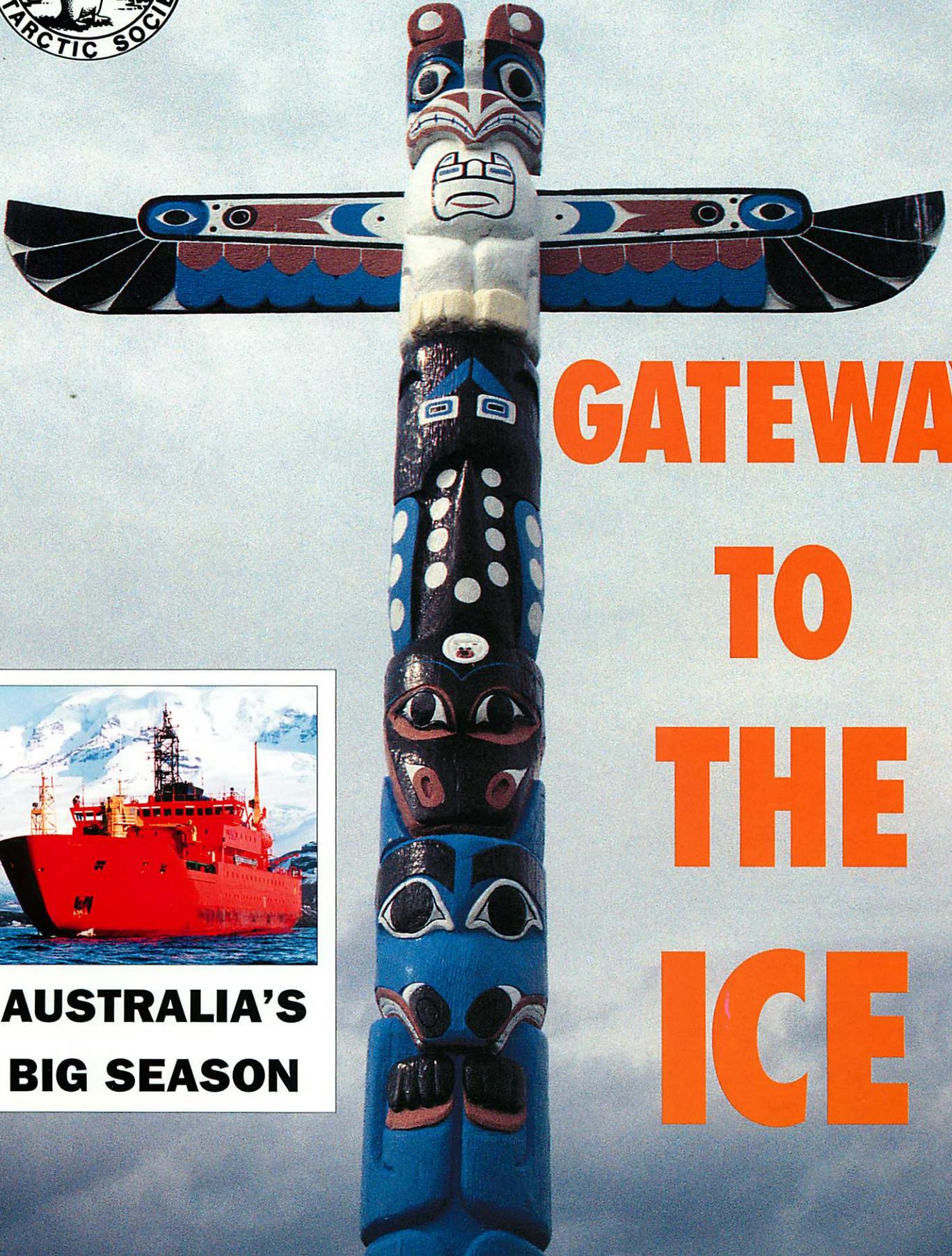


ANTARCTIC



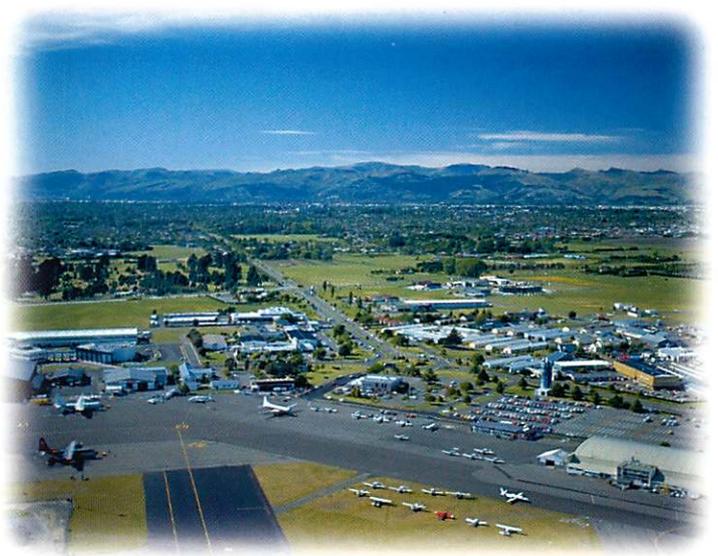
The Journal of the New Zealand Antarctic Society Vol 15. No. 3, 1997



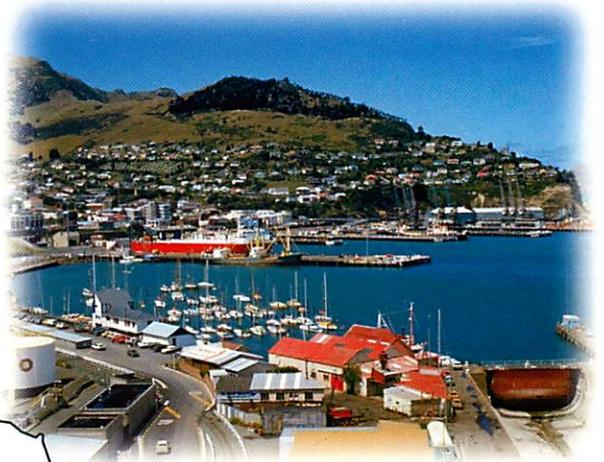
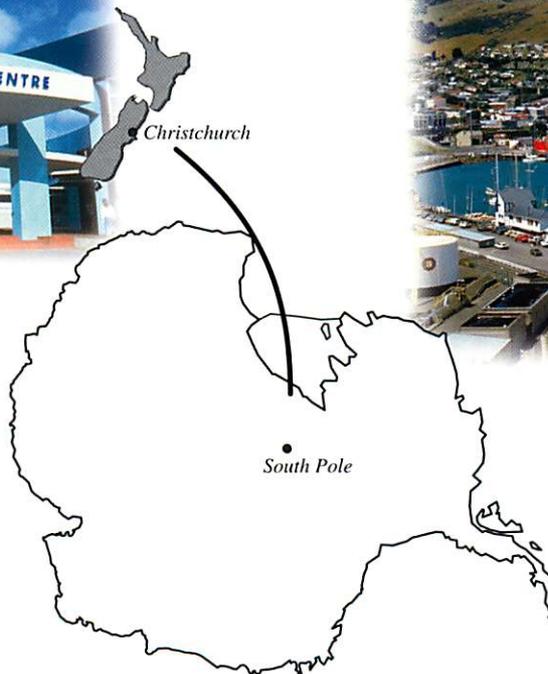
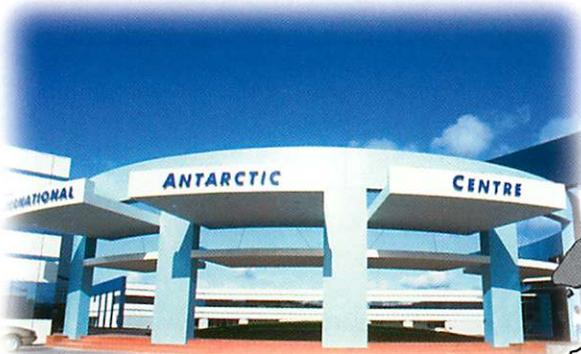
GATEWAY TO THE ICE



**AUSTRALIA'S
BIG SEASON**



CHRISTCHURCH GATEWAY TO ANTARCTICA



For further information contact
City Promotions
Christchurch City Council
P.O. Box 237
Ph: 64 3 371-1780
Fax: 64 3 371-1262



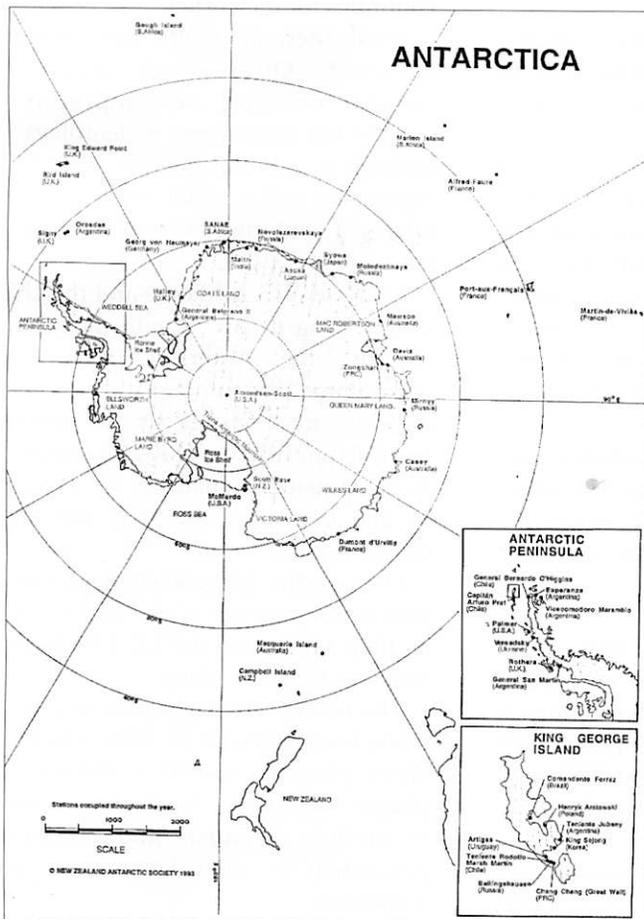


Cover: Thunderbird, a North American Indian god of storms, sits atop the totem pole at Christchurch Airport honouring US airmen who made a supply drop to the South Pole in 1956.

Volume 15, No. 3, 1997,

Issue No. 162

ANTARCTIC is published quarterly by the New Zealand Antarctic Society Inc., ISSN 0003-5327.
 Editor: Shelley Grell
 Please address all editorial inquiries and contributions to Antarctic Bulletin,
 P O Box 404, Christchurch or
 telephone 03 365 0344, facsimile 03 365 4255,
 e-mail headcon@chc.planet.org.nz.



CONTENTS

	Page
FORTHCOMING EVENTS	51
POLICY	52
Looking into the Ice's 21st Century	
NEWS	53
NATIONAL PROGRAMMES	56
New Zealand	56
Australia	57
Malaysia	58
South Korea	58
USA	58
Russia	59
COVER STORY	60
Gateway City Blazes a Trail	
TOURISM	62
GENERAL	63
REPORT	66
Iceberg Devastation Creates New Life, <i>by Dr Lloyd Peck</i>	
EDUCATION	67
BOOK REVIEWS	69
The Silence Calling	69
"Lonely Planet Antarctica"	69
FEATURE	71
Exploring the Unknown	

FORTHCOMING EVENTS

28-30 April, 1998 — Antarctic Futures Workshop, St Andrews College, Christchurch NZ. The workshop aims to examine the trends likely to shape Antarctic activities over the next few decades and the opportunities these may provide for New Zealand. Organisers: Antarctica New Zealand.

14-16 May 1998 — Belgica Centennial Symposium, Brussels, Belgium. The Belgica Centennial Symposium will be held in Brussels (14-16 May 1998) under the High Patronage of His Majesty the King Albert II, to commemorate the 100th anniversary of Gerlache's 1897-1899 Belgica expedition.

25 May — 5 June, 1998 — XXII ATCM, Tromso, Norway

8-11 June, 1998 — The 9th Global Warming International Conference and Expo will be held in Hong Kong.

20-31 July, 1998 — SCAR/COMNAP Meetings, Concepcion, Chile

31 August — 4 September, 1998 — SCAR Biology Symposium, Christchurch, NZ.

July 1999 — SCAR Earth Science Symposium, Wellington, NZ.

LOOKING INTO THE ICE'S 21ST CENTURY

By Warren Head

Scenarios that will shape Antarctica into the 21st Century will be debated during a major workshop being hosted by Antarctica New Zealand in Christchurch in 1998.

Antarctica New Zealand is a new Crown agency with the mission to provide leadership in developing, promoting and realising opportunities for New Zealand from international involvement in Antarctica and the Southern Ocean.

Its goals span science and related strategy, environmental stewardship, education, logistical services and non-government activities. These include the framework for appropriate commercial and tourist opportunities consistent with New Zealand's values in the Antarctic.

The current view is that New Zealand's founding involvement in the Antarctic Treaty system helped to let peace and science prevail on the continent through a time of Cold War geopolitics and beyond.

Antarctica New Zealand says a radically different world is emerging. The value of science in Antarctica is increasingly recognised and there are new high standards set by global agreement which reflect international environmental awareness.

At the Antarctic Treaty's Consultative Meeting in 1997 at Christchurch, the New Zealand government conveyed its vision of conservation of the intrinsic values of the Ross Dependency and the Southern Ocean through active and responsible stewardship.

The background to the forum in 1998 includes exponential growth in tourism activity pushed along by access to ice-strengthened vessels and growing Western affluence. Airlinks to the Ice are no longer the exclusive domain of military-supported national programmes. Declining Northern Hemisphere fish stocks and lucrative Asian markets are pushing fishing fleets southwards.

New technologies in scientific research, mapping and telecommunications and Antarctica's recent role as a barometer for global climate change have popularised the continent.

The "Antarctic Futures" workshop, 28-30 April 1998, aims to involve leading international and New



Antarctic New Zealand workshop to debate policies for sites such as Scott Base on the southern continent.

Zealand figures from the science, education, policy, business, tourism, and environmental sectors.

The outcomes are expected to include a better understanding of the frameworks guiding commercial activity in Antarctica and identification of where New Zealand can

benefit from opportunities emerging in Antarctica and the Southern Ocean.

There will be identification of the values that New Zealand places on the Antarctic and the standards it would consider appropriate for environmental performance and operational safety.

CURTAIN FALLS ON US NAVY ANTARCTIC OPERATIONS

The 42nd and final operating season of the US Navy's Operation Deep Freeze is now mid-way.

It began on 30 September with the first US Air Force flight of the 1997-98 summer to Antarctica, carrying cargo and passengers.

In March 1998 the US Navy will disestablish Naval Support Force Antarctica in California and US Naval Antarctic Support Unit in Christchurch and hand over its function in the US Antarctic Programme to the New York State Air National Guard's 109th Mobility Air Wing and civilian contractors.

While the US Navy is withdrawing after 42 years of service (and sacrifice: 50 Americans have died on the Ice since 1955), the US presence in Antarctica and Christchurch will continue.

The US Antarctic Programme has a full schedule of events supporting more than 120 science projects involving more than 600 people this summer. Of these, some 70% will transit to the Ice through New Zealand.

Projects include continuing study of ozone layer depletion; fossil micro-

organisms: Antarctic dry valley lakes; marine ecosystems. The search continues for meteorites.

Hydrothermal vents are being surveyed. Other work involves auroral imaging; seismography; gamma-ray astronomy; meteorology; biological adaptations of marine organisms and a social study of the effects of wintering-over on Antarctic personnel.

US Navy, US Air Force and the US Coast Guard are continuing to support the American scientific programme this summer in a variety of ways; most visibly by the seven LC-130 aircraft of Navy Antarctic Developmental Squadron Six (VXE-6); and the four LC-130s of the Air Guard and Air Force.

One of the biggest changes this year is the presence of the Air Guard, as they take over the LC-130 flight missions from the Navy.

The formal dis-establishment ceremony is on February 20, 1998. The US Navy plans to unveil a memorial plaque honouring the 50 Americans — civilian scientists and military personnel — who have died in Antarctica.

NEWS

MARS LINK IN ROBOT RESEARCH

NASA scientists are testing 'telepresence technology' in Antarctic which may be used to explore Mars.

Both areas are remote with hostile environments that are difficult for humans to explore but can be reached by sophisticated robots.

"We will be able to catalogue a previously unexplored ecology at a depth nobody has seen before," said Dr Carol Stoker, a scientist at NASA's Ames Research Centre in California.

Scientists will use a modified submarine called a telepresence remotely operated vehicle (TROV) to explore 800ft below the surface of McMurdo Sound near Ross Island.

Telepresence technology allows scientists on land to use head movements to point cameras on the underwater vehicle and steer by remote control.

This year's expedition will see scientists steering the vehicle not from adjacent land in Antarctica but from California.

They will steer the TROV by computer, both directly and by linking it to a "virtual reality" underwater terrain model of Antarctica, thus ensuring that useful scientific samples are being retrieved.

The TROV is attached to a 1000ft tether consisting of integrated and fibre optic cables which sends digital data and video signals to the surface.

The signals are combined into stereo imagery that scientists can view using special 'stereo glasses.'

A researcher at Monterey Bay Aquarium Research Institute, James Barry, will use the TROV to plot how dominant bottom-dwelling life-forms change from shallow to deep water in McMurdo Sound.

The TROV also has a manipulator arm to collect biological samples, including bottom-dwellers such as bryozoans (small colonial animals) and deepwater sponges which will be used in studies to ascertain how these organisms use chemical defences.

NEW POST FOR CHIEF EXECUTIVE

Antarctic New Zealand's chief executive Gillian Wratt has been appointed chair of the Council of Managers of National Antarctic Programmes, the first woman to be appointed to the post.

In a three year term she will work on development of collaborative efforts among Antarctic Treaty nations. Another New Zealander, Julian Tangaere, will also be involved.

Wratt says the position will strengthen New Zealand's leadership role in the Antarctic as treaty nations exchanged ideas. Being the first woman to hold the position was of "little consequence," she said.

Ms Wratt spent her first summer on the Ice in 1985-86 working as a field assistant. She has previously been director of the New Zealand Antarctic programme and is currently chief executive of Antarctica New Zealand.



Right: Gillian Wratt ... first woman appointed.

MORE NATIONS SIGN ANTARCTIC PROTOCOL

The US and Russia have signed the Antarctic Environmental Protocol.

The Protocol is an agreement designed to provide comprehensive protection of the world's last great wilderness.

The US ratified it on April 17, six months after President Clinton signed the Antarctic Science, Tourism, and Conservation Act of 1996. The delay in the US ratification was due to a new State Department requirement that ratification could not occur until all required regulations were in place.

Shortly after the US signing both houses of Russia's parliament also ratified the protocol.

For the Protocol to enter into force internationally all 26 Antarctic Treaty Consultative Parties must ratify it.

When this happens a Committee on Environmental Protection (CEP) will be established and the process and procedures for reviewing environmental impact assessments of all Antarctic activities will be put in place.

SPENT WEATHER BALLOONS ENDANGER WHALES

Spent weather balloons could have a serious impact on endangered species of white whales.

About 10,000 balloons are launched each year from Antarctic bases and most burst and fall to land or ocean within hours.

A study conducted at the Oak Ridge National Laboratory in Tennessee to see if the balloons posed any threat to whales has concluded that the chances are reasonably high.

Ecologist Gerald Eddlemon and his colleagues assumed that spent balloons are scattered randomly across

the ocean and that whales swim randomly, feeding near the surface. They then added into their calculations reasonable numbers for the size of a whale's gape and its swimming speed.

The result was that whales had about a 7% chance of encountering a balloon in the course of a year. For a population of several thousand whales (which is about the population of species such as the humpback and blue whales) this translates into a few hundred encounters each year.

Eddlemon says this was likely to be

an underestimate, particularly because many of the balloons are made of polythene which could last decades in Antarctic waters. Currents were also likely to sweep the balloons and whales' planktonic food into the same areas of the ocean.

Little is known about the actual effect if whales swallowed a balloon although there have been reports of dead whales with plastic balloons in their stomachs.

SOUTHERN FRIED EXPOSURE

Two recent studies which show that penguins have been exposed to poultry diseases are raising concerns about the role of humans in spreading diseases to and within Antarctica.

In one study, Australian researchers found antibodies for infectious bursal disease virus (IBVD) in Emperor chicks and adult Adélie penguins. The virus may retard penguin chicks' growth, predisposes them to infections, is highly contagious and can cause high death rates.

In a separate study Swedish scientists discovered a small outbreak of salmonella in subantarctic penguins on Bird Island. The scientists surmise that the bacteria was introduced either by ships dumping sewerage at sea or by albatrosses foraging for waste-contaminated squid near South America.

The Antarctic Protocol will regulate the handling of poultry and disposal of waste within the treaty area.

CAPE EVANS PERMITS

Antarctica New Zealand is now issuing permits to cover visits to Scott's Hut and its surrounds at Cape Evans and to reinforce the code of conduct developed to protect the values of the site.

This season 10 New Zealand permits have been issued to cover the visits of about 80 people involved in restoration and conservation work, as well as education and recreation activities in accordance with the management plan. More than 600 tourists will also visit the protected area in January and February 1998.

TVNZ'S "60 MINUTES" FILMS ON ICE



Pauline Donaldson (LEARNZ), Cameron Bennett and Ken Dornon ("60 Minutes"), Pete Sommerville (LEARNZ) and David Lomas ("60 Minutes") prepare for an Antarctic interview.

Television New Zealand's team from the weekly programme "60 Minutes" visited the Ice in October to film for the LEARNZ programme — an innovative education programme for schoolchildren around New Zealand.

Correspondent Cameron Bennett interviewed Kiwi school teacher, Pauline Donaldson and LEARNZ coordinator, Pete Sommerville. From Scott Base by phone and Internet, Pauline and Pete were able to bring the Antarctic experience to hundreds of New Zealand school children. The "60 Minutes" programme was broadcast on New Zealand television on Sunday 23 November.

Despite the publicity and accolades the LEARNZ initiative is still seeking funding to continue in 1998. Plans are to focus on the Southern Ocean, with the LEARNZ teacher on board a NIWA research vessel, including international linkages through the 'Year of the Ocean'. (For further details of LEARNZ see page 67).

FRENCHMAN SUCCEEDS IN SAILING AROUND ANTARCTICA

A French adventurer has circumnavigated Antarctica, joining a handful of intrepid sailors who have completed the voyage through some of the world's stormiest seas.

Bernard Espinet, 43, sailed into Wellington on 18 August, some 15 months after he set sail on 28 April 1996.

The 18,400-mile voyage was "gruelling," said Espinet, who left France 15 years ago for life at sea.

POETS AND ARTIST TO SCOTT BASE

Poets Bill Manhire and Chris Orsman, and painter Nigel Brown, will be the first artists to participate in a scheme initiated recently by Antarctica New Zealand (ANZ).

The aim is to raise awareness of the scientific and other values of Antarctica with a new audience and a fresh perspective.

Tim Higham, ANZ's communications manager, said: "Antarctica has traditionally been the domain of adventurers and scientists, but it is also a place of fascination, importance and mystique for many people. It looms large in the national consciousness."

The three men will spend two weeks on the ice in January.

NEW ACTING HEAD OF POLAR PROGRAMMES AT NSF

In September 1997 the National Science Foundation appointed John B. Hunt as the new acting director of the Office of polar programmes.

Hunt was formerly the assistant director of mathematical and physical sciences and has considerable experience in managing large, complex programmes.

The National Science Foundation is an independent federal agency

responsible for fundamental research in all fields of science and engineering, with an annual budget of about \$3 billion. NSF funds reach all 50 US states through grants to more than 2000 universities and institutions nationwide.

The foundation receives more than 50,000 requests for funding annually, including at least 30,000 new proposals.

REPLACEMENT OF US SOUTH POLE STATION

It will take eight years to replace the sinking US South Pole station which is more than 20 years old.

Pollution, waste disposal, safety considerations and fuel storage need to be addressed, but are hampered by decreasing funds as a result of changing scientific priorities.

The National Science Foundation is seeking ways to achieve the improvements required for safety and environmental preservation without sacrificing the programmes on global warming, ice sheet melting, ozone depletion and the study of galaxies.

Funds will be shifted from the Navy to independent civilian contrac-

tors in order to achieve some savings. Scientists will also be required to stay in Antarctica only long enough to make observations and gather data, and then return home to analyse the information and prepare reports.

The NSF dome, which provides cover for the station, will be returned to the US and replaced with two horseshoe-shaped buildings on stilts which will resist settling in the snow and ice. The US also hopes to refurbish McMurdo Station on Ross Island and Palmer Station on the peninsula. The US will also ask Britain, New Zealand and South Africa to help with logistics and costs.

NATIONAL DATA CENTRE CLOSER

The first steps in establishing a National Antarctic Data Centre (NADC) for New Zealand are being put in place.

Scientists will be encouraged to complete data descriptions while at Scott Base and with end-of-season science reports.

Descriptions of data collected through government-funded Antarctic research are not being systematically made or kept and, as a result, valuable information is being lost or is not accessible.

The NADCs, being established by all treaty nations, will form an Antarctic Master Directory (AMD) — an initiative of SCAR and managed by the International Centre for Antarctic Information and Research (ICAIR).

ICAIR, with seed funding from the Ministry of Foreign Affairs and Trade, is also designing an interface that will enable data descriptions to be retrieved from the NADC and AMD databases via the web. A web interface to allow entry of data descriptions is also planned.

Courtesy of "Ice Cap News"

AUSTRALIA CONSIDERS LEASING BASES

A recent report recommends that Australia lease two of its three bases to other nations and create a permanent air link and summer tourism in Antarctica.

Compiled by Australia's Antarctic Science Committee the report (Australia's Antarctic Programme Beyond 2000) also recommends changes to Australia's entire Antarctic programme with more emphasis on practical research with economic and national significance.

"Australia must retain a permanent presence in Antarctica and retain at least one all-year operational station on continental Antarctica," the report said. "But with the expected increasing automation of data gathering the requirement for three year-round stations may diminish."

The report suggests Australia retain Davis base for its central and convenient location and consider sharing or leasing Mawson and Casey bases to other nations. Building a permanent air strip on the continent to improve Australia's links with its Antarctic bases was also recommended.



Davis Station, Antarctica. By D. Watts

NATIONAL PROGRAMMES



NEW ZEALAND

1997-8 SEASON UNDER WAY

The first passenger flight of the summer Antarctic season left Christchurch for McMurdo Sound on 1 October.

On board were 19 New Zealanders supporting science from Scott Base and other camps. Thirty New Zealand projects are being

supported this season, the largest of which is the six-nation Cape Roberts project which had to be postponed early this season due to unstable ice conditions. (See story and photographs on page 64)

Other projects will examine the way life-forms cope with extreme

environmental conditions, the influence of sea ice on Southern Hemisphere climate and the geological history of a part of Antarctica once linked with New Zealand. About 350 people will be catered for at Scott Base, making it one of the busiest seasons.

THIRD QUARTER PHENOMENA STUDY CONTINUES

A team from Lincoln University led by Dr Gary Steel visited the Ice twice again this season to continue a behavioural study experienced within isolated groups over the course of an Antarctic year.

The study is investigating the relationship between personality variables and fluctuations in mood, morale and group cohesiveness.

Dr Steel hopes results of the study will help to address fundamental

questions about the temporal processes of emotions and motivation. It will also aid station managers and staff in planning for the challenges of long-term stays on the ice.

Results so far seem to show that Bechtel's third quarter theory (drop in mood) is unlikely to be supported by the data collected, possibly because the people he studied "are remarkably resourceful and open to experience".

ANTARCTIC ALBEDO

Scientists from Victoria University have recently returned from a three week study on the Ice measuring the amount of ultra violet light reflected by snow.

Reflection of sky light by snow determines the Antarctic albedo and it is understood that transmission through snow can affect the amount of UV reaching algae on the sea-ice bottom.

Scientists checked and compared properties of the Antarctic skies at Scott Base and near the sea-ice edge with the expectation that the nature of the skylight — polarisation and intensity distribution — would change near the sea-ice edge.

TRANSANTARCTIC MOUNTAINS EVOLUTION

Dr Ian Turnbull from the Institute of Geological and Nuclear Sciences visited the Ice in December to investigate the structure of the lithosphere of the Transantarctic Mountains and Victoria Land Basin.

The project aims to improve knowledge of the processes involved in the structural development and evolution of this major rift mountain chain, which is one of the largest ranges on Earth.

The Transantarctic Mountains have had a profound influence on the geological and glaciological development of the Antarctic region during the Cenozoic age and, as a result, have had a significant influence on global sea-level

and climate changes during this period.

The work will also contribute to the understanding of crustal isostatic response to deglaciation, the evolution of the rocks forming the Transantarctic Mountains, and the seismicity and geomagnetism that link present day Antarctica to contemporary global geophysical processes.

Geological field investigations of the rocks adjacent to the Wilson Piedmont Glacier, between Granite Harbour and New Harbour in Southern Victoria Land, are focussed on identifying major fault systems associated with uplift of the Transantarctic Mountains.

FLU PANDEMICS UNDER STUDY

Influenza pandemics occur when a new flu virus spreads rapidly and causes illness in a high proportion of the global population.

The last one was 26 years ago and plans are being made to deal with the next one. One of the recommended actions is to look for potential pandemic flu viruses in animals and birds.

Dr Frank Austin of Dunedin spent a month visiting Cape Bird, Cape Crozier, Cape Royds and Cape Evans looking for potential pandemic influenza viruses in Antarctic skuas and penguins. Samples from penguins and skuas were collected to compare virus isolates with human strains.



AUSTRALIA

WIDE RANGE OF RESEARCH PROGRAMMES UNDER WAY

During the 1997-98 season, the Australian Antarctic Division, through ANARE (the Australian National Antarctic Research Expeditions), will support 135 scientific research programmes in the atmospheric, biological, human impacts, oceanographic and medical disciplines, to be conducted in the Antarctic and subantarctic regions.

Subantarctic Macquarie Island will be the focus for new and continuing studies, including investigations into the factors controlling the population status and food consumption of elephant seals, in an attempt to understand why seal numbers have been declining since the 1950s.

A track survey of the island this season will document the flora and fauna, heritage, aesthetic and wilderness qualities, and will form the basis of a wilderness inventory for a Macquarie Island Geographic Information System.

At Australia's Mawson Station, research programmes will include investigations to obtain basic information on the microbial, viral and parasitic flora of Adélie and emperor penguins in Antarctica, and especially to identify pathogens and exotic agents that may pose a threat in the future.

Physicists at Mawson this season will look high above the Antarctic continent in a number of related studies that will provide further insight into the structure, variability



*Aurora Australis at anchor near subantarctic Heard Island.
Photo by Rick Burbury, courtesy of the Australian Antarctic Division*

and energy transfer mechanisms operating in the high latitude upper atmosphere.

Research programmes at Casey Station this coming summer will include a continuing study of petrels on Ardery Island as part of a major international study of seabirds as an indicator of climate change, and an investigation of the coastal marine communities to monitor the health of the Antarctic environment in the Casey area.

An Australian-French cooperative study on the use of alternative energy systems has the longer term objectives of making Antarctic stations independent, or near independent, of fossil fuels and consequently minimising their impact on the environment. As well as the collection of meteorological data in support of the project, work this year will include the collection and analysis of hydrological data

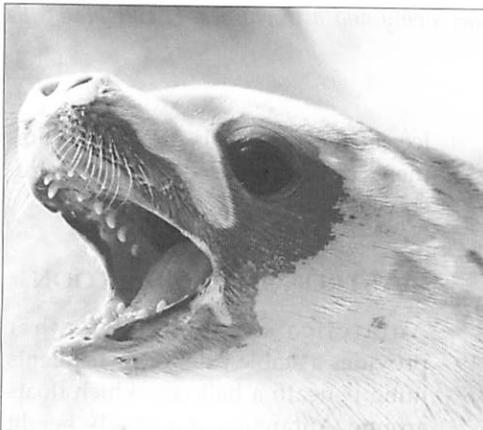
at a site near Australia's Davis Station, which has potential for utilising tidal power.

Human responses to the Antarctic form part of medical research to be carried out at all ANARE stations this year aimed at understanding the effects of the Antarctic environment on expeditioners, providing researchers and operators with a more detailed knowledge of the problems of adapting to life in Antarctica.

The Australian Antarctic Research and Supply Vessel (RSV) *Aurora Australis* will support a number of marine science projects this season in the Southern Ocean and the waters adjacent to the Antarctic continent. In October *Aurora*, on its first Antarctic voyage of the season to resupply Davis Station, will be the platform for a number of marine research projects.

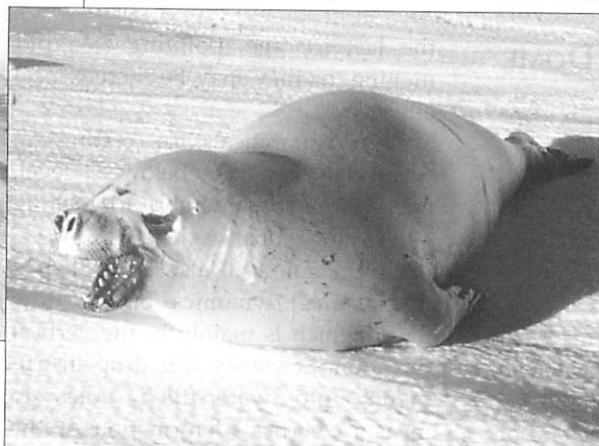
The programme will include studies of pack-ice seals, notably the elusive crabeater seal, which

lives exclusively in the Antarctic pack-ice zone. The long-term study is part of an international research programme that will culminate in a multi-nation circumpolar survey of pack-ice seals in 1998-99 aimed at improving understanding of the behaviour, distribution and abundance of these significant marine mammals.



Crabeater seals.

Above photo by D Cheeseman, courtesy of the Australian Antarctic Division



In February 1998 the marine science focus will turn to the subantarctic, where a month long Southern Ocean voyage will concentrate on a variety of research projects including an investigation into the role of the subantarctic zone in Southern Ocean heat and water transport, air-sea gas exchange, primary productivity, ecosystem structure, and carbon export to the deep sea.

For further information on the Australian Antarctic Programme contact the Australian Antarctic Division on telephone +61 3 6232 3209 or access the Australian Antarctic Division's World Wide Web Home Page at: <http://www.antdiv.gov.au>



Adélie Penguins. Photo by D Cheeseman, courtesy of the Australian Antarctic Division



MALAYSIA

MALAYSIA'S FIRST OFFICIAL VISIT TO ANTARCTICA

Malaysian and New Zealand cabinet ministers visited Scott Base on 13 November to show the Malaysian delegation the international nature of Antarctic activities and to encourage science collaboration between the two countries.

Dato' Seri Dr Ling Liong Sik, the Malaysian Minister of Transport, led the first official Malaysian visit to Antarctica, hosted by Simon Upton, New Zealand's Associate Minister of Foreign Affairs and Trade. Dato' Dr Salleh Mohd Noor, a fellow of the Malaysian Academy of Sciences, and a foreign affairs official, Mr Hussein Haniff, were also part of the Ice visit.



SOUTH KOREA

NEW SOUTH KOREAN BASE IN ANTARCTICA

The South Korean news agency, Yonhap, reported that the South Korean government has budgeted US\$92m for a new Antarctic base. The completion of the base is expected in 2002.

Yi Chung-hwan, marine policy bureau chief of South Korea's Maritime Affairs and Fisheries Ministry, stated that studies at the new base will include "explorations of mineral resources and offshore oil (and) studies on marine resources" to contribute to "the securing of territorial rights for mining blocks of underground resources." This is in spite of the fact that the Environmental

Protocol establishes a 50 year moratorium on oil and mineral exploitation.

When asked to comment on this report, Ambassador Yoon-Kyung Oh, head of the Korean delegation to ATCM XXI, issued a "non-paper" which stated that the report was an "utter misrepresentation".

The Korean Government is a firm supporter of the cause of Antarctic environmental protection and will continue to carry out its scientific activities in the Antarctic in strict compliance with the Protocol and Annexes. The Ambassador promised to pursue this matter and take corrective measures, if necessary.



UNITED STATES

A new research season is under way in Antarctica, encompassing 185 research projects supported by the National Science Foundation (NSF). The number of projects is significantly higher than recent summer seasons because of the addition of a major oceanography programme. Research covers earth sciences, glaciology, biology, medicine, oceanography, meteorology, aeronomy and astrophysics. Highlights of the current season include:

ICE DRILLING AT SIPLE DOME

Drillers will extract a 1000-metre core from West Antarctica's Siple Dome, a mound of ice between two fast-flowing ice streams. The ultimate goal is to study the annual layers of ice to improve predictions of climate change.

The rivers of ice drain the West Antarctic ice sheet and are critical to its stability. Current changes in the ice sheet could be responses to the end of

the last ice age, pointing to rapid melting, or they may be merely local effects.

West Antarctica's ice, resting on ocean crust in a basin below sea level, may be most vulnerable to melting and raising global sea level.

Siple Dome will also be drilled to understand dynamics of ice flow there, which is mainly in the vertical direction. Scientists will drop instruments into water-filled holes to measure vertical deformation of the

ice, in the first such direct measurements of vertical velocity at a deep ice-core site.

ASTRONOMY BY BALLOON

Antarctica's summer weather provides a stable ride for instruments hung beneath a balloon, which floats around Antarctica at a steady height above most of the atmosphere, providing a cheaper way to get scientific experiments into space.

This year, a spectrometer will sail for 10 days around the continent, tracking gamma rays emitted by neutron stars, black holes, the centre of the galaxy, and other features.

JOINT VENTURE TO DRILL AT VOSTOK

In a joint U.S.-Russian-French venture, scientists will complete drilling the world's deepest ice core this season at Russia's Vostok Station. Drilling last stopped in February, 1997 at a depth of 3523 metres.

Covering more than 400,000 years of snowfall, this core spans four glacial interglacial cycles, furnishing an archive of information on past climate history. The drillers will plumb about 175 more metres of ice, stopping 50 metres above Lake Vostok so as not to contaminate the huge lake sealed beneath the ice sheet.

ULTRAVIOLET REVELATIONS

When more than half of Antarctica's stratospheric ozone disappears each spring, the sun's ultraviolet-B radiation can penetrate to the Earth's surface and into the sea.

Scientists will study how UV-B affects the embryos and larvae of three key invertebrates living in shallow waters off the U.S. Palmer Station near the Antarctic Peninsula.



Palmer Station . . . ultraviolet study.

Another project at Palmer will study the photochemistry of seawater surrounding cells in organisms bombarded by increased UV-B. Such chemistry can influence damage to the cell surface. Still other work will quantify how UV light affects plankton, the base of the ocean food chain.

SEA ICE — SHRINKAGE

The growth and shrinkage of the sea ice around Antarctica may be the greatest seasonal event on Earth.

Scientists aboard the *Nathaniel B. Palmer*, NSF's icebreaking research ship, will compare ice and snow on the surface with how they appear in satellite images.

Actual measurements of ice on the surface help to validate computer models of climate by making simulations of sea ice more accurate.

Turbulent Mixing:

Very cold, saline water, formed in the depths of the southernmost Weddell Sea, feeds dense "bottom water" that spreads throughout the world's ocean.

U.S. scientists on a British Antarctic Survey research vessel will study the open water at the face of the Filchner-

Ronne Ice Shelf, focusing on how the water emerging from beneath the shelf mixes with other water masses.

"ICEBREAKER" TO HERALD NEW SOUTH POLE STATION

NSF will formally break ground (or ice) this month to begin constructing a new station at the South Pole.

During the first phase of construction, a new garage and shop, fuel storage system, and power plant will be built. This season the site will be prepared and a new arch to house the garage and shop will be erected.

New Atmospheric Research Observatory will be dedicated in January at the South Pole, replacing the overcrowded and ageing Clean Air Facility.

The ARO will offer twice the space of its predecessor for research on climate, ozone, ultraviolet light, and other atmospheric studies.

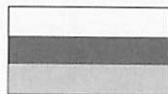
TRACKING NEUTRINOS AND THE BIG BANG FROM THE SOUTH POLE

The Antarctic Muon and Neutrino Detector Array (AMANDA) is an unusual form of telescope has been buried in the ice cap at the South Pole to look downward into the earth for the telltale traces of neutrinos.

Leading the nascent field of neutrino astronomy, AMANDA studies the ghostly subatomic particles emitted from such sources in space as supernovae remnants, pulsars, neutron stars, or active galactic nuclei. The neutrinos pass through the North Pole, on through

the earth, and stream into AMANDA's detectors. Scientists will augment the current array this season by adding three new detector strings to the 14 already in place.

New at South Pole this season will be Viper, a two-metre diameter telescope designed to look at radiation left over from the 'Big Bang'. It will operate on a smaller scale than previously from the Pole (initially with an angular scale of one-half degree at a six millimetre wavelength; in the future on a finer scale).



RUSSIA

MOLODEHZHNAYA STATION WILL CLOSE TO CUT COSTS

In an effort to economise Russia plans to close the Molodezhnaya Station in Eastern Antarctica within two to three years.

Other stations are also feeling the pinch. The Progress station 800 miles away will become Russia's main base on the continent. The Bellingshausen station will be left with a minimum work force and crew from Mirny Station, which has an observatory, will be halved. And the Vostok Station, near the Pole of Inaccessibility, will be maintained as an international research base.

In Soviet times, Russia had as many as seven Antarctic stations. But financial problems since the 1991 Soviet collapse have made continuing on that scale impossible.

(Ice Cap News)

GATEWAY CITY BLAZES A TRAIL

By Warren Head

The value of Antarctic scientific and commercial activity has been conservatively estimated as being worth \$50m annually in economic benefit to the city of Christchurch in New Zealand.

High-profile events during 1997 have created a higher awareness of the city's historic association with "the Ice", including celebrations marking the 40th anniversary of New Zealand's Scott Base.

An associated event was the 14 May 1997 opening by Christchurch Mayor Vicki Buck of the "Antarctic Heritage Trail", which marks eight individual sites within the precincts of the central city, its port town Lyttelton and Christchurch International Airport.

This trail ties in numerous locations of interest to the city's growing number of international visitors at a time when the Antarctic experience may be emerging as a significant business driver.

The New Zealand Tourism Board's International Visitor Survey shows that in 1995-96 602,000 visitors included Christchurch among their calls, spending \$388m in the city. On a multiplier of 2.4 times this suggests an annual economic impact of \$932m in the city from tourism, says the executive director of Canterbury Tourism Jeanette Elliott.

The NZTB International Visitor Surveys also indicate that 54% of visitors include museums and art galleries among their leading preferences for attractions.

This finding gains credibility from the performance of the innovative Canterbury Museum which, according to spokesperson Sarah Aston, attracted 462,000 visitors in 1996. "The majority of these visitors would have visited our famous Antarctic Hall, which features the only collection of its type anywhere in the world."

Alerted by these trends, and the high profile resulting from the establishment of the new government organisation Antarctica New Zealand, Christchurch city is focusing resources behind the Antarctic.

Early in 1998 local agencies and organisations such as Antarctica New Zealand, the Christchurch City



The International Antarctic Centre, at Orchard Road near Christchurch Airport.

Council's economic promotion agency the Canterbury Development Corporation and the Canterbury Employers' Chamber of Commerce will collaborate to explore a range of initiatives related to the great white continent.

A clearer understanding of the overall economic benefit of being the Antarctic gateway city for New Zealand is expected to emerge.

For almost a century, Christchurch, has been the stepping-off point by air and sea for numerous Antarctic activities.

Today the city is regarded as one of the major gateways south to the continent, servicing the New Zealand, United States and Italian national

programmes as the final supply base for New Zealand's Scott Base, the USA's McMurdo and South Pole Stations and Italy's Terra Nova base.

The nearby port of Lyttelton is the departure point for Antarctic supply and research vessels from numerous nations and for tourism cruise vessels.

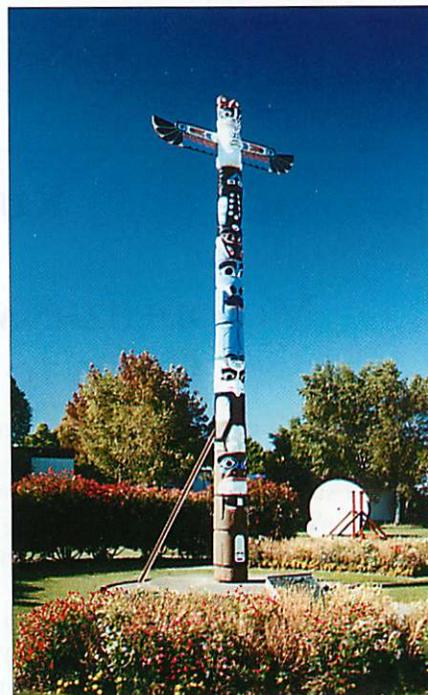
Canterbury Museum on Rolleston Avenue is the home to some of the most important Antarctic relics in the world. It was here that Dr Edward Wilson, of Robert Falcon Scott's National Antarctica Expedition, worked on the beginning of one of the most outstanding international collections on exploration.

Centre-piece today in the epic Sir Robertson Stewart Hall of Antarctic Discovery is the snocat "Abel" of the Trans-Antarctic Expedition led by Britain's Sir Vivian Fuchs and the Ferguson tractor driven by New Zealander Sir Edmund Hillary to the South Pole on the 1957-58 expedition.

It was from Lyttelton that the ships of Robert Falcon Scott's National Antarctica Expedition, *Discovery*, *Morning* and *Terra Nova*, sailed between 1901 and 1904. Returning to Lyttelton in 1910, Scott sailed on his ill-fated second expedition.

The statue of Scott, unveiled in 1917, in Worcester Boulevard is one of the best known landmarks on the Heritage Trail.

Sculpted by Kathleen Scott, the explorer's widow, it is a magnificent monument to the deaths of Scott and his men Wilson, Evans, Oates and Bowers, in an unsuccessful attempt to return from the South Pole.



The totem pole celebrating Operation Deep Freeze.

Prior to the 1901 expedition, Scott stayed with the Rhodes family at Te Koraha, now part of Rangi Ruru Girls' School in Hewitt Road, Merivale. The famous explorer also stayed at the home of Sir Joseph Kinsey on Clifton Hill and, like Shackleton and Wilson, he was also a guest of the Bowen family at 'Middleton' (now Middleton Grange School).

Ernest Shackleton's 1907-1909 expedition also sailed from Lyttelton, where Quail Island was used as a quarantine station for the party's animals. Shackleton's ship *Nimrod* carried the party south including three men who, travelling overland, would be the first to reach the South Magnetic Pole.

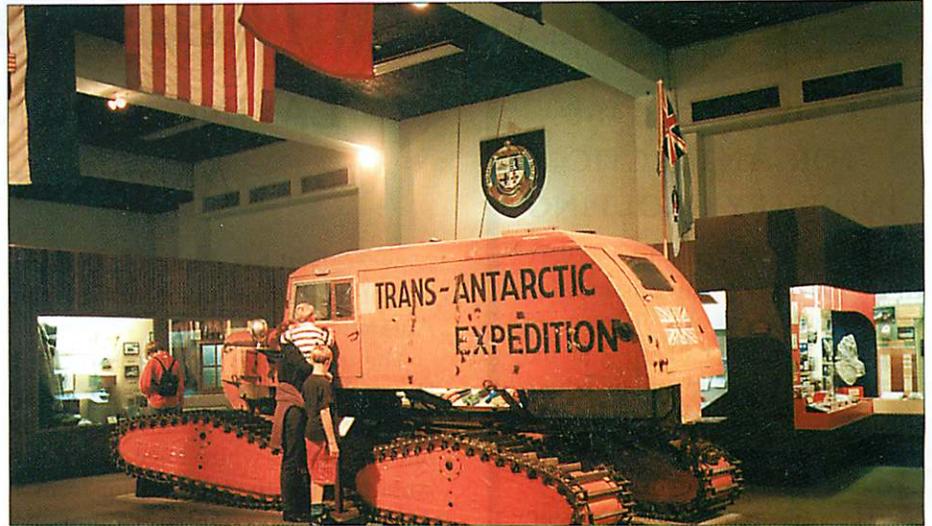
Lyttelton Harbour and No 3 wharf were the last points of departure for many of the British expeditions at the turn of the century. The port town was at the centre of international interest and at the departure of the *Nimrod* on New Year's Day 1908 a crowd of 50,000 gathered on the wharves to farewell Shackleton's expedition.

During the 1960s, Operation Deep Freeze had a warehouse in Lyttelton ... and the first American-style coffee bar (Revells, now Lyttelton Takeaways).

An early seamen's mission — which gave comfort to many an Antarctic crew, including that of the *Terra Nova* — has been converted to the Lyttelton Museum and features an Antarctic Gallery. Genuine relics from early Antarctic exploration are on display including a sledge used by Shackleton.



Statue of Robert Falcon Scott.



The Canterbury Museum features the world-renowned Antarctic Hall.



Lyttelton Museum highlights Antarctic expedition vessels.

Quail Island became the stock quarantine station during the heroic era of Antarctica exploration because of its natural water boundary. The animals, Samoyed and Husky dogs, Manchurian ponies and Indian Army mules, which were an essential element of the expeditions of Scott, Shackleton and Byrd, were trained on the island.

The island is today administered by the Department of Conservation, which has established an "Interpretation Centre" in the former manager's residence.

At Christchurch Cathedral, at the beginning of the trail, an outdoor plaque is a memorial to those who have given their lives to Antarctica. A second plaque, inside the imposing cathedral, was presented to the people of New Zealand by the officers and men of Operation Deep Freeze, the United States Antarctic programme based from 1955 at Christchurch.

From 1964 this programme has

been administered by the US National Science Foundation's Office of Polar Programmes. After a 42 year involvement by the US Navy, the operational functions of the programme will transfer from February 1998 to the New York State Air National Guard.

Until 1980 a North American Indian totem pole "of friendship" stood in the city's Hagley Park, a gift from the Oregon Centennial Commission and the Portland Zoological Society in appreciation of the hospitality accorded to personnel of Operation Deep Freeze.

At the top of the pole, now relocated to Christchurch airport, is the American Thunderbird, traditional Indian god of storm, honouring US airmen who made their first supply drop at the South Pole in October 1956.

Another carved figure, the killer whale, honours US sailors who opened sea lanes through the ice-pack to the continent.

Continued on page 68
Continued from page 61

TOURISM

CDC PUTS CASE FOR ANTARCTIC INDUSTRY GROUPING

Christchurch clearly has a very strong and very visible association with Antarctica, and if a recent Cluster Meeting gathering in the city is anything to go by, there exists a strong commitment to develop a cluster of industry centred on the Antarctic.

The 7th August Cluster Muster, organised by the Canterbury Development Corporation, examined how clusters of industry could be developed to act as the economic drivers of the local economy into the next century. After an overview of the Canterbury region's business and infrastructural strengths, close to 200 of the region's business, education and community leaders joined together to identify and map local industry clusters that were both 'real' and 'wanna be's'.

Very much in the 'real' category is Antarctica, with Christchurch already home to a critical mass of organisations for which the continent is their core business:

- Antarctica New Zealand
- International Centre for Antarctic Information and Research
- New Zealand Antarctic Society
- Antarctic Heritage Trust
- Deep Freeze and NZ Antarctic Programme Base
- Antarctic Visitor Centre.

The challenge to build an Antarctic industry cluster on this already strong platform will be taken up in the next few months with further opportunities in science, research and development, technology transfer, engineering, servicing, education and tourism being identified in conjunction with a review of any infrastructural issues that might have potential to act as an impediment to growth.

For further information contact Chris Pickrill at the Canterbury Development Corporation, phone (03) 379 5575.

LAYING DOWN THE RULES FOR ANTARCTIC TOURISM

New Zealand has published the first set of rules for operators in the Antarctic.

The rules are for the Ross Sea Dependency and apply to New Zealand citizens and to citizens of other countries which have signed the Antarctic Treaty. An operator from a non-signatory country cannot be made to abide by the rules.

The head of the Antarctic division of the Ministry of Foreign Affairs, Stuart Prior, said the need for guidelines had become apparent as international operators target what he calls the "Theme Park Antarctica."

The book says after fishing, tourism is the main commercial enterprise in Antarctica. In the 1995-96 summer about 9000 tourists visited the subcontinent, mostly in the Antarctic Peninsula, south of South America. About 95 per cent go by commercial cruise ships. Last year 800 visited the Ross Sea.

The book points out the scope of tourism activities is changing.

While most tourists and visitors arrive aboard ships for sight-seeing, increasing numbers are seeking wilderness adventure experience such as mountaineering, skiing,

motorised over-snow travel, paragliding and scuba diving: "... the recent substantial and sustained growth in the number of tourists, and the expansion and diversification of activities give rise to concerns over the potential for increased and cumulative environmental impact."

'While most tourists and visitors arrive aboard ships for sight-seeing, increasing numbers are seeking wilderness adventure.'

At some scientific stations restrictions have been placed on visitors and some overcrowding has occurred at historic huts.

Under the rules operators will have to prepare environmental impact assessments and will have to pay to have a New Zealand government representative with them at all times they are in the dependency.

GETTING THE MESSAGE ACROSS

by Roger Dennis

The Visitor Centre at the International Antarctic Centre in Christchurch is the first tourist attraction in New Zealand to make use of digital audio technology for multi-lingual commentary.

The system, called Snowphone, is similar to a telephone handset and carries a digitalised commentary in a small computer chip. The 50 handsets carry half an hour of commentary in either English, Japanese, Korean, Thai, Mandarin, or German. The language on each handset can be changed in as little as 90 seconds, according to Richard Benton, general manager Visitor Centre, International Antarctic Centre.

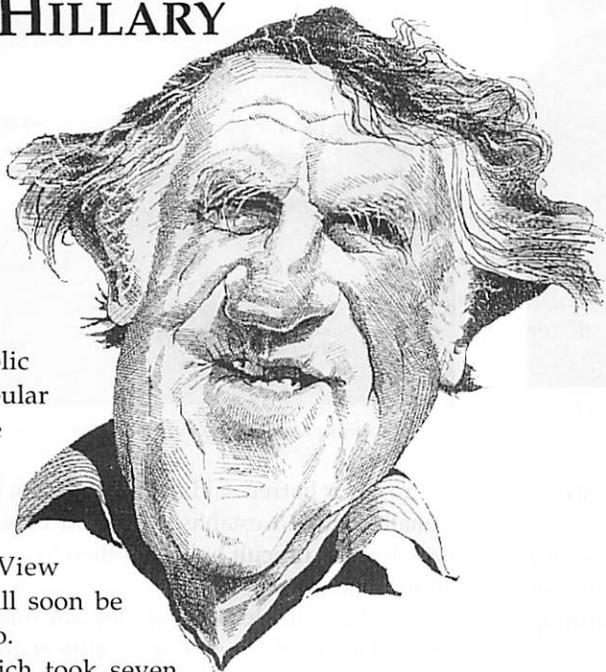
Visitors are issued the handsets on

arrival, and listen to the commentary as they move around the centre. At various points, markings on the wall denote a number next to a flag. The visitor selects the number which corresponds to their flag, and enters this number on the handset keypad. The commentary for the relevant display then starts. It can be stopped, paused, rewound or repeated as often as required.

Mr Benton says that he had been searching for a multi-lingual commentary system for some time, and first saw the Acoustiguide at the San Diego zoo. Acoustiguide also supply the commentary system for renowned attractions including the Louvre and the Empire State Building.

GENERAL

TVNZ HILLARY SERIES ON VIDEO



Good news!
After much public acclaim and popular demand, the recently screened four part TVNZ series entitled 'Hillary — A View from the Top' will soon be available on video.

The series, which took seven years to create, focuses on the life of Sir Edmund Hillary and his amazing exploits.

It is hoped that readers of 'Antarctic' will be able to receive a special offer when the video becomes available to the public.

See the next issue of 'Antarctic' for further details.

WANTED

Diary of Harry Neville Shrimpton, written during the Richard Byrd Expedition 1928-1930

Can anyone help Bronwyn Taylor find her father's diary? Harry Neville Shrimpton, who died in 1988, was the radio operator on the 1928-30 Byrd Expedition.

His diary was apparently lent to someone at an Antarctic Society meeting in Wellington sometime during 1950 or 1951, but was not returned.

Shrimpton's second diary, which describes his journey post-expedition (1930) from Dunedin to New York to receive the US congressional medal, is in a worn, black, soft-covered exercise book. His daughter assumes that the missing diary (part one) might look the same.

If anyone has the diary, or knows where it might be, please contact Bronwyn Taylor at 71 Hatton Street, Wellington 5, New Zealand tel. (04) 476 6369.

Antarctica New Zealand

Providing leadership in developing, promoting and realising opportunities for New Zealand from international involvement in Antarctica and the Southern Ocean.

Recent Publications:

- Antarctic Science Beyond 2000: Report from a strategic science directions workshop.
- 1996/97 Annual Report
- Opportunities for post-graduate Antarctic Scholarships

Upcoming Christchurch Events:

- Antarctic Futures Workshop, April 1988.
- Scientific Committee for Antarctic Research VII International Biology Symposium, August 31-September 4, 1988

Publications and conference circulars available from the Antarctica New Zealand library.

Antarctica New Zealand

International Antarctic Centre, Orchard Road, Private Bag 4745, Christchurch, New Zealand

Telephone: +64 3 358 0200 Fax: +64 3 358 0211

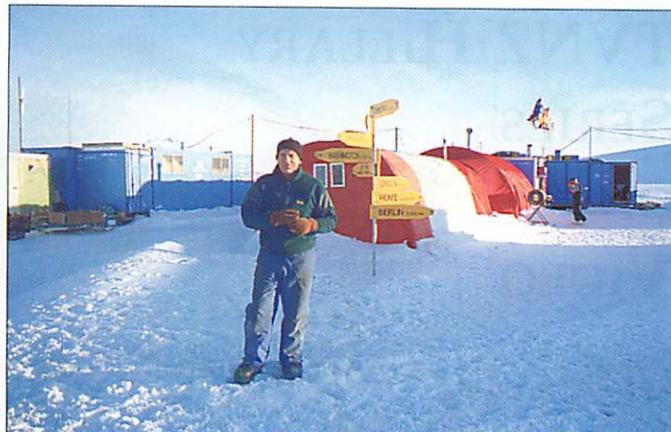
Web site: <http://www.antarcticanz.govt.nz>



STORM PUTS BRAKE ON CAPE ROBERTS DRILLING



Scientists examining some of the core this season's drilling samples recovered from below the ocean floor.



Logistics Manager Jim Cowie at the Cape Roberts Project base camp.

A severe storm brought this seasons drilling at Cape Roberts to a premature close in late October.

The two-day storm in the southern ocean cracked sea ice which had moved to within a kilometre of the project's 50-tonne drilling rig and caused huge swells under the drilling platform.

Twenty drillers and support staff, part of the six nation research project being managed by Antarctica New Zealand, were forced to evacuate the Cape Roberts area, 125km from Scott Base. The decision to evacuate was taken after an aerial reconnaissance revealed fresh sea ice cracks.

Chief scientist Peter Barrett, of Wellington's Victoria University, said while the abandonment was disappointing, nearly 150m of rock core had been recovered from below the ocean floor. Scientists had dated the rock at 17 to 22 million years old.

"This was a major surprise and an exciting one," Professor Barrett said of the first find. "It's a period of time not sampled before near the big Antarctic ice sheet."

He had hoped to drill a second hole closer to shore to reach rocks expected to be in the 30-70 million year old range but the state of the sea ice platform, weakened by unseasonably warm temperatures and southerly storms, prevented this.

Professor Barrett said the project team had worked exceptionally hard to establish camp in bitter weather, recover rock from a difficult hole, and then to evacuate a drill site at short notice.

"We have made some significant finds, proven that the technology works in this environment and built operational and science teams that put us in good stead for next year."

It is expected another hole will be drilled in October-November 1998.

The Cape Roberts Project involves funding and scientific collaboration from the United States, Italy, New Zealand, Australia, Germany and Britain. Its aim is to determine ancient scientific climatic conditions to support research into predicting the effects of the ice sheet on any future changes.

The research programme had been 10 years in the making and had an operating budget of \$8 million. Drillers were recruited from rigs around the world, including Papua New Guinea and Mongolia. An advance party had established the project's base camp and a route to the drilling area, about 16km offshore.

Professor Barrett said the sedimentary rock was formed up to 100 million years ago. "Like the pages of a history book it should reveal the changes in Antarctic climate conditions during this period and links to ice sheets and sea level."

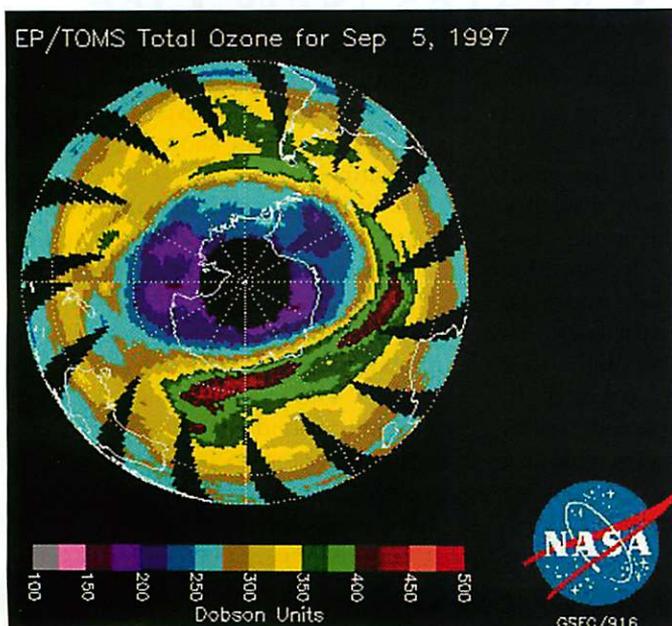


The Cape Roberts drill site during dismantling after the October storm.



Team leader Peter Barnett, of Victoria University, at the project camp site.

NEW EVIDENCE ON OZONE THINNING



NASA maps show ozone thinning begins mid winter.

New evidence has emerged that thinning of the ozone layer — previously regarded as a phenomena occurring in the southern hemisphere's spring — actually starts during winter.

The depletion process starts at the sun-lit edge of Antarctica, researchers from the British Antarctic Survey (who discovered the hole in the Earth's ozone layer in 1985) and the University of Cambridge revealed in the October issue of "Science".

Their disclosure came as New Zealand's Institute of Water and Atmospheric Research (NIWA) was declaring the ozone hole over Antarctica "as severe as ever."

NIWA scientists at Scott Base have reported that the ozone layer's thickness has recently been close to record lows. Satellite data from the US space agency NASA shows the ozone hole covering 25 million sq km (9.65 million sq miles), says NIWA.

"The extent and severity of the 1997 hole is about the same as in each of the past five years, at about 60% less ozone than pre-1980," says NIWA. "The hole is at its worst in October and breaks up by early December."

NIWA scientists expect severe ozone holes to develop annually for the next 20 years because of the residual amount of chlorine pollutants already in the Earth's atmosphere. They say the ozone hole is formed by a combination of extremely cold temperatures, the return of sunlight to the Antarctic and chlorine pollutants.

NIWA claims that "virtually all of the ozone in the Antarctic atmosphere between 14-20kms (9-13 miles) has been destroyed by chlorine pollutants released from choroflouorocarbons (CFC's)".

Use of CFCs, found mainly in aerosols, refrigerators and air conditioners, are to be phased out under the terms of the 1987 Montreal Protocol. New Zealand enacted the Ozone Layer Protection Act 1991 to try to reverse the damage to the ozone layer which shields the Earth from harmful ultraviolet rays from the Sun. *Continued on page 68*

1998/99 SEASON

ANTARCTICA

the ultimate
cruise experience
aboard the Marco Polo



Unequaled in value

The Marco Polo brings Antarctic cruising into the realm of the affordable. For instance, you can join one of our expeditions from just \$8,295* including return airfare, first-class hotel accommodation, all shore excursions and meals onboard.

Unequaled in splendour

Stunning icescapes, majestic glaciers, astounding wildlife and a ship to take you there that is every bit as splendid as the scenery combine to make a cruise to Antarctica the ultimate travel adventure. The Marco Polo, with its ice-strengthened hull and Zodiac landing craft, is uniquely suited for cruising these waters. And because of her luxurious facilities, she offers a level of graciousness and comfort not usually available in this remote part of the world.

Four exciting voyages in 1998/99

For the austral summer season of 1998/99, the Marco Polo will be returning to the White Continent with four stunning expeditions, one including the Falklands and one including a partial circumnavigation of the continent, led by noted explorers and scientists.

Passenger capacity will be limited, so book early.
1997/98 season sold out.


ORIENT LINES

Represented in New Zealand by Cruise Vacations (NZ) Ltd.

For further information contact your local travel agent or call

TOLL FREE 0800 CRUISE
(27 8473)

CRUISE THE WORLD ABOARD THE MARCO POLO
Great value cruise holidays to the world's great destinations:
Greek Isles ♦ Mediterranean ♦ Africa ♦ Egypt ♦ Indian Ocean
Southeast Asia ♦ New Zealand ♦ Australia ♦ Antarctica

*Price shown is per person based on two sharing cat. K and includes the early booking discount applicable to bookings confirmed before Dec 1, '97



CALL FOR A BROCHURE TODAY

REPORT

ICEBERG DEVASTATION CREATES NEW LIFE



By Dr Lloyd Peck, British Antarctic Survey.
Presented at the British Association Annual Science Festival

Researchers from British Antarctic Survey (BAS) have found that every year massive iceberg impact totally removes all large animals and microscopic organisms from some Antarctic shallow marine environments. The devastation creates remarkable opportunities for new life.

Iceberg disturbance not only acts as a destructive force, but also clears areas for new colonisation of larvae from distances up to several thousands of kilometres away. This is a major factor enhancing the diversity and abundance of marine benthic communities in this highly dynamic ecosystem. Several mechanisms are important in the return of species to an impacted site, including storm-induced water movements and recolonisation by larval forms.

Each year an area of sea ice about twice the size of Europe (15 million km²) forms during winter and melts in summer. Large glaciers discharge around 1500 billion tonnes of ice into the sea annually. Consequently, the sea is filled with ice ranging from single crystals to bergs up to hundreds of kilometres long and draughts over 400 metres deep. Wind and currents at speeds which may at times approach 5kph move this ice.

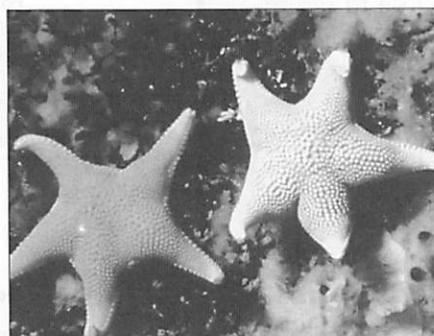
The destructive capacity of objects this size, even when moving at only a few kilometres per hour, is immense. Biological communities living on the seabed are subject to disturbances ranging from minor impacts to total destruction. Generally the shallower a site the more frequently it is disturbed. The vast majority of habitats less than three metres deep are swept clean of life every year, and often several times per year by brash and anchor ice.

In protected areas a highly abundant and diverse fauna exists, even in shallow sites. The diversity of these organisms is so high that the long-held belief that animal diversity decreases towards the poles has recently been refuted for benthic marine species in the Southern Hemisphere. Abundances in protected sites are so high that surfaces are completely covered. In exposed, highly impacted areas ephemeral annual species colonise some surfaces, but the macrofauna are restricted to a few mobile species. These include migratory populations

scientists has found many more pelagic larvae than expected. Recent studies have also shown that development rates in cold water ectotherms are dramatically slowed, such that in many species, including nemertean worms, sea urchins and starfish, the time taken to complete the larval phase often exceeds 100 days and may be as long as 150 to 200 days. The circumpolar current moving around the Southern Ocean, and the gyres associated with it in the Weddell and Bellingshausen seas have mean current speeds of around 1 knot. At these speeds a larva could



A British Antarctic Survey diver looks for samples under the ice.



Slow-developing starfish.



Nemertean worms.

of the limpet *Nacella concinna* and the urchin *Sterechinus neumayeri*. Between these two extremes a mosaic of disturbance levels exists producing a great variety of habitat types.

Traditionally it has been thought that very few benthic species living in Antarctica produced larvae which were transported in the water column. However, over the last three years work in Antarctica by BAS

travel distances in excess of 5000km to colonise new sites.

Investigations of the sediment-living bivalve mollusc *Yoldia eightsi* have shown that in areas where iceberg impacts are common, populations are dominated by small juvenile individuals. Less disturbed sites, on the other hand, are dominated by large aged specimens which inhibit recruitment of larvae.

EDUCATION

THE LEARNZ INITIATIVE

LEARNZ — the education programme for schoolchildren around New Zealand — has been taking students on an electronic trip to Antarctica for three years.

The programme is led by Pete Sommerville, LEARNZ (Linking Education Antarctic Research in New Zealand). Pete works at the International Centre for Antarctic Information and Research (ICAIR) and has been the driving force behind the popular LEARNZ initiative.

Improving communication between teachers and the science community is one of the primary objectives of LEARNZ. Each programme is built on Antarctic research projects with a selected teacher assisting in the interpretation of the science and the preparation of the learning modules. The programmes also share the issues and adventure of Antarctica with schools through live audio conference and Internet links. In 1997 LEARNZ registered schools enjoyed live links at the 21st Antarctic Treaty Consultative Meeting; at the International Antarctic Centre; during Antarctic Field Training; from Scott Base and at



LEARNZ leaders Pete Sommerville and Pauline Donaldson at Cape Roberts.

the international research camp at Cape Roberts. Many schools were thrilled with being able to share the experience.

As 1998 is the Year of the Ocean, organisers hope to be able to focus on the Southern Ocean. Bu Windsor, teaching principal at Mount Cook school, has been supported by NIWA to travel to the Campbell Plateau, South of Stewart Island in the Southern Ocean, on the two berth *Tangaroa* research vessel. LEARNZ hopes that Ms Windsor will also be the 1998 LEARNZ teacher onboard the oceanographic research cruise and focus on the education resources distributed to participating schools. But, despite the publicity and praise, this all depends on whether sufficient

funding can be raised to run the 1998 LEARNZ programme.

If funding can not be found. The LEARNZ programme will not be able to operate in 1998. However it will return for the austral winter in 1999 as the National Science Foundation have offered LEARNZ a berth for a New Zealand teacher to sail aboard the *Nathaniel B Palmer* state-of-the-art US ice breaking research vessel. Details of the 1999 programme are yet to be finalised.

For information about the LEARNZ programmes or to discuss sponsorship please contact Pete Sommerville at ICAIR on Tel: + 64 3 353 7791, Fax: +64 3 353 7799, or E-mail: learnz@icair.iac.org.nz

OTAGO AND AUCKLAND STUDENTS WIN ANTARCTIC SCHOLARSHIPS

Otago students Stephen Read and Brent Sinclair have won the inaugural Sir Robin Irvine Antarctic Scholarship, named in honour of a former Otago University Vice Chancellor.

Funded by Antarctica New Zealand, the \$10,000 scholarships are designed to encourage young scientists into the field of Antarctic research, a cause championed by Sir Robin before his death last year while chairman of Antarctica New Zealand's board of directors. The scholarships were presented to the students by Lady Irvine in August.

PhD student Stephen Read will visit remote areas of the Transantarctic Mountains to examine a suite of 500 million-year-old rocks and collect samples for sophisticated chemical analysis. His results are expected to help unravel the history of movement of the earth's crustal plates around the time that the rocks were formed, then

cooled from their molten state. He will spend five weeks in the mountains with three other Otago University scientists during the 1997/8 summer season.

Brent Sinclair, who is also studying for a doctorate, will spend time on his hands and knees near a penguin colony on the northern tip of Ross Island. He will examine tiny invertebrate animals which live among mosses and lichens, dependent on brief summer melt water from glaciers. His research will focus on how these animals survive such low temperatures and any possible effects of climate change on their populations. It will involve technologies ranging from a computer-controlled cooling system to plastic clothes, familiar to spring-time gardeners. He will make three visits to Cape Bird over the summer with other scientists from Otago University.

The 1997 \$10,000 Kelly Tarlton's Antarctic Scholarship was awarded to an Auckland University masters student. Lara Wilcocks will study wave motion in sea ice, an important factor in understanding climate change in the Antarctic. She will work for five weeks from a containerised camp on the sea ice north of Scott Base, part of an international team led by scientists from Industrial Research Limited and New Zealand universities.

Antarctica New Zealand chief executive Gillian Wratt said a record number of 16 applications were received for the scholarships this year, from universities throughout New Zealand.

1998 Antarctic Scholarships

New Zealanders who wish to apply for the 1998 postgraduate scholarships can contact Antarctica New Zealand on telephone (03) 358 0200.

NEW EVIDENCE ON OZONE THINNING

Continued from page 65

Antarctic ozone depletion occurs under very specific conditions.

When temperatures in the layer get cold enough, says the British Antarctic Survey, icy clouds can form that in association with sunlight activate chlorine and bromine gases that destroy ozone.

The new British observations were made at Faraday Station ("Vernadsky") at the edge of Antarctica (-65°S), using a new year-round instrument.

Previous instruments could not take measurements during the Antarctic winter because of a design requirement for sunlight at ultraviolet wavelengths which are scarce during winter.

The observations show a decline in ozone from mid-winter, due to chemical depletion by reactive chlorine and bromine compounds.

"We now have a new perspective on the Antarctic ozone hole," says BAS's Dr Howard Roscoe, noting the start each year in mid-winter at the edge of the continent.

"This is important because ozone-poor air from the edge of the ozone hole regularly passes over southern South America, exposing populations to larger than normal doses of damaging ultra-violet radiation."

BAS have installed a detection network based on the new Systeme d'Analyse d'Observations Zenithales (SAOZ) detection instrument devised by Dr Jean-Pierre Pommereau of Service d'Aeronomie du CNRS, Paris, in the mid 1980s. The instrument looks at the spectrum of the weak absorption bands of ozone in visible light, using a photodiode array originally developed for facsimile and bar-code readers, to detect light at all visible wavelengths.

Because the absorption bands are weak, the instrument observes their structure over a wide range of wavelengths to discriminate absorption by ozone from scattering by air molecules in the atmosphere. Because the light is at visible wavelengths, ozone can be measured even when the sun is at the horizon.

Modern computers record the

GATEWAY CITY BLAZES A TRAIL

The American eagle, grizzly bear and beaver are also represented on the pole.

The airport is also the location of the International Antarctic Centre, opened in 1990 as the headquarters facility of Antarctica New Zealand, the organisation spearheading New Zealand's strategic objectives in Antarctica.

The facility, part of the Heritage Trail, also houses the Antarctic Heritage Trust, the United States' Office of Polar Programmes, Italian Antarctic programme, the International Centre for Antarctic Information and Research, the Antarctic Library, an Antarctic passenger terminal and cargo storage.

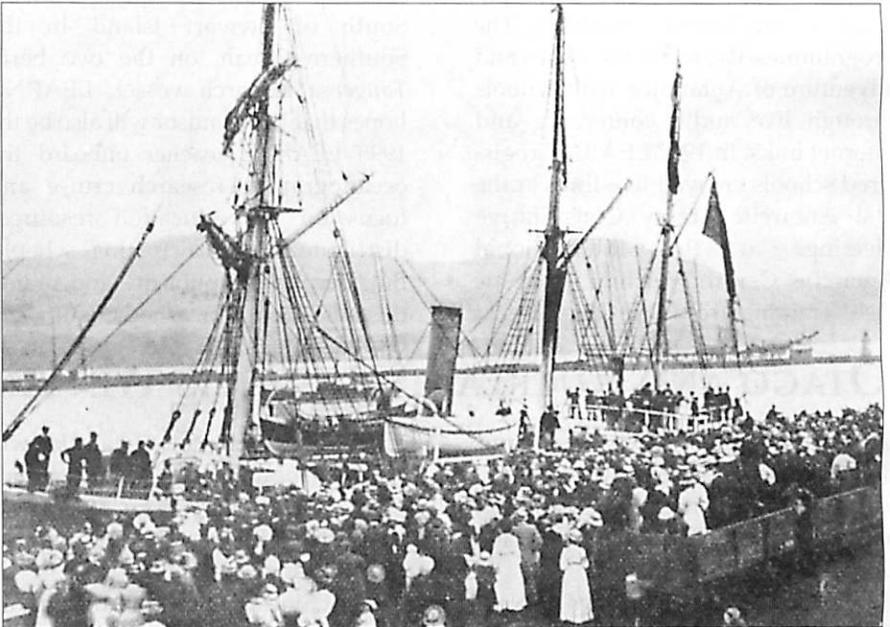
Adjacent to the complex is the Antarctic Visitor Centre, an interactively themed fun and educational

facility opened in 1992 featuring an Antarctic Snow and Ice experience.

The Antarctic Heritage Trail was launched as a project of the Christchurch City Council to reinforce the attraction to visitors of the city's deep historical and current commitment to the Antarctic.

"We want to encourage tourists to stay longer in the city and appreciate its heritage," says John Dryden, head of the city's environmental Policy and Planning Unit. "We also hope that the trail will help to promote the excellent facility at the Antarctic Visitor Centre."

The city is not being complacent about its relationship with the southern continent. It will soon host a forum which will look ahead to the strategic future of Antarctica. (See separate story on page 52).



Ernest Shackleton's ship Nimrod returns to Lyttelton during the 1907 - 1909 expedition.

amount of ozone measured in the path of this scattered light to be related to the amount of ozone in a vertical path.

The calculation is more accurate for light at visible wavelengths than at UV wavelengths because there is less scattering at visible wavelengths.

Older instruments for measuring ozone look at the strong absorption bands of ozone in UV sunlight, using a pair of vacuum tubes (photomultipliers) to detect light at two wavelengths.



New observation instruments track ozone levels year-round.

BOOK REVIEW

THE SILENCE CALLING

**Australians in Antarctica 1947-97
(The ANARE Jubilee History)**

by **Tim Bowden**

Published by Allen and Unwin, St Leonards, NSW 1997. Recommended retail price Aus \$59.95. Reviewed by Malcolm Kirton.

Fifty years ago, on November 17, 1947, the first of the Australian National Antarctic Research Expeditions (ANARE) sailed from Melbourne on a war-surplus "landing ship tank" (LST 3501, later renamed HMAS Labuan) to establish a research station on sub-Antarctic Heard Island.

This accomplished, the ship returned to Melbourne and departed again on February 28, 1948 to establish a similar station on Macquarie Island. During this 1947-48 summer a third expedition on board HMAS *Wyatt Earp* (Lincoln Ellsworth's old ship) attempted to reach continental Antarctica to explore possible locations for stations there. The chief scientist on this voyage was Dr Phillip Law, who went on to lead subsequent expeditions for the next eighteen years as Director of the Australian Antarctic Division.

Both ships proved ill-suited for voyages in the Southern Ocean, in fact they were in situations of considerable danger at times. Nevertheless Heard and Macquarie Islands' stations were maintained until 1954 when the first of the famous "Dan" ships became available. These were ice-strengthened ships owned by the Lauritzen Company of Denmark and in turn the Australian Government chartered *Kista Dan*, *Thala Dan*, *Magga Dan* and *Nella Dan*. These enabled ANARE to reach the continent of Antarctica and Mawson Station was established, followed by Davis in 1957. Wilkes was taken over from the USA in 1959 and replaced by Casey station in 1968. Also over this period, during each summer, Law led exploration teams which mapped the Australian Antarctic Territory.

The political incentive to establish these stations was the need to reinforce Australia's territorial claim to a large slice of Antarctica. This claim

was first made by Sir Douglas Mawson during his three expeditions between 1911 and 1931. A small amount of scientific work was included in the early wintering expeditions, almost as a by-product of the "flying the flag" occupations.

This increased year by year, also other government departments and universities were brought into ANARE to pursue their scientific disciplines.

'The quality of the results produced gave Australia a respected voice in Antarctic affairs as a member of the Antarctic Treaty group of nations.'

The advent of the International Geophysical Year (IGY) of 1958 gave additional stimulation to the politicians to increase funding for science. Thus the IGY saw Australia with three well established stations of Mawson, Davis and Macquarie Island up and running with scientific programmes.

The quality of the results produced by these gave Australia a respected voice in Antarctic affairs as a member of the Antarctic Treaty group of nations. In the subsequent 40 years programmes have advanced and technology has revolutionised data gathering.

Now the focus of Antarctic science is on global climate change and environmental protection. These are of such widespread concern that we now have a situation of science driving politics instead of the reverse as during the first years of ANARE.

To commemorate the fiftieth year of ANARE this year, the Australian Antarctic Division and the ANARE Club have organised a number of celebratory events. The major one was to commission Tim Bowden to write this book. Tim is well qualified for the task; he is an historian and former war correspondent who made several visits to Antarctica in connection with his work for the Australian

Broadcasting Commission Social History Unit and for the recording of two documentary series.

Above all he is highly enthusiastic about all things Antarctic and this shows on every page. He has made an excellent job of the book, tracing the development of programmes and policies over 50 years (about 178 station-years), detailing the major activities, achievements, successes and disasters. This is leavened with a nice selection of personal anecdotes of station life.

Australia's Antarctic activities have often been controversial and Tim has researched an astonishing amount of government documents to present a full picture of these. A very strong esprit de corps developed among expeditioners, past expeditioners and head office staff, all committed to the success of the Antarctic programmes. The reverse was often true on the part of the political and bureaucratic masters of ANARE, some of whose decisions had very negative impacts on the work of the people in Antarctica.

This book is an important contribution to Antarctic history, covering 50 years of, for most of the time, very praiseworthy achievements. If it does nothing else it will show the Australian taxpayers that they have received good value for their tax contributions.

(Malcolm Kirton is president of the ANARE Club and editor of "Aurora — Australia's Antarctic Journal")

"LONELY PLANET ANTARCTICA"

by **Jeff Rubin**

Reviewed by Malcolm Macfarlane

Such a guide in the style of the Lonely Planet's Antarctica has been long required to serve both the needs of the Antarctic tourist and armchair visitor. In the first of a number of guide books due to be published, Jeff Rubin provides readers with a generally well researched wealth of information.

The first parts of the guide are very comprehensive, although somewhat hard to find one's way about at times. However, the site guide section does let the rest of the book down somewhat.

This guide covers six main areas for the potential Antarctic visitor: background information about Antarctica; facts for the visitor; a wildlife guide; visitor information for the gateways to Antarctica; and lastly, a hundred pages covering places that have been visited (or plan to be) in the Antarctic and Subantarctic islands.

Background facts and facts for the visitor are covered well and in many ways represent the most concise update of general Antarctic information since the publication of the Readers Digest's Antarctica. Here information is to be found on: Internet web pages dealing with Antarctica; general publications; how to get to Antarctica; novels written which include an Antarctic theme; an extensive listing of films and documentaries made; maps and charts that are available; and the various societies and publications catering for the Antarctic.

By devoting many pages to contributions from acknowledged authorities on Antarctic subjects the author provides up to date information for the reader. Contributions cover a diverse range of subjects including: Antarctic science (David Walton); environmental issues (Maj de Poorter) and a private expeditions summary which is the most recent available (Colin Monteath). In addition, detail on a wide range of interesting topics is covered in numerous sidebars such as the most frequently visited Antarctic tourist sites

(Deception Island); life aboard a tourist vessel; and hints on taking photos in Antarctica. Most of the first-time visitor's questions are well answered in these sections.

Thirty-two pages are dedicated to a wildlife guide (by John Cooper) which covers most marine mammals and birds likely to be encountered. Colour photographs and drawings are provided. While the coverage is comprehensive, this section suffers from some poor depictions of whales and some incorrect photo captions and detail (blue whales are not the only baleen whale to show flukes on diving, humpbacks do as well; studies have shown Weddell seal dive depths to be up to 600 metres, not 60 metres; female crabeater seals are generally larger than males, not smaller).

Antarctic gateway information is credited to other relevant Lonely Planet guides and covers Cape Town, Christchurch, Hobart, Punta Arenas, Stanley and Ushuaia. Missing, perhaps, is Buenos Aires as an increasing number of early season cruises now begin from there.

Antarctic and sub-antarctic tourist destinations are dealt with in the final five chapters, each progressively smaller than the last. These chapters may not provide the traveller with the level of detail they may expect on the places they are likely to visit. Maps accurately locate main islands and geographical locations and information on discovery and history is provided. The level of detail varies from very good and comprehensive to very brief.

Southern Ocean and Sub-antarctic Islands covers all the Southern Ocean's Sub-antarctic Islands plus the

island chain of the South Shetland Islands. While Whaler's Bay at Deception Island receives the largest number of visitors on an annual basis there is no map of this extensive site to guide the visitor ashore. Here the guide makes one of its most significant omissions; there is no mention of the protected area that

begins only a short distance from the area usually frequented by visiting tourists. Similarly there is no mention of the protected area just above the beach at nearby Pendulum Cove.

The Antarctic Peninsula and the Weddell Sea chapter covers many of the likely tourist stops but some are missing. The entry for Paradise Harbour is somewhat confused. The guide mixes up the positions of the separate Chilean and Argentine Stations in the Harbour.

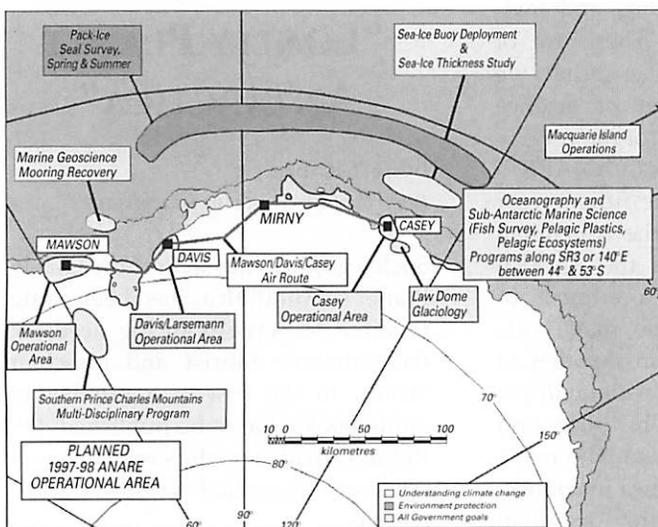
'The Italian station at Terra Nova Bay rates only a brief three line mention and is said to have Antarctica's best espresso.'

The Ross Sea chapter details most sites in the Ross Dependency, however, curiously, one of only three station maps appears here, McMurdo Station (Grytviken whaling station and South Pole are the others). Pole and McMurdo receive a very disproportionate amount of coverage compared to the actual numbers of visitors. For some reason the author has chosen to provide more interpretative information for McMurdo and Pole ahead of Whalers Bay, Deception Island or about any of the more frequented historic sites.

The Italian station at Terra Nova Bay rates only a brief three line mention and is said to have Antarctica's best espresso. The station does not even find its way on to the map of stations in the Ross Sea — a sizeable omission.

There is a wealth of good information in this guide. It provides most of the information a traveller is likely to need before setting off and includes the most up to date single listing of 'things Antarctic' which the traveller may use both before and after visiting the continent. The plentiful maps are of the good quality we have come to expect from Lonely Planet.

While it is let down by a number of small errors, a lack of interpretative material for the onshore visitor and guidance on where you may or may not go once ashore, this is a valuable reference book for the Antarctic traveller.



FEATURE

EXPLORING THE UNKNOWN

October 3rd, 1957 was the last time the New Zealand team was all together at Scott Base. As the month progressed, the four main summer parties left the base, returning to New Zealand at different times as their journeys ended.

First away was the Northern Party on 4 October to explore the Transantarctic Mountains between the Mawson and Mulock Glaciers. Richard Brooke, Bernie Gunn, Guyon Warren and Murray Douglas left Scott Base with two dog teams on a bitterly



*The Auster and the Northern Party camp at Granite Harbour.
Photo courtesy of Antarctica New Zealand Archives.*

cold day with temperatures -30°C . Happily, it was the only really cold day of their four month expedition. The route for their journey had been carefully chosen after a photographic flight made by John Claydon, Bob Miller, Richard Brooke and Bernie Gunn in the previous autumn. A further flight, with Richard Brooke in the spring, to look specifically at the Fry Glacier as a route into the interior emphasised how useful the small New Zealand planes were in reconnoitring potential routes, saving a lot of time in the field. On the Fry Glacier flight the Auster encountered a strong katabatic wind which, on their second attempt, they "rode" up the glacier "bouncing like a dingy in a choppy sea". Potential obstacles were identified on the Fry and Mackay Glaciers and this led to a further flight, the day before the party left, to "recce" a possible route up the Mawson Glacier to the north, but this too seemed to

Part IV of a series by
Margaret Bradshaw

present obstacles for a sledging party.

The early days of the Northern Party, after they had travelled round McMurdo Sound, were not without incident. First there was a dog-fight on the way to Gneiss Point which blinded dog Joe. Then a crevasse bridge broke under the dogs when the teams began to climb up on to the Wilson Piedmont Glacier in the Bay of Sails. The unfortunate Joe, together with Dismal, fell deep into the crevasse when their harness rings broke. Richard Brooke was lowered into the crevasse and found the dogs 10 metres down wedged in delicately poised soft snow which Joe had half broken through. The dogs were silent and subdued, although obviously pleased to see their driver, who held on to them to prevent them falling further until another rope could be lowered.

By 10 October the Northern Party had reached and climbed Mt Newell on the south side of the lower Wright Valley, where they set up an important survey station. Returning to travel along the sea ice, they paused to kill a seal for the dogs, then travelled north to Cape Roberts. Halfway there Brooke had to race back to help right a sledge that had capsized and trapped Guyon Warren's legs. Murray Douglas was taking most of the weight of the sledge, and only Guyon's ski was broken.

Surveying at Cape Roberts, the party found a cairn left by Griffith Taylor's party in 1911, and nearby, a blubber stove, some clothing and a film-changing bag. When the Auster flew in with a

month's food supply, it returned to Scott Base carrying the historic items.

On 14 October, the day that the Northern Party reached Cape Roberts to the south of Granite Harbour, the polar tractor party left Scott Base with Ed Hillary on the lead tractor, followed by Ron Balham and Peter Mulgrew driving the other two Fergusons. The tractors towed seven sledges, and Murray Ellis, bringing up the rear in the Weasel, was towing the "caboose", a two bunk fibreboard and canvas contraption heated by the weasel's exhaust.

Over the winter and spring, the Ferguson tractors had been modified, tested and tried, and Ed Hillary was convinced of their capability to travel far on to the Polar Plateau.

Four days later, while the tractor party was still driving towards the mouth of the Skelton Glacier, Bob Miller and George Marsh were flown into Skelton Depot at the bottom of the Skelton Glacier by Bill Cranfield in the Beaver, accompanied by six dogs, camping gear and food. Lines of hard sastrugi at the depot severely jolted the Beaver when it tried to land across them into the wind, giving Bob Miller, unsecured in the back of the plane with the dogs and supplies, a hard time and nearly sending him through the roof. Bill Cranfield powered off the surface and after a couple of circuits landed cross-wind along the lines of sastrugi. After unloading, take-off was just as hair-raising when a side wind gust lifted one side of the plane before it had become airborne.

In the evening of the same day the Beaver returned piloted by John Claydon. More dogs and equipment



*Tractor party laying a depot on the Polar Plateau.
Photo courtesy of Antarctica New Zealand Archives.*

were unloaded. Jim Bates also arrived battling a bout of influenza that had arrived in the south with the new season's base staff. John Claydon was able to report that the tractor party was about 80km away but had halted for the day with engine trouble in the Weasel. Consequently, the depot party was surprised when the tractor party roared into camp in time for breakfast the following morning. While the tractor party slept, Jim Bates attempted to mend the Weasel which involved lifting out the whole engine with a special frame and endless chain. Later Murray Ellis took over from Jim Bates.

Bob Miller and George Marsh began moving up the Skelton Glacier with their dog teams on 22 October, breaking ground for the tractor party behind, but they found the sastrugi hard going. Capsized sledges were too heavy to right single-handed and had to be unloaded first. By the end of the day the two men had dealt with 13 capsizes in a distance of 29km. The tractors following had no such problem, and although the towed sledges yawed wildly from side to side, they did not tip over.

Bad weather a few days later emphasised the differences between the capacity of machines and dogs in poor conditions. Halted by a blizzard howling down the glacier, which made the dog teams almost invisible to each other, Bob Miller and George Marsh huddled for shelter behind their sledges to wait for it to clear. During a slight lull, they watched the tractor team, unhindered by the wind, roar past them a mere 20 metres away, completely unaware of the sheltering men. Unable to follow them into the teeth of the gale, Miller and Marsh eventually had to pitch tent, a task that took 90 minutes fighting the wind. Meanwhile, the tractor train had reached an area of blue ice in which the narrow crevasses were clearly visible and across which they lurched, leaving behind them a trail of broken snow bridges. They began to climb the glacier's Lower Staircase to the Landing beyond, while behind them Bob Miller and George Marsh struggled on with the dog teams, still battling blizzards, and with Bob suffering from the "Scott Base flu". On the

Lower Staircase, they were met by Hillary and Mulgrew in the Weasel, backtracking to search for the dog teams.

On 28 October the dog teams left early in cloudy conditions and poor visibility to climb the Upper Staircase, navigating by compass and leaving marker flags. By the early afternoon they had travelled 24km, climbed 730 metres and had reached the edge of the Skelton Névé. Four hours later the tractor party joined them, although at times it had been necessary to get out



Ed Hillary leading the tractor train from Depot 480.
Photo courtesy of Antarctica New Zealand Archives.

of the tractor to see their tracks. On the steeper sections the sledges had to be relayed. In Hillary's words as they emerged onto the Névé: "The worst was now behind".

The next day (the 29th) as the tractor party climbed towards the Portal between Portal Mountain and Mt Feather, they were overflown by John Claydon in the Beaver, who dropped a message to say he had just deposited Harry Ayres and Roy Carlyon and some of their dogs near Polar Depot. The tractor party camped quite close to Portal Mountain then continued to join the others on the edge of the Polar Plateau on 31 October. Bob Miller and George Marsh meanwhile, had been forced to remain at the top of the Staircase with the dogs because of blizzards. After the exhausting job of digging out their tent and sledges, they began travelling again on 1 November in white-out conditions. Sastrugi, the steep gradient and low temperatures slowed their travel, and late that day they camped a mere two miles away from the invisible Plateau Depot tractor camp.

Meanwhile, the Northern Party had established a series of survey stations in the lower Mackay and Benson Glaciers. Surveying is a far from glamorous task in the Antarctic, especially in low temperatures and a wind, for not only did fingers become numb, but there was the additional danger of faces freezing on to the theodolite.

Returning again to the coast, stress levels rose more than usual when after one capsized the local seals decided to launch an attack on the pinioned dogs.

On 24 October John Claydon flew Ted Gawn into Cape Ross to replace their faulty radio. Soon after that the party split up to make the best use of the time. Richard Brooke and Guyon Warren surveyed in the Fry Glacier while Murray Douglas and Bernie Gunn travelled further north, then inland up the lower Mawson Glacier to climb Mt Gauss. The two parties rejoined north of Granite Harbour and travelled south to Cape Roberts before relaying supplies up on to the Wilson Piedmont and into the Debenham Glacier. Here they again split into

two groups, Murray Douglas and Bernie Gunn relaying loads to the head of the Debenham Glacier and Guyon Warren and Richard Brooke exploring the glacier south of the Johns Range to set up a survey station with a view into the Dry Valleys. The glacier route that Guyon Warren and Richard Brooke ascended was so slow and difficult that they named it the Purgatory Glacier. With a snow storm approaching, they had time for only a quick round of sights from the top of Purgatory Peak before returning to camp.

About the same time, in the rolling expanse of white on the edge of the Polar Plateau, the tractor party was having difficulty locating Plateau Depot left the previous autumn. It was eventually located by John Claydon in the Beaver aircraft who marked its position to the men on the ground by flying straight between the depot and the tractor camp while Bob Miller lined up flags at 100 metre intervals. When the direction was followed on the ground, however, the weather closed in and the flags became invisible. The only way was



Guyon Warren (left) and Murray Douglas with a radio on the Miller Glacier. Photo courtesy of Antarctica New Zealand Archives.

for a man on the sledge behind the tractor to give steering directions to keep the tractor as straight as possible.

At last the depot was reached and the men found a large windscoop on one side and a huge snow dune on the lee side that reached to the top of the pile of supplies. Over several days the entire depot, which included important stocks of dog pemmican and fuel, was shifted to the new camp. The only mishap was Murray Ellis injuring his back, and though determined to carry on, he was in so much pain that George Marsh insisted he was flown out. Ed Hillary and Peter Mulgrew also returned to Scott Base with Ron Balham who was keen to study the Weddell seals pupping close to base.

The sledging teams were now eager to get away and reconnoitre the way forward across the Plateau, but were loath to leave Jim Bates, the only one now left of the tractor party, on his own. They occupied themselves by building a series of cairns at 80 metre intervals out from each side of the depot across the line of approach, with red flags on one side and black on the other, a system first used in the Antarctic by Roald Amundsen. The innovative Jim Bates also got Roy Carlyon and Bob Miller to help fuse sulphur on to the tractor sledge runners with a welding torch to reduce friction.

On 8 November, Bob Miller, George Marsh, Harry Ayres and Roy Carlyon, with 36 dogs, left Plateau Depot travelling due west. The loads were heavy, and there was an almost imperceptible but steady gradient

with a surface covered by dry soft snow. This, following a week's inactivity, left the pulling dogs and the pushing men totally exhausted, despite some of the supplies being off-loaded and left. After four days of slow progress, always uphill, the sledges reached a point where the Plateau seemed to fall southwards. Here they built a large marker cairn.

The other men had now returned from Scott Base. Some of the drivers had changed. Murray Ellis was still convalescing and Ian Wright, cameraman from the previous summer, was immediately commandeered as a driver. After returning from base, Peter Mulgrew had slipped off the roof of the caboose while fixing an aerial and had fractured several ribs. Ted Gawn was asked to let Peter Mulgrew do his base radio duties to allow his ribs to heal, and Ted became the second replacement driver.

On the same day that the dog teams were building their cairn, 12 November, Ed Hillary and his tractor team left Plateau Depot pulling a total load of 11 tonnes, but they found the going as hard as the dog teams had done. Getting bogged down in the snow as the slope steepened forced them to relay the sledges, consuming more fuel than anticipated. Because the Weasel was handling the conditions better than the tractors, it took the bulk of the loads. Now it was Hillary's turn to catch the dreaded flu. After three days the tractors had travelled only 56km, but soon after, they reached the dog team's cairn and turned south to find better conditions.

The sledging party, nearly always travelling into the prevailing wind, was now going well, but radioed back warning that they had found a crevasse zone west of Mt Warren where the huge Mulock Glacier began draining off the Plateau. Yet another blizzard kept them tent bound, this time for three days. Bob Miller recorded the following in his diary reflecting how every tent-bound sledger spends his days "Slept a little, darned a little, read a little and lost two games of chess to George. We discuss every topic under the sun on days like this; from the diuretic effect of cold feet to the cost of living in

England or the iniquity of death duties." It was now George's turn to succumb to the flu. The tractor party, unhindered by the blizzard had passed 8km to the west, avoiding the crevasses.

The Northern Party had again joined up and were forcing an awkward route from the Debenham Glacier over into the Miller Glacier. Bernie Gunn and Richard Brooke set up a survey station at the southern end of the spectacular Killer Ridge and established two more stations further down the glacier on the slopes of Mt Mahony, while Guyon Warren and Murray Douglas geologised and looked after the dogs. Soon after an air drop of mail, the party began relaying loads north to the edge of the Mackay Glacier, crossing unpleasant, rippled blue ice. They camped below Mt Suess, and like Griffith Taylor's party before them, discovered ancient fish fossils in the moraine, but none in the outcrops. On the 21 November they began travelling up the southern side of the Mackay Glacier, relaying loads and setting up a survey station on Detour Nunatak. Turning north towards Gateway Nunatak, then west, they reached the last nunataks along the edge of the Polar Plateau.

While the Northern Party had



The Beaver at Skelton Depot.

Photo courtesy of Antarctica New Zealand Archives.

been climbing the Mackay Glacier, the tractors were finding the going better further south because of harder surfaces, although the canvas shelters were far from adequate in the strong wind. Despite travelling blindly in white-out conditions across snow carved into lines of large sastrugi, they proceeded without mishap until 24 November when two of the tractors broke through the bridges of gigantic crevasses.



RNZAF staff, manning air support "Darwin Depot" for the tractor train, dig themselves out after a storm.
Photo courtesy of Antarctica New Zealand Archives.

They immediately turned west to get out of the crevasse field, but the situation grew worse. In a baptism of fire, Ted Gawn found his tractor with a large hole behind him and an open crevasse straight ahead. The party was tired and stressed and camped where they were. Far away on the other side of the continent, Sir Vivian Fuchs' main crossing party had just left Shackleton Base. Better weather conditions the following day and some careful probing on foot allowed the New Zealanders to flag a route out of the crevasse field.

On 25 November, after travelling about 340km from Plateau Depot, they reached a site suitable for an aircraft landing and began laying Depot 480. The dog teams were now also travelling, although poor visibility and an overcast sky made navigation difficult. They failed to pick up the tractor tracks, and at one stage, unable to use the sun compass, were convinced they were going in the wrong direction. Steering by magnetic compass alone, they almost over-shot the tractor camp only 13km away but barely visible in the undulating terrain.

After three weeks without the sun and travelling into the wind, the dog-men appeared battle-worn. Harry Ayres, Bob Miller and Roy Carlyon all showed frostbite scars on their faces. Despite some excellent travelling days when they covered 32km, the dog teams were disappointed at the time they had taken to cover the 340km. On the other hand, the tractors had performed well and it now seemed unnecessary for all four dog teams to proceed as far

south as the proposed Depot 700. Bob Miller and George Marsh were eager to explore the Queen Alexandra Mountains, and Harry Ayres and Roy Carlyon hoped to investigate the Darwin Glacier region.

While they rested at Depot 480, the team discussed the idea of a Midway Depot to support the dog teams. The sun at last came out and the exact position of the depot could be calculated. Even so, without accurate maps or landmarks, locating the depot from the air still posed navigational problems for John Claydon in the Beaver, flying in with a now fit Murray Ellis on 29 November. The small group of black dots on a huge white expanse was not easy to pick out from the air.

Several weeks before this flight, and on his own initiative, John Claydon decided to establish an air staging depot about halfway between Scott Base and Depot 480 to help ferry supplies onto the Plateau. Sited near the mouth of the Darwin Glacier, and manned by Peter Tate and Ian Chapman of the summer party of the RNZAF Antarctic Flight, the depot was called "Darwin Depot". It was fully stocked during five flights on 28 November, the day before the first flight to Depot 480, constituting an Antarctic record of 31 hours flying in one aircraft in under two days. No sooner had the Beaver done this, it was then flying in a depot to the Northern Party, who had paid a visit to Carapace Nunatak while they waited, finding some fascinating geology there.

To be continued . . .

MEMBERSHIP

You are invited to join the Antarctic Society — please write to:

National Secretary,
P O Box 404,
Christchurch 8000,
NEW ZEALAND.

All New Zealand administrative inquiries should go to the National Secretary. All overseas branch inquiries should go to the Overseas Branch Secretary. Inquiries regarding back issues can be made to the Back Issues Officer, P O Box 404, Christchurch 8000, New Zealand.

Members should direct other inquiries to their local branch.

Secretary,
Auckland Branch,
New Zealand Antarctic Society Inc.,
P O Box 8062
AUCKLAND 1035

Secretary,
Wellington Branch,
New Zealand Antarctic Society Inc.,
P O Box 2110
WELLINGTON 6000

Secretary,
Canterbury Branch
New Zealand Antarctic Society Inc.,
P O Box 404
CHRISTCHURCH 8000

Secretary
Otago Branch
New Zealand Antarctic Society Inc.,
P O Box 7083
DUNEDIN 9030

Overseas Branch Secretary
New Zealand Antarctic Society Inc.,
P O Box 404
Christchurch 8000
NEW ZEALAND

Advertising Enquiries to the:

National Treasurer
New Zealand Antarctic Society Inc.,
P O Box 404
Christchurch 8000
New Zealand

Deadlines for advertising and copy are the 20th of each month preceding publication.

The Complete Antarctic Experience

CHRISTCHURCH

The International Antarctic Centre is the must see attraction in Christchurch. Located right next to Christchurch International Airport and winner of the 1997 NZ Tourism Award for best attraction, the International Antarctic Centre is a fun and entertaining experience for the whole family to enjoy... and with our world first Snow & Ice Experience, you too can explore real life Antarctic conditions!

Open 9am to 8pm every day
Oct 1 to March 31, and 9am to 5.30pm
every day April 1 to September 30.
Please allow at least 1 hour for a visit.
Adults \$12, Children under 15 \$6.
Family Pass (2 Adults & up to 3 Children) \$28.
Snowphone™ \$4.



International
Antarctic
Centre



FANEY 4775

◀ 15 minutes from the City Centre, 8 minutes walk from ChCh Airport on Orchard Rd. Free shuttle bus available from airport. ▶



CANTERBURY DEVELOPMENT CORPORATION

- promotes and facilitates economic growth and employment in the region by using initiatives that focus on:
 - fostering job rich economic growth
 - employment, education & training
 - improving the management capabilities of small businesses
 - helping communities to help themselves
- is non profit & commercially neutral
- is the economic development and employment arm of the Christchurch City Council

Our business

Your success

Canterbury's future



First Floor, 186 Hereford St
P O Box 2962, Christchurch, New Zealand
Telephone 03 379 5575 Fax 03 379 5554
E-Mail: cdc@cdc.org.nz Internet: www.cdc.org.nz

