 January 2005 which estimates the size of A-43A at about 51 kilometres long and 21 kilometres wide. That's about 360 times bigger than the largest piece the New Zealand Air Force spotted last week,

Canterbury before flowing out towards the Chatham Islands.'

The Antarctic Circumpolar Current is the world's biggest current. It typically flows at the rate of about a quarter of a kilometre per hour, but can reach a top speed of seven kilometres per hour.



*Above: Aerial view of icebergs originating from the collapse of an ice shelf in the Antarctic Peninsula, Weddell Sea Region, Antarctica. Photo by Wolfgang Rack.*

the peninsula side of Antarctica.

Dr Mike Williams, an oceanographer with NIWA, says in 2000, an iceberg 167 kilometres long and 32 kilometres wide broke off the Ronne Ice Shelf. This was named A-43.

A-43 subsequently broke into pieces. The largest piece, known as A-43A, was created in early May 2001, and is probably the 'parent' of the icebergs which are currently close to New Zealand.

The Ronne Ice Shelf borders the Weddell Sea, south of the Atlantic Ocean, in Antarctic territory claimed by Britain, Chile, and Argentina.

'A-43A was last spotted in the Scotia Sea, just to the north of the Weddell Sea, on 30 January 2005. That is about 13 500 kilometres away,' says Dr Williams.

'Based on A-43A's last recorded position, and assuming it travelled the shortest possible route around Antarctica, we calculate an average speed of 0.9 kilometres per hour, or about 21.5 kilometres per day.'



*Above: One of the icebergs off the east coast of the South Island of New Zealand. November 26, 2006. Photo by Wolfgang Rack.*

and is consistent with the iceberg breaking up on its journey to New Zealand,' says Dr Williams.

'We believe A-43A drifted up past South Georgia Island. It would then have been swept along by the Antarctic Circumpolar Current and strong westerly winds around Antarctica. The iceberg – or icebergs – ended up slightly north of the usual track, and came between the Auckland Islands and Stewart Island where they were pushed into the Southland Current. The Southland Current runs up the east of the South Island to about mid-

'The track of this current crop of icebergs looks very similar to the route of an iceberg reported in 1931 off the Auckland Islands and then again off Dunedin. We would expect the icebergs to keep moving up the east of the South Island for a week or so. One or more of the larger ones may well break up further in that time.'

**Editor's Note:** At the time of going to press, the icebergs off the coast of NZ have all melted.

# RECORD DEPTH FOR ANDRILL PROJECT



Above: ANDRILL Camp with covered drill rig in background. Photo by Yvonne Cook.

ANDRILL, the ANTarctic Geological DRILLing Programme, drilled to a record depth of 1000 metres below the sea floor from the site on the Ross Ice Shelf near Scott Base in Antarctica. This milestone, makes ANDRILL the most successful Antarctic drilling programme in terms of depth and rock core recovered. The previous record of 999.1 metres was set in 2000 by the Ocean Drilling Programme's drill ship, the *Joides Resolution*. ANDRILL project manager Jim Cowie said the operations team of 25 drillers, engineers and support staff was extremely pleased with the results so far.

Antarctica New Zealand, which managed the Cape Roberts Drilling Project, a highly successful predecessor to ANDRILL, is managing the on-ice drilling operations and logistics on behalf of ANDRILL partner nations Germany, Italy, New Zealand and the United States. Antarctica New Zealand's chief executive Lou Sanson said ANDRILL was one of the organisation's flagship projects. "It is great to see such spectacular success after five years of



Above: The ANDRILL drill rig. Photo by Yvonne Cook.

preparation and planning." Sanson said that much of the technical success of the project could be attributed to Alex Pyne, who has overseen the design and

fabrication of the drilling system.

Pyne, from Victoria University in Wellington, is a veteran of 30 years of scientific drilling in the McMurdo Sound region. He acknowledged that much of the present success is due to lessons learned from previous drilling projects, as well as a dedicated team who have brought to the project a wide range of expertise and experience. Pyne was also the technical expert behind the Cape Roberts Project in Antarctica that drilled to a depth of 939.4 metres below the sea floor.

ANDRILL staff scientist Rich Levy, from the University of Nebraska in the United States, said the science that will come from the drill cores would be extremely revealing. So far the drill cores tell a story of a dynamic Antarctic ice sheet advancing and retreating more than 50 times during the last five million years. ANDRILL co-chief scientist Tim Naish, from Victoria University and GNS Science, said some of the disappearances of the ice shelf were probably during past times when the planet was 2-3 degrees Celsius warmer than it is today.

The ANDRILL PROGRAM: A guide for the media, the public and policy makers can be downloaded at <http://www.andrill.org/uploads/MediaGuide.pdf>

**More information about ANDRILL can be found at [www.andrill.org](http://www.andrill.org)**

# 2006 Ozone Hole - Largest Ever Observed

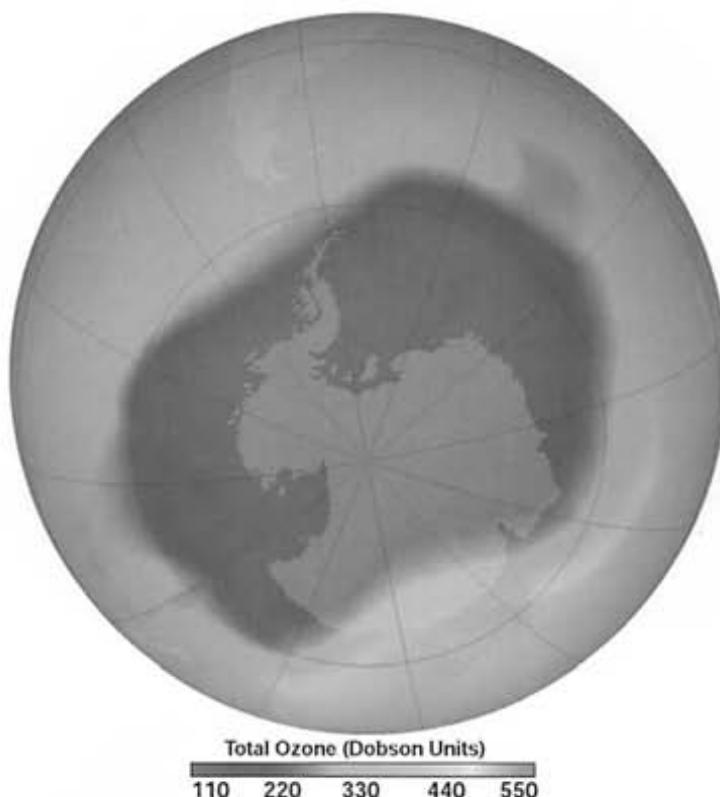
The average area of the ozone hole over Antarctica was the largest ever observed in Spring 2006, measuring a massive 10.6 million square miles (27 million km<sup>2</sup>) between September 21-30, reported atmospheric scientists from NASA's Goddard Space Flight Center. This new record was for the largest average area over an 11-day period, indicating that the hole stayed larger for longer than it ever has before.

This year's ozone hole also broke records for its depth. A little over a week after the ozone hole sustained its new record high for average area, satellites and balloon-based instruments recorded the lowest concentrations of ozone ever observed over Antarctica, making the ozone hole the *deepest* it had ever been.

The graph illustrates why the ozone hole was unusually large and long-lived this year even though we have reduced the production of ozone-depleting chemicals. While human-produced compounds break down the ozone hole by releasing chlorine and bromine gases into the atmosphere, the temperature of the Antarctic stratosphere causes the severity of the ozone hole to vary from year to year.

Colder-than-average temperatures result in larger and deeper ozone holes, while warmer temperatures lead to smaller ones. In 2006, temperatures dipped well below average, hovering near or dipping below record-lows.

These unusually cold temperatures increased the size of the ozone hole by 1.2 to 1.5 million square miles, say NOAA's National Centers for Environmental Prediction (NCEP). If the stratospheric weather conditions had been normal, the ozone hole would be expected to reach a size of about 8.9 to 9.3 million square miles, about the surface area of North America.



Above: This image, made from data collected by the Ozone Monitoring Instrument on NASA's Aura satellite, shows the Antarctic ozone hole on September 24, 2006. The darker areas that cover most of Antarctica illustrate where ozone levels were low. On September 24, the ozone hole covered an area of 11.4 million square miles, matching the single-day record area previously observed on September 9, 2000.

As far as the depth of the ozone hole goes, the Ozone Monitoring Instrument (OMI) measures the total amount of ozone (in Dobson Units) from the ground to the upper atmosphere over the entire Antarctic continent. One Dobson Unit is the amount of ozone it would take to create a layer of pure ozone 0.01 millimetres thick at 0° C at the surface of the Earth. Any location where the concentration drops below 220 Dobson Units is part of the ozone hole.

On October 8, the OMI observed a low value of 85 Dobson Units in a region over the East Antarctic ice sheet. These measurements were

similar to levels recorded by balloon-borne instruments over the South Pole. The balloons also found that nearly all of the ozone in the layer between eight and thirteen miles above the Earth's surface had been destroyed.

In this critical layer, the instrument measured a record low of only 1.2 Dobson Units, meaning the ozone was virtually gone in that region of the atmosphere said scientists from the University of Wyoming, who are leading the group carrying out the balloon-borne measurements. Balloon-borne instruments are launched

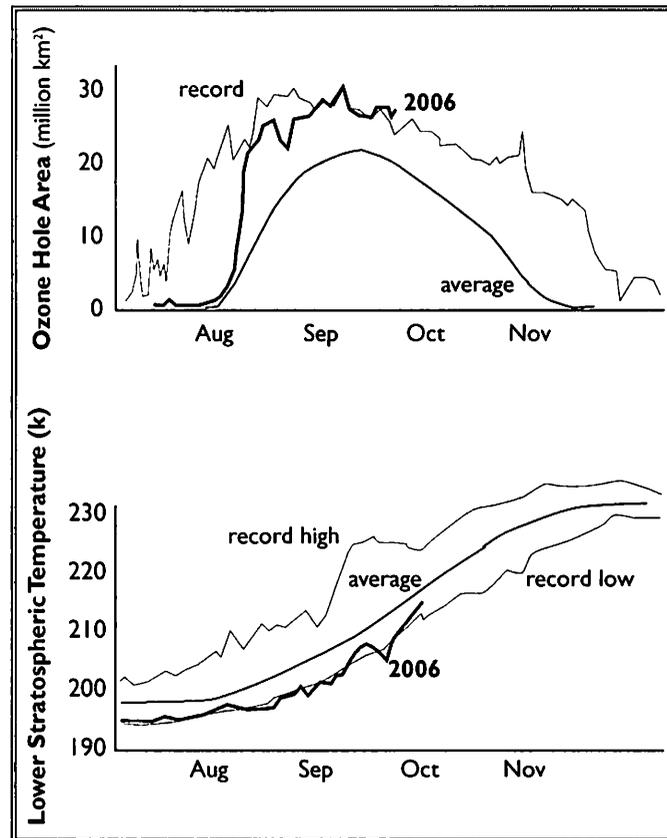
*Continued to page 51*

Continued from page 50

from South Pole station year-long.

The 1987 Montreal Protocol banned ozone-depleting chemicals, but the long lifetime of those chemicals means that the ozone layer will not recover for several decades. Scientists say they expect these monstrous sized ozone holes to continue for at least the next several years. Real improvements may not come until the year 2010, and continued variability may mask the repair process for a long time. Estimates for recovery range from 2040 to 2080, though NOAA and NASA anticipate recovery of the ozone layer by 2065.

The NASA image is from GSFC Ozone Processing Team, based on data provided by the Ozone Monitoring Instrument (OMI). The Ozone Monitoring Instrument was developed by the Netherlands' Agency for Aerospace Programs, Delft, The Netherlands, and the Finnish Meteorological Institute, Helsinki, Finland.



Left: The darkest line charts out the area of the ozone hole during 2006. In the background, the smooth grey curve illustrates the multi-year average area during the austral spring, when the ozone hole is largest. The third line shows the record areas—the largest area observed on any single day—during the same multi-year period. Instead of spiking and then dropping as might be expected, the area in 2006 ghosts the multi-year record, staying unusually large over a relatively long period.

More information can be found at <http://toms.gsfc.nasa.gov/>.

## SCIENCE EDUCATORS PICKED TO PARTICIPATE IN ANDRILL PROGRAMME

Six science educators from four nations have been chosen to participate in the 2006-07 ANDRILL Research Immersion for Science Educators (ARISE) program.

ARISE will provide an immersion experience for the educators in ANDRILL (ANtartic DRILLing), a multinational collaboration involving 150 scientists from Germany, Italy, New Zealand and the United States. ANDRILL's purpose is to recover sediment core samples from the McMurdo Sound region of Antarctica to develop a detailed history of the Antarctic climate and the expansion and contraction of the Ross Sea area's ice sheets and ice shelves over the past 20 million years. (see page 49).

The educators, chosen by inde-

pendent selection committees in their respective countries, are:

- \* Matteo Cattadori, Trento, Italy;
- \* LuAnn Dahlman, Mesa, Ariz., United States;
- \* Vanessa Miller, New York, N.Y., United States;
- \* Alexander Siegmund, Heidelberg, Germany;
- \* Julian Thomson, Belmont, Lower Hutt, New Zealand; and
- \* Betty Trummel, Crystal Lake, Ill., United States.

The ARISE educators will travel to Antarctica in the 2006/07 season for a two-month stay. Each educator will

be a member of a science discipline team and contribute to the scientific investigation of the core samples. Once back from Antarctica, they will maintain communication and collaboration with their science team members and utilize their expertise as educators to develop and implement innovative approaches to geosciences education and public outreach.

Information about the ARISE participants and on the 2006/07 ANDRILL programme can be found at <http://andrill.org>.

# Listening for Whales

Research on the underwater calls of whales was presented in a poster at the Scientific Committee on Antarctic Research (SCAR) Open Science Conference in July.

The poster entitled "Use of passive acoustic techniques to assess relative distribution and seasonality of Antarctic marine mammals", was selected as the Best Open Science Conference Poster from 350 scientific posters displayed.

The authors, Jason Gedamke, Sarah Robinson and Nick Gales, of the Australian Government Antarctic Division, and John Hildebrand and Sean Wiggins of the Scripps Institute of Oceanography reported on their research which used 42 drifting sonobuoys and two acoustic recording packages – moored to the sea floor near the Antarctic coast – to survey a one million square kilometre ocean area for the presence and distribution of whales.

Whales were recorded at 64 sites. While endangered Blue whales were recorded at 47 of these sites not one was sighted during the survey.

At the other end of the spectrum, Minke whales were recorded at only

one site, despite numerous visual observations. Other recorded species included Sperm whales at 44 sites, Fin whales at 4, Humpback and Sei whales at two sites each, and Leopard and Ross seals at 4 sites each.

The research demonstrates that these remote recording devices are valuable tools for surveying marine mammals in difficult to study areas such as the Southern Ocean.

The drifting sonobuoys, which detect a wide range of sound (5-2500 Hz) and the direction it came from, can be used over large areas for short time periods.

This provides information on the presence and relative numbers of different whale species in a region at a particular time.

The acoustic recording packages, which detect low frequency sounds (less than 250Hz) produced by Baleen whales, are anchored to the sea floor for up to one year and provide information on the seasonal occurrence of whales.

Dr Gedamke hopes to record whales as they migrate north later this year.

## NEW BAS MAP PRODUCED

The British Antarctic Survey (BAS) has just produced a map exclusively for the UK Antarctic Heritage Trust. The double-sided publication measures 80 x 90 cm and is focused on the Antarctic Peninsula region. The front side shows the northern Peninsula stretching from Elephant Island in the NE to Marguerite Bay in the SW at a scale of 1:1000000. The reverse side shows the Scotia Sea area and includes Tierra del Fuego, Falkland Is-

lands, South Sandwich Islands, South Georgia and the northern portion of the Antarctic Peninsula at a scale of 1:4000000. Both sides contain full topographic data and bathymetric data. Copies are available for purchase only at Port Lockroy or by post from AHT (UK).

**Information on cost and posting can be obtained by emailing: [info@ukaht.org](mailto:info@ukaht.org).**

## WHALING FLEET HEADS FOR ANTARCTIC WATERS

Japan's whaling fleet headed for Antarctic waters in early November, prompting protests from many including anti-whaling campaigners. The Japanese say several boats sailed for Antarctica as part of a two-year study of the population and the feeding and breeding habits of whales. Many opponents of whaling saying the Japanese are simply carrying out commercial harvesting of whales under the veil of scientific research.

The Japanese fleet proposed to catch up to 850 Minke whales during this years trip south. Japan is opposed to the international moratorium on commercial whaling. At the 58<sup>th</sup> Annual Meeting of the International Whaling Commission in June 2006, the primary item of business on day three of the meeting concerned the question of Whale Marine Sanctuaries. A proposal by Brazil and Argentina for a South Atlantic Sanctuary was again presented to the International Whaling Commission. Such a proposal would have required a three-quarters majority to have been adopted. In the event, after considerable discussion, the matter was not put to the vote. A proposal to abolish the Southern Ocean Sanctuary was again presented to the Commission by Japan. It would also have required a three-quarters majority to pass but was defeated by 28 votes to 33 with 4 abstentions.

# Science theme for Ross Dependency Stamps 2006

On 1 November, New Zealand Post released the 2006 Ross Dependency Stamp set which celebrates Antarctic science. Details of the 2006 stamp set are included here and more information can be found at: [www.nzpost.co.nz](http://www.nzpost.co.nz).



## BIOLOGIST - 45C

The 'BioRoss' research programme aims to improve our understanding of the Ross Sea region. A collaborative project led by New Zealand's Ministry of Fisheries, it's developing an inventory of the region's marine environment and its rich biological resources – especially with the increasing pressures of human activity. The knowledge gained will help to improve the region's management and support the development of a network of protected marine areas.

## HYDROLOGIST - 90C

Seven countries around the world joined forces for the 1996-2001 'Cape Roberts Project', which focused on understanding the Ross Sea region's climatic and tectonic history. As a result of the research, the scientists may have found evidence that the East Antarctic Ice Sheet has expanded and contracted many times in the past – which may help in developing ice sheet models for the future.

## GEOLOGIST - \$1.35

The multinational 'Antarctic Drilling Project' (ANDRILL) builds on the results of the Cape Roberts Project. It aims to improve our understanding of Antarctica's role in 'Cenozoic' global change (which means from 65 million years ago until now) – and is

doing this through a comprehensive drilling programme in the McMurdo Sound area. ANDRILL involves scientists from New Zealand, the United States, Germany and Italy.

## METEOROLOGIST - \$1.50

Scientists from a number of national Antarctic programmes and projects are working towards a common goal through the 'Latitudinal Gradient Project'. The Project aims to understand the complex ecosystems at five sites along the Victoria Land coast in the Ross Sea region, and to determine the effects of environmental changes on those ecosystems. The information gained will help us to create a picture of the future effects of environmental change.

## MARINE BIOLOGIST - \$2.00

The five-year 'Census for Antarctic Marine Life' aims to focus public attention on the region's ice-bound oceans during the International Polar Year in 2007/08. The project is studying the evolution of life in Antarctic waters to find out how it has influenced the diversity of the current flora and fauna – and to predict how they might respond to future change.

## NEW EDITION OF FIDS STAMP CATALOGUE NOW AVAILABLE

Stefan Heijtz's superbly comprehensive catalogue of stamps and the postal history of the FIDs region entitled "Specialised Stamp catalogue of the Falkland Islands and Dependencies, including Postal Histories and Cancellations, 1800 – 2006, with British Antarctic Territory and also Paper Money, Coins and Telephone Cards", has a lengthy title but is a comprehensive publication for the discerning philatelist. This privately published volume is available in hard copy or on CD in pdf format. It is the fifth edition and is illustrated in full colour. The author twice served as postal officer on BAS ships which visited bases cancelling first day covers and attending to philatelic requests from all over the world. The publication is reviewed on page 28 of the most recent *BAS Club Newsletter* and information on the publication or on purchasing can be obtained from the author at [Stefan.heijtz@home.se](mailto:Stefan.heijtz@home.se).

He also has a web page at <http://www.novastamps.com/stefan/>.

# Global Launch of IPY Announced

Plans are well advanced for the start of International Polar Year (IPY) 2007-2008.

The official launch of IPY is set for 1 March, 2007, at the Palais de la Decouverte, Paris, France. The launch of IPY marks the start of one of the most ambitious coordinated international science programmes ever attempted.

Over 170 scientific projects involving thousands of scientists, from over 60 countries and over a wide range of research disciplines, will set out to explore and discover more about the polar regions and their critical influence on the whole planet.

A major component of the IPY campaign is to educate and involve

the public in polar science and to begin to train the next generation of polar scientists, engineers and leaders.

Invited speakers at the IPY launch will include Professor Thomas Rosswall, Executive Director of the International Council for Science (ICSU), Mr. Michel Jarraud, Secretary-General of the World Meteorological Organization (WMO) and Dr. David Carlson, Director of the IPY Programme.

Other IPY launch events are taking place all over the world in early 2007. Further information on IPY can be found at the IPY website: <http://www.ipy.org>.

## TRIBUTE

# PHYSICIST, SPACE PIONEER DIES AT 91

**Physicist James A. Van Allen, born September 7, 1914 died on August 9 2006 aged 91.**

In a career that stretched over more than a half-century, Van Allen designed scientific instruments for dozens of research flights, first with small rockets and balloons, and eventually with space probes that travelled to distant planets and beyond.

His discovery of the Van Allen belts spawned a whole new field of research known as magnetospheric physics. As an undergraduate at Iowa Wesleyan College, he helped prepare research instruments for one of Admiral Richard E. Byrd's Antarctic expeditions. He received his master's degree and Ph.D. from the University of Iowa, USA. Van Allen was named to the National Academy of Sciences in 1959.

In 1987, he received the National Medal of Science, the nation's highest honour for scientific achievement. Two years later, he received the Crafoord Prize, awarded by the Royal Swedish Academy of Sciences in Stockholm each year since 1982, for scientific research in areas not recognized by the Nobel Prizes. (Also see *Antarctic Journal*, vol 23, no 2, 2005).

## ANTARCTIC ACCOLADES

**Paolo de Bernardis**, Italy, and **Andrew Lange**, USA, have won the International Balzan Foundation Prize (Zurich) for observational astronomy and astrophysics in 2006 for "...their contributions to cosmology, in particular the Boomerang Antarctic balloon experiment."

Cosmologist **George F. Smoot**, UC Berkeley, USA, who led a team that obtained the first images of the infant universe — findings that confirmed the predictions of the Big Bang theory — won the 2006 Nobel Prize in Physics, sharing the prize with **John C. Mather** of NASA Goddard Space Flight Center, USA.

In 1989, Smoot and Mather, led the building and launch of NASA's Cosmic Background

Explorer (COBE) satellite to look for telltale signs of the primordial explosion.

According to theory, the Big Bang fireball 13.7 billion years ago filled the universe with heat that has since cooled to a mere 2.7 degrees above absolute zero.

Smoot was a Principle Investigator on the Antarctic Cosmic Microwave Background Radiation Project (CMBR) at the South Pole which searched for this residual heat and led to its discovery. "Those measurements really confirmed our picture of the Big Bang," Smoot said. "By studying the fluctuations in the microwave background, we found a tool that allowed us to explore the early universe, to see how it evolved and what it's made of."

# One Foot at the Pole

By Natalie Cadenhead.  
Curator of Antarctic and Canterbury  
Social History at Canterbury Museum

One of the most unexpected finds in the Antarctic collection store at Canterbury Museum, Christchurch New Zealand, is a prosthetic leg, worn by Jim Henderson when he traveled to the South Pole in 1960. Originally from Nelson, Henderson, who lost his leg during WWII, went to Antarctica as the guest of the United States Antarctic Program, working as a freelance print and radio journalist. He is the first known person with an artificial leg to stand at the South Pole.

According to the expedition account in his book *One Foot at the Pole*, the invitation to travel to Antarctica came unexpectedly while Henderson was at home on holiday. Given two days notice before his flight, his main concern was whether his leg would react badly to the cold and be rendered inoperable. On being assured that it should be fine, although his Prosthetist "had never known anyone with an artificial limb going to the Antarctic"<sup>1</sup>, Henderson was kitted out with clothing and left New Zealand two days later. In his luggage were several strips of carpet under-felt, recommended to wrap around the metal parts of his artificial leg to insulate them from the cold. The felt had been a last minute addition, cut from under the carpet in the basement room of his house, much to his wife's disbelief.

Also packed were a number of 'good luck' pieces provided by his wife and his neighbour, Celia Manson, including three dried broad beans, a Hutt Valley High School (Wellington) black and white knitted scarf, a paua shell tiki on a neck string and a broach belonging to his wife.

Henderson traveled to Antarctica in a combined group of media (correspondents), from the United States and two Congressmen. He wrote a



Above: Prosthetic leg worn by Jim Henderson at the South Pole. Canterbury Museum Antarctic Collection, 1985.324.1

number of stories for *The Listener* magazine of his adventures in Antarctica, and completed a series of programmes for Radio New Zealand.

While the prosthetic leg held up well in the cold, Henderson did experience some difficulties with chafing due to his stump sock working its way in wrinkles down his leg. Henderson describes the process of having to adjust the sock through the outer layers of his cold weather clothing, unlike his normal process in New Zealand of removing his outer clothing to adjust the stump sock.

On the 23<sup>rd</sup> November 1960 the correspondents, including Henderson, flew to the South Pole in a Hercules ski plane. After a short taping session and a 360° circle of the Pole – de-

scribed as around the world in 80 seconds, Henderson began the return trip to McMurdo and on to New Zealand, leaving behind some tassels of the scarf and the three broad beans. For, when he asked the question "Why beans?" and his neighbour, Celia, replied, "Why not? And they might grow, two thousand years from now. Don't you think?"<sup>2</sup>

Along with the prosthesis, Canterbury Museum holds Jim Henderson's US Navy shirt worn at the Pole and a United States flag which was placed at the Pole by one of his companions and which bears the text "One Foot at the Pole 1960".

<sup>1</sup> Henderson, J *One Foot at the Pole* p 13.  
<sup>2</sup> *Ibid* p18.

## SOUTH POLE WEBCAM

Raytheon Polar Services hosts a live webcam site of the Amundsen-Scott South Pole Station. You can find it at: <http://www.usap.gov/videoclipsandmaps/spwebcam.cfm> Live images of the South Pole are carried to the U.S. via communications satellites. Satellite coverage of South Pole Station is available for roughly 11 hours and 15 minutes each day, during which time live images are sent to this web site. The daily satellite communications window occurs approximately four minutes earlier each day.

# Active Year for Volcano

An article by Peter Rejcek in a recent edition of the *Antarctic Sun*, reports that the Mount Erebus volcano on Ross Island had a very active year in 2005, erupting as much as six times per day, and displaying one of its most volcanically active seasons in its last 165 years.

Mount Erebus is the world's southernmost active volcano and it persistently records low-level activity on monitoring equipment.

But Phil Kyle, a volcanologist with the New Mexico Institute of Mining and Technology, who leads a team of scientists and students as part of an NSF funded Antarctic science event, is attempting to find out what makes Erebus tick. His research suggests that 2005's activity followed about three years of uncharacteristic silence. Eruptions started to pick up in 2004, and by the middle of 2005, the scientists knew something was up thanks to data received from a suite of about 10 seismometers located on the volcano, mostly around the rim, that operate year-round. Kyle said 2005 appears to be the third most volatile period on record for the volcano, which has been active for about 1.3 million years.

"Erebus is less active this year than last year," he said. "We don't know why it starts and stops like this." But the answers are coming.

For more than three decades, Kyle and colleagues have explored Erebus. Others, such as explorers Robert Falcon Scott and Ernest Shackleton, apparently reported seeing a red glow above the volcano's cone during the dark winter months during their time on the ice.

One of the goals of the research team next season will be to discover more about the volcano's internal structure, particularly the magma chamber inside Erebus that feeds the crater lake and the conduit that con-

nects the two. The researchers will install about 25 additional seismometers on the volcano next year. Seismometers measure and record the size and force of seismic waves. By studying seismic waves, the scientists can map the interior of the volcano, much as a CAT scan images the inside of an object using X-rays. "We can use incoming earthquakes from different places to see what happens as they pass through the volcano," Kyle said, adding that the seismic waves produced by eruptions from the volcano itself will also be helpful for such imaging. "Hopefully we'll get a good look at what's inside there."

Volcanologists are also interested in learning more about what comes out of the volcano to understand Erebus' effects on the atmosphere and environment.

**More information, including a live video link showing pictures of the volcano's crater for those of you with fast computers, can be found at: <http://www.ees.nmt.edu/Geop/mevo/mevo.html> <http://www.ees.nmt.edu/Geop/mevo/mevo.html>**

## MOVIE

### HAPPY FEET

The computer-animated movie about dancing and singing penguins has been a big hit in many countries including the United States where it was at the top of the movie charts for three weeks.

Happy Feet is the story of an Emperor penguin chick born into a community of singing penguins, but much to his family's horror he is unable to carry a tune. Instead, Mumbles can only tap dance. The story of Mumbles' unhappy "chickhood" is further saddened by the reduction of fish (their food supply) in the Southern Ocean. A happy ending is created when the dancing skills of Mumbles help humans to understand what is happening to Antarctic penguin colonies because of the loss of so many Southern Ocean fish.

The movie is visually stunning, with a realistic impression of Antarctic colours, ice and ocean...and the movie contains a few surprises! The makers of the movie were given an opportunity to visit Antarctica by Antarctica New Zealand and this adds, no doubt, to the realism of the computer-generated Antarctic scenery.

The makers of Happy Feet co-sponsored the Non-Native Species in the Antarctic Workshop held in New Zealand in early 2006 as a way to give something back to the Antarctic community that helped them make the movie of Mumbles the penguin.

# SOUTH OF SIXTY LIFE ON AN ANTARCTIC BASE

Written by Michael Warr

Antarctic Memories Publishing, Prince George, BC (2005) [www.antarcticmemoriespublishing.com](http://www.antarcticmemoriespublishing.com)

US\$ 21.95 ISBN 978-0-9738504-0-6

Review by Mike Finnemore

Michael Warr, meteorologist and dog-handler for the British Antarctic Survey (BAS) during the early 1960s, produces a book that is the recalling of his wintering-over experience at two early BAS bases. It focuses on daily life on Deception Island Base (60 miles \ 100 kms off the Antarctic Peninsula) and on Adelaide Island Base during the early years of scientific exploration of Antarctica.

The story is based upon journals that Michael kept throughout both his winters. In some places the retelling is full of detail, but in many other places throughout the book the entries are short and terse. The snappy writing style is a pleasure to read and while much of the material appears to be taken directly from his journal, it does not suffer from the usual mundane rhetoric that many journal-based books from the Antarctic often do.

The book follows Michael Warr's experience of living and working on several small British bases at a time when it was clearly a male-dominated life, with the main land transport dog teams. Michael's primary responsibility was meteorology-weather observations, but with only 10 men on the Deception Island base, everyone pitched in on most of the jobs that had to be done and taking care of the dogs was one such shared job. With only 10 men, the journal entries reflect some of the interesting social moments and group dynamics, he and the team were faced with during the winter months. Michael mentions "the Saturday night booze-ups" that presented the winter-over team with a time to vent any frustrations the men had against "them". "Them" being the BAS administration! He notes that it was better that "they" were the "scapegoats, rather than disrupting the unity (of the base) by having a base victim".

Where the book suffers is in the visual aids, that is, the



maps and photos. More photos would have been fantastic, what photos there are, are OK, but with one picture being worth a thousand words...more is better! This is usually a criticism of most of these types of books and maybe a little harsh, given the pictures that are included are fine. The real disappointment is with the maps. The main map (only four maps are included) in the book is the real disappointment. Not only does it lack detail, but also it failed to point out the location of the two bases that are the focus of the book. Many of Michael's retelling included reference to journeys that they took with the dog teams but the maps do not show the routes taken-this would have been an interesting and valuable addition.

In the final three chapters of the book, Michael tells the story of his return to Antarctica in 2005 as a tourist on board the *Polarstar*. The title of chapter 37 "You can return" perhaps reflects the general direction of these chapters and of his life. Experiencing Antarctica for the first time, 40 years previously as one of the FIDs and now going back to find a new Antarctica, you get the feeling that he understands that the greatest changes that have taken place in those 40 years is not Antarctica (the place) nor the memories that he holds, but Michael himself and the world outside of Antarctica.

The book is compact and easy to read. I think it is interesting reading for those who have previously wintered in the Antarctic, those interested in life on early Antarctic outposts and those people who are interested in small group dynamics. This isn't a book about "heroes" as such, but a story of every day life in the Antarctic on an early Antarctic base.

**Mike Finnemore is a geophysicist who has twice wintered in the Antarctic.**

# Bromine Explosions and Ozone Depletion

By Tim Hay

The Antarctic ozone hole that forms between about 12 to 25 km up in the stratosphere each spring is a well known phenomenon (see Ozone Hole story on page 50), but rapid ozone depletion events also occur in the lowest few hundred metres of the polar atmosphere.

These rapid depletion events occur early in the Antarctic research season, generally around, or shortly after WINFLY (mid-August). They occur over short periods of time, over hours or days, with ozone concentrations dropping from 25-40 parts per billion (ppb) to as low as 0.05 ppb.

In order to record these rapid depletion events, Tim Hay (University of Canterbury PhD candidate and Christchurch City Council Antarctic Scholarship recipient for 2006) and Katja Riedel (NIWA, Wellington), went to Scott Base at WINFLY with a new prototype instrument to record and measure the extent of such events.

Scientists understand that the main mechanism for these sudden and rapid ozone depletion events, involves release of bromine, referred to as 'bromine explosions', from sea-salt surfaces. Satellite images show that extensive areas of bromine enriched air masses, associated with sea ice zones around Antarctica, form for short periods in the Austral spring. The conditions that trigger these events are not fully understood, but young sea ice and a low inversion layer, which acts like a cap permitting little exchange with the air above, are known to be important.

Recent studies are beginning to recognize the importance of reactive bromine, even in small concentrations. Bromine can potentially influence global climate by removing ozone, which absorbs solar radiation,



Above top: Prototype instrument designed to measure rapid ozone depletion events.  
Above bottom: Emperor penguins at Cape Bird. Photos by Tim Hay.



Left top: Adie penguin investigates the instrument at Cape Bird.

Left bottom: Katja and instrument at Cape Bird.

Photos by Tim Hay.



by oxidation of greenhouse gases such as methane, and by altering the production of cloud condensation nuclei. Conversely, the potential impact of climate change on the chemistry of bromine, ozone and mercury by altering sea ice cover is uncertain.

NIWA has been making measurements of tropospheric bromine oxide and ozone at the Arrival Heights observatory (approximately 184 m above sea level) near Scott Base since 1998 and several bromine explosion

events have been observed there each spring. Similar observations have also been made at Neumayer, the German Base in the Weddell Sea region. However, since the boundary layer height is often lower than 200 m and the prevailing wind at Arrival Heights is off the land, some ozone depletion events may not be detected there. Therefore, the object of Tim and Katja's field research was, for the first time in Antarctica, to obtain measurements out on the

sea ice itself. They spent 3 months in Antarctica deploying a prototype instrument to measure bromine out on the sea ice. The insulated, battery powered system, developed at NIWA in Lauder, contains a spectrometer to measure bromine oxide, a webcam to monitor cloud cover, an air sampler to measure ozone, and a weather station. The batteries are charged by a combination of solar power and a small generator.

The instrument was towed on a sledge to a site on the sea ice below Arrival Heights. By repeatedly scanning from the horizon to zenith and comparing the spectra from a series of set elevation angles a relative measure of bromine oxide in the boundary layer can be retrieved. This is then compared to the ozone concentration measurements to determine if there are any ozone dips.

At least two ozone depletion events were detected on the sea ice, including one event that was not observed by the instruments at Arrival Heights. An initial analysis indicates bromine oxide in the boundary layer during at least one of these events and satellite images also show elevated bromine oxide columns over the Ross Sea region. This is an exciting result for the first research of this kind in Antarctica.

Support for this research was provided by Antarctica New Zealand, the Christchurch City Council, NIWA, the University of Canterbury, and from Tim's PhD supervisors and colleagues: Karin Kreher, Katja Riedel, Adrian McDonald, Paul Johnston and Alan Thomas.

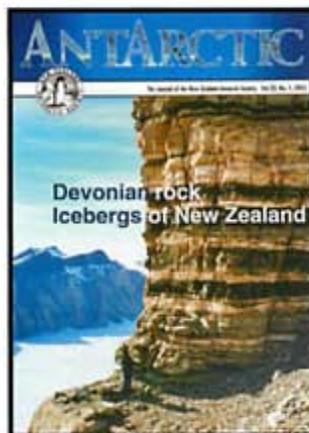
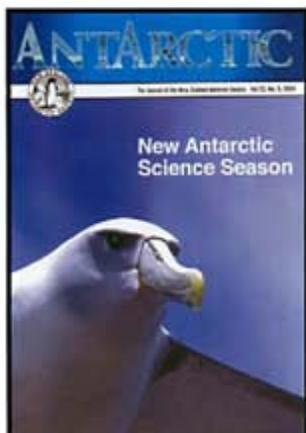


Above: Tim Hay checks the solar current on the instrument. Photo by Katja Riedel.





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It is unique in Antarctic literature as it is the only periodical which provides regular and up to date news of the activities of all nations at work in the Antarctic and Sub-Antarctic. It has worldwide circulation.

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*Climbers descend the summit ridge on Mt. Scott, a prominent peak near the southern end of Lemaire Channel on the Antarctic Peninsula.  
Photo by Colin Monteath.*