

ANTARCTIC



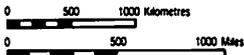
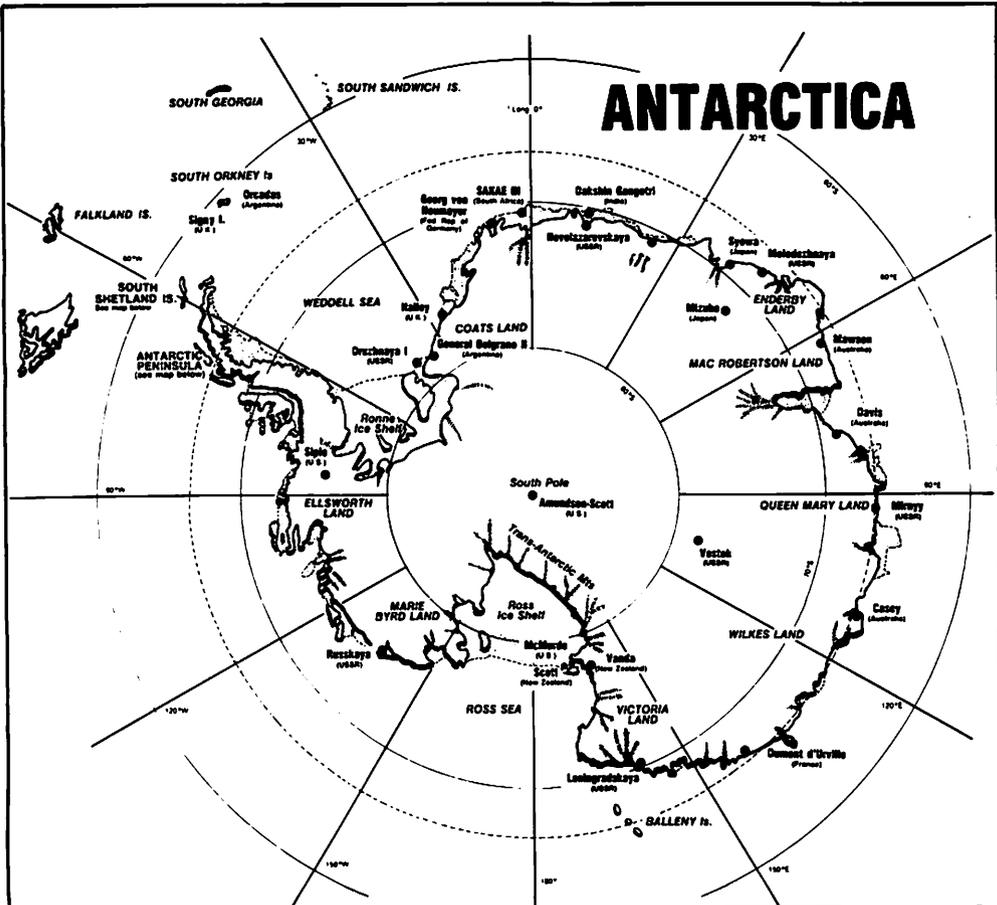
Bulletin Vol. 12 No. 9

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Dear Pennell

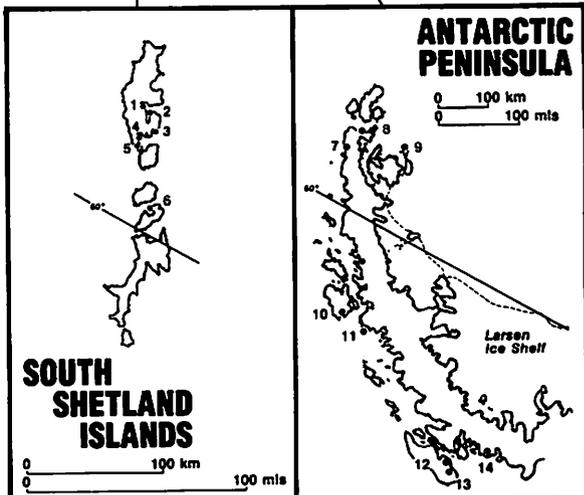
We have left our
headquarters (Camp Jeffery) for a
more northerly one on Cape Robert
which is on the route direct ship or
your mail route to reach the
Rendezvous
We shall wait at Cape Robert
(Hemlock Pt) until Jan 31
when we push overland (via the
Piedmont) to Cape Renard
about point
Fuller details on the
Signal flag 500 feet up the
Rendezvous Bluff a 1 mile east
of the
Jan 11 Taylor

ANTARCTICA



- 1 Comandante Ferraz BRAZIL
- 2 Henry Arctowski POLAND
- 3 Teniente Jubany ARGENTINA
- 4 Artigas URUGUAY
- 5 Teniente Rodolfo Marsh CHILE
- 6 Beltingshausen USSR
- 7 Great Wall CHINA
- 8 Capitan Arturo Prat CHILE

- 7 General Bernardo O'Higgins CHILE
- 8 Esperanza ARGENTINE
- 9 Vice Comodoro Marambio ARGENTINA
- 10 Palmer USA
- 11 Faraday UK
- 12 Rothera UK
- 13 Teniente Carvajal CHILE
- 14 General San Martin ARGENTINA



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Photo: Alan Green.

NZAP

Aspects of climate change dominate New Zealand Antarctic programme

This year's scientific projects continue to focus on global climate issues with further investigation into the size of the ozone hole, studies of chemical composition of the atmosphere and greenhouse gases and their significance in global warming. Work on glacial movement and structures will be undertaken; the evolution and adaptation of fish to the prevailing conditions, their circulatory system, will be studied, penguins will again be counted and the genetic makeup of mosses analysed. In addition a major three year geological study of Marie Byrd Land will be completed and an international joint venture will be undertaken between the Natural History Units of Television New Zealand the BBC with filming under the sea ice of McMurdo Sound, in the Dry Valleys and at historic sites on Ross Island.

Ozone

Two groups are specifically involved in ozone studies within the New Zealand programme. Both are from NIWAR the National Institute of Water and Atmospheric Research Ltd, one group being based in Wellington and the other at Lauder, Otago in Central Otago.

Ozone measurements made at Scott Base during the last ten days of September 1992 by Tony Bromley from Wellington, have consistently been lower than 180 Dobson Units. This represents a loss of over 40 percent of the ozone over that region. Other Antarctic stations have also seen indications of an unusually early or steep decline in ozone amounts. The circulation and stratospheric temperature patterns indicate that the 1992 Ozone hole will be another exceptionally deep one.

Each September since the early 1980's a

large part of the ozone layer over Antarctica has disappeared. This depletion has become known as the Antarctic Ozone Hole. The Ozone Hole has generally increased and become more persistent through the 1980's. In 1987, 1989, 1990 and 1991 more than half the ozone over Antarctica disappeared from late September until late November. The 1992 Ozone hole has begun to develop in a very similar way to each of the past three seasons.

Tony Bromley travelled to Scott Base on Winfly to conduct an intensive series of measurements during the spring. The measurements clearly show the rapidly depleting ozone, in a similar pattern to September 1989, 1990 and 1991. The ozone hole is expected to reach its maximum extent in the first half of October. It will persist until late November or early December, when the ozone poor air will be dispersed to

lower latitudes by the changes to atmospheric circulation which naturally occur in early summer.

Sylvia Nichol from NIWAR in Wellington went south on October 12 to undertake equipment maintenance and training of the technician who will continue observations during the winter. She was accompanied this year by Carlo Valenti from the Instituto Di Fisica Dell'Atmosfera in Rome whose organisation is operating a Brewer Spectrophotometer at Arrival Heights. He is undertaking maintenance and training on their behalf.

Also working on ozone depletion but focussing on measurement and modelling of stratospheric trace gases was Alan Thomas from NIWAR at Lauder, in Omakau. Alan flew south on Winfly and will return to New Zealand in mid-October making a second trip to Scott Base about 20 January to ensure equipment will be operational for the winter.

The Lauder group, in co-operation with others from New Zealand and overseas, is continuing to develop an atmospheric database covering aspects of the Antarctic ozone problem. Their work is directed particularly towards understanding the reasons for, and the significance of, the changes with time in stratospheric nitrogen and chlorine compounds. Measurements made in the past at three sites in the Antarctic have been extended now to Campbell Island where they are using remote-sensing spectroscopic techniques in the visible regions of the spectrum to obtain data.

The operation at Arrival Heights has been stepped up this year with the installation of a new high resolution interferometer to improve measurements of nitric and hydrochlorine acid in the stratosphere. The data show that very disturbed chemistry has been taking place in the atmosphere during 1992. This is attributed to the effects of volcanic aerosols resulting from the Mount Pinatubo and Mount Hudson eruptions of mid-1991.

Making use of flights between Christchurch and the Antarctic for further atmospheric studies are three scientists from NIWAR in

Lower Hutt who will be collecting large samples of air from which a variety of trace gases, particularly methane and carbon monoxide, and natural radioactive species are being measured. The measurements are being used, in conjunction with samples from other parts of the world to develop a more detailed understanding of natural atmospheric processes and how these are modified by global atmospheric pollutants. The results will be used to validate detailed models of climate change being developed in the USA and elsewhere. The work is being undertaken on flights planned for late November and mid-January. Martin Manning, the project leader is not flying south this summer so the work will be undertaken by technicians Gordon Brailsford and Paul Roberts both of Wellington.

Sea ice studies

Several different projects will be focussing on aspects of the sea ice in the McMurdo area this season.

Algae: In the second part of a three year project Professor David Beaglehole and Grant Carter from the Physics Department of Victoria University will be studying the amount of ultraviolet falling on the Antarctic sea ice, the intensity and polarisation distribution, the effects of the ozone hole and the impact of ultraviolet B radiation on the sea ice algae.

Their study is important because ice algae are at the base of the food web in polar waters and reduced productivity can have serious implications for other marine life. The algae are trapped at the ice/water interface and may be particularly sensitive to changes in UV radiation which in turn is dependent on the atmospheric ozone content and scattering in the atmosphere.

The pair will be in Antarctica for a month from 21 October. During this time they will verify earlier measurements and models for the intensity and polarization distribution of sky light in the Antarctic and confirm earlier measurements on the growth of sea ice algae at normal and enhanced levels of UVB radiation.

The health of the Antarctic ecology depends on the intensity and the spectral mix of sunlight during the brief summer season. As a significant amount of Antarctic life is found under the sea-ice cover that forms every winter, it is important to understand the effects that control the level of light transmission through the sea ice.

This season Dr's Bob Buckley of Industrial Research Ltd in Wellington and Dr Joe Trodahl of Victoria University will return to Antarctica to undertake further experiments on the transport of light in sea ice. The experiment requires the introduction at the surface of the ice a 2 nano second laser pulse and recording the shape of the back scattered pulse at the ice surface. The pulse shape is determined by the arrival times of the photons at the surface and reflects the path length distribution of the photons in the ice. The studies will be supported by measurements of the structural and thermal state of the ice. They will be conducted on first year sea ice in McMurdo Sound mainly in the Cape Evans, Tent Island area.

Rheology: Also working in the Cape Evans and Tent Island area where the first year sea ice is less than 1.7 metres thick will be a party of scientists undertaking a further year's research aimed at devising a constitutive equation for sea ice rheology.

Led by Dr Tim Haskell, the team comprising Mathew Jury and Simon Gibson from Industrial Research Limited in Wellington and Colin Fox from the University of Auckland will be joined by Dr's Patricia Langhorne and Philip Rottier from Otago University. The party will be in Antarctica from mid October to early December, during which the Otago team will also participate in a study of the fast ice with another group.

The project, begun in 1989, involves fatigue experiments using cantilever beams, collecting acoustic emission data, measuring features in the ice which relate to its physical properties and investigating the internal friction by using resonance techniques. They have already found sea ice to be a strikingly complex material whose physical and structural character depends markedly on the conditions under which it grows.

The boundary of the fast ice is exposed to the dynamic behaviour of the ocean. Incoming waves can transfer energy to the ice leading to its breakup but can also be reflected by it. DSIR Physical Sciences, now NIWAR, has developed a microwave radar which measures ocean surface parameters and can distinguish incident from reflected ocean waves making it suitable for studies of the fast ice boundary.

This season Dr's Murray Poulter and Murray Smith from the National Institute of Water and Atmospheric Research Ltd in Lower Hutt, accompanied by Dr Philip Rottier and Colin Fox will use the equipment to measure the motion of the water surface and of the pack ice in conjunction with making strain measurements in order to determine the energy transfer. Their results will be related to theories of ocean wave reflection from an ice boundary. They will be working on the project from 20 November to approximately 9 December in the vicinity of Cape Evans and Roysds.

Glaciation

Working on the Taylor and Lower Wright Glaciers, a team from Auckland and Otago Universities will be investigating two glaciological phenomena, the nature and causes of the mechanical behaviour of debris bearing ice and the implications of this behaviour for ice dynamics and the relative importance of the thermal regime and climate for the nature of landforms on the ice margins of the glaciers in the arid polar environment. Their project involves, among other things, the sampling and testing of the debris-laden layers of ice in the basal zones of the Taylor glacier, mapping landforms around the margins of the Taylor and Wright Glaciers, and subsequent laboratory analysis of samples collected in the field and returned to New Zealand.

One of the particular scientific dilemmas that the group hope to resolve is that of the effect of the presence of debris on the hardness of the ice. In the past laboratory results have suggested that debris-laden ice is stronger than clean ice, whereas field

observations have suggested precisely the opposite, that debris-laden ice is essentially weaker than clear ice.

Led by Dr Wendy Lawson of the University of Auckland the team comprises Christopher Nelson, a consultant engineering geologist and Dr Sean Fitzsimons and Kathryn Humphreys from the University of Otago. They will be in the field from early December until mid-January.

Fish studies

The Antarctic *Notothenioid* fishes have radiated to form over a hundred closely related species filling a range of ecological niches in the polar seas. In doing so, some have developed extreme specialisations, but, others have remained generalised. This season Dr John Macdonald accompanied by Stuart Ryan and Tim Lowe all from the University of Auckland will be examining the metabolic consequences of niche specialisation in the McMurdo Sound area, comparing specialists with generalists both between and within families. This will be done by measuring metabolic rates at the cellular and molecular levels, quantifying substrate dependencies, metabolite levels and nucleotide ratios. Incubation and sampling will be carried out at Scott Base and subsequent analyses completed in New Zealand using spectrophotometry and high-performance chromatography. They will be in the field for four weeks from mid-November.

Studying another aspect of *Notothenioid* fish this season will be two scientists from Canterbury University, Dr's Bill Davison and Malcolm Forster and two from the University of Goteburg in Sweden, Dr Michael Axelsson and Professor Stefan Nilsson.

Working at Scott Base for nearly three weeks from 11 November they will focus on how the heart and blood flow to and from the gills is controlled. The anatomy of the arterial system will be investigated as will the locations of adrenergic, cholinergic and peptidergic receptors. Doppler pulsed flow probes and indwelling canulae will be used to investigate blood flow through the heart and the gills and to determine how this is control-

led. The project is of particular interest as the blood of Antarctic fish is highly modified compared with that from temperate water fish and very little is known about how it is controlled.

Penguin census

The annual photographic survey and assessment of population dynamics of penguin rookeries in the Ross Dependency will be continued this year. Two parties from Landcare Research New Zealand Limited in Nelson, will visit Antarctica to undertake the project; the first, comprising Bruce Thomas, Brian Karl and Kerry Barton will fly south for approximately ten days from November 23 and the second comprising Dr Peter Wilson and Kerry Barton will travel south on January 13 for a further ten days. Logistic support for the project will be provided by VXE-6 helicopters and C-130 flights.

From 1981 until the present, all islands and sea coasts between 158deg E and 175 deg E have been searched and 12 previously unreported breeding rookeries discovered. Thirty-nine Adelie rookeries are now known in the region with a total of about 1,082,000 breeding pairs - almost half the world population. Some rookeries have been photographed in all or most seasons to study the pattern of natural population fluctuations. The numbers at nearly all rookeries have increased markedly in size over the past ten years, but there have been annual fluctuations possibly because of seasonal variations in sea-ice and weather conditions and longer-term climate change.

Plant life

Previous surveys of the Darwin Glacier area at 80deg S have identified benthic microbial communities in some of the melt waters, unusually high nitrate and dissolved organic nitrogen concentrations and the possibility of a complex layered ecosystem some 90 metres deep in Lake Wilson at the base of the Glacier. This year Dr Clive Howard-Williams, Dr Ian Hawes and Malcolm Downes from the National Institute of Water

and Atmospheric Research Ltd (NIWAR) in Taupo will work in the area with Drs Mike Timperley and Jenny Webster from the Institute of Environmental Health and Forensic Sciences Ltd (IEHFS) in Auckland. They will investigate the microbiology and the chemistry of the area with particular reference to nitrogen compounds and their transformations. The unusual chemistry of the Lake Wilson and its catchment may be reflected in an unusual assemblage of organisms and microbial processes relative to those in the more northern McMurdo Dry Valleys

In another project Drs Howard-Williams and Hawes will be joined by Malcolm Downes and Ann-Maree Schwarz also from the National Institute of Water and Atmospheric Research Limited (NIWAR) for a study of the tidal mudflats at the southern end of McMurdo Sound.

Large tidal lagoons occur at Brown Peninsula and Black Island and smaller systems at Bratina Island and parts of New Harbour. The party aims to define the environmental gradients in time and space which exist in this area of Antarctica and study the benthic algal and cyanobacterial communities in relation to them. They will work specifically at Bratina Island on Brown Peninsula, and at the mouths of the Miers and Garwood Valleys. Particular emphasis will be placed on how metabolic processes are adapted to the alternating regimes of low temperature water with varying salinity and exposure to air at sub-zero temperatures caused by the once-daily tides.

Knowledge of the past history of the colonization of Antarctica by terrestrial organisms is quite limited. Several species of *bryophytes* (mosses) are locally abundant, but the phylogenetic relationships between populations are entirely unknown. For most of January Dr Dieter Adam and Dr Marie Connett of the University of Waikato, Dr Patricia Selkirk of MacQuarie University in Sydney and Dr Louise Lewis from Duke University, North Carolina will be in Antarctica investigating some of these populations. Their work will take them to Cape Bird, Cape Royds and Cape Chocolate, as well as

sites described by other University of Waikato teams at the Canada Glacier in the Taylor Valley area and Cape Geology/Granite Harbour.

At these locations they will compare the genetic and morphological variability of populations of at least two mosses *Bryum argenteum* and *Pottia heimii*. From this they hope to be able to draw conclusions about colonization patterns in the region, as well as help determine relationships between genetic variability and environmental parameters in plants living under Antarctic conditions.

Comparing the relative levels of genetic variability in Antarctica and temperate populations of the same species may provide some answers to questions about whether plant populations in extreme habitats are more or less variable than populations in more temperate environments.

Dr Henry Kasper of the Cawthron Institute in Nelson will spend part of January at the Bratina Island camp studying the role of anaerobic micro-organisms in saline anoxic Antarctic ecosystems. He will also collect samples for Dr Douglas Mountfort of the same institute who will isolate low temperature anaerobes and investigate their likely biotechnological applications.

Currently there is limited knowledge on the physiology and biochemistry of anaerobic micro-organisms that grow at low temperature. The study will provide new information on novel biotransformations carried out by cold temperature micro-organisms and will contribute to the development of processes which exploit cold temperature enzymes.

Balleny Islands

The Balleny Islands will be visited this season. They constitute the northern-most land in the Ross Dependency and exhibit great biological diversity. Most islands in the group are uninhabitable but two, Sabrina and Chinstrap, offer possible campsites and abundant wildlife for study purposes. This year Dr Peter Carey from the University of Canterbury will lead a team to the islands. It includes Dr Paul Sagar from Fisheries Re-

search Division of MAF in Christchurch, Dr Colin Miskelly, Department of Conservation, Wellington, Michael Whitehead from Monash University in Melbourne and Massimo Gasparon from the University of Tasmania in Hobart. Field assistance will be provided by Neil Sheerin from the New Zealand Antarctic Programme.

The party will be offloaded by helicopter from a USCGS icebreaker about December 28 and during their two week stay in the area they will conduct a quantitative survey of the biota including seabirds, seals, terrestrial invertebrates, vegetation and lichens. A census of Chinstrap penguins is of particular importance because this is the only known breeding site for this species at this latitude. Feeding ecology studies are also proposed for penguins and petrels and include the attachment of time-depth recorders (TDR's) to selected penguins. Data collected from the oceanic Balleny Island will also allow valuable comparisons to be made with the feeding ecology of penguins at continental shelf sites.

Geological samples will be collected for subsequent petrological-geochemical analyses. The information gained will help complete models of the magmatic developments of the Southern Ocean.

Coring programme

A party of geologists from Victoria University will take a series of sea-floor sediment cores from the Victoria Land Coast around Granite Harbour. The cores, which will be up to six metres long and comprise soft mud and stiff diamicite, will be obtained from water up to 1000 metres deep. Using radio carbon techniques to date the shell debris the team hope to be able to establish the time at which the grounding line retreated past each site and from this will be able to determine the timing of the ice margin retreat back to the Victoria Land coast north of McMurdo Sound, which is an area with a complex local glacial history.

Knowing the extent of the ice at the time of the last glacial maximum some 20,000 years ago is of particular interest as it will

allow scientists to estimate the volume of ice then and its contribution to the lowering of world sea level by 120 metres at that time. The rate of retreat of the West Antarctic ice sheet is of interest because it is probably the least understood and most unstable of the present-day ice-sheets.

Alex Pyne, John Carter, Emily Gee, and Bruce Anderson accompanied by an NZAP mechanic will be in Antarctica from early November to mid-December and three of them will make a second visit later in the season with Dr Peter Barrett.

Unravelling Gondwana

A comprehensive three-year study of the Marie Byrd Land basement by detailed field examination is now in its third season. This year Dr's John Bradshaw and Steve Weaver of the Department of Geology at Canterbury University will again be joined by USAP scientists, Dr's David Palais and Victor di Venere and BAS scientists Dr's Brian Storey and Bob Pankhurst for a visit to the area. Field support will be provided by Andy Harris and John Roberts of NZAP.

This year, the party will again use a BAS Twin Otter for movement between locations in the Kohler Range, Mt. Murphy, Bear Peninsula and Martin Peninsula as part of the project which was designed to examine all the basement outcrop of Marie Byrd Land crustal rock in order to determine its structure, history, petrology, geochemistry, geochronology and paleomagnetism. Intensive laboratory analysis is also being undertaken; the results will show the relationship of Marie Byrd Land to the other parts of the Gondwana supercontinent and how the Campbell Plateau-Chatham Rise block separated from Antarctica during the Gondwana breakup.

Marine or non-marine?

Working on the East Antarctic ice cap some 500 km from Scott Base will be an international party of scientists under the leadership of Dr Steve Bannister from the Institute of Geological and Nuclear Sciences Ltd., in Wellington. He will be accompanied by Hugh

Stevens and Dr Fred Davey from the same organisation and by Bruno Marino from the Osservatorio Geofisico Sperimentale in Trieste. They will be assisted in the field by Bill King and Ron Rogers from the New Zealand Antarctic Programme.

The party are scheduled to be flown into the area by LC-130 towards the end of November and will carry out a short seismic reflection line on the east Antarctic ice cap 500km due west (grid East) from McMurdo Sound over the subglacial Wilkes Basin.

A seismic reflection programme was undertaken by the British during the IGY in 1957-58 but this is the first time since then that a programme has been planned on the East Antarctic ice cap and so part of the experiment will be dedicated to testing acquisition parameters for multi-channel seismic data in the area. The principal objective however, is to test for the presence of marine sediments under the ice cap which is important because there is converging scientific evidence that the icecap is an ephemeral feature that retreated sufficiently, just a few million years ago, for a marine seaway to advance well into the continent.

Xenoliths and other outcrops

The earth's lithosphere comprises a cool brittle outer carapace of crust coupled with an upper mantle. Genuine samples of the deep lithosphere at the surface of the planet are rare. One example exists as xenoliths. These are fragments of the deep earth transported to its surface by vulcanism. As such, they offer a unique window from which to obtain fundamental knowledge of the petrologic nature of the lithosphere, the timing of events and the nature of processes acting on it. Such knowledge is crucial to an understanding of the processes such as plate tectonics, magmatism and fluid migration, degassing and crustal growth.

As part of a continuing study of xenoliths from the Antarctic lithosphere, Dr John Gamble, Richard Wysoczanski and Jonathan Brooker from Victoria University in Wellington will, this season, collect samples at Black

Island, the Upper Koettlitz Glacier, Roaring Valley in the foothills of the Trans-antarctic mountains and Mt Bird on Ross Island. Their objectives are to find out how the lithosphere formed, to establish the major events contributing to its growth and to determine how the crust and mantle making up the lithosphere are related. By comparing their data with other documented results from West Antarctica, the Pacific rim and Gondwanaland they hope to be able to evaluate their results in terms of available terrane models for the region.

Making use of other exposed rock this season is a party from the Department of Geology at Otago University. Working along the Renegar and Skelton Glaciers and on Salmon Hill they will focus on outcrops of the Wilson Terrane, a deeply eroded portion of a 400-500 million year old mountain belt formed during the plate tectonic collision at the edge of Gondwana. The results of the middle crustal processes (magma intrusion, metamorphism and their relationship) which occurred during the collision and now occur in active mountain belts at about 15 km depth will be examined in detail in their attempt to develop an understanding of the regional geology.

Led by Dr Dave Craw the party comprising Yvonne Cook and Guy Simpson from Otago University, will be assisted by Brian Alder and Ross Cullen from the New Zealand Antarctic programme. They will be in Antarctica from mid-November, Dr Craw returning to New Zealand after three weeks while the others remain in the field until the end of December.

Mapping

Further geological mapping will be undertaken by New Zealand geologists this season. The team of four from the Institute of Geological and Nuclear Sciences Ltd. IGNS (formerly DSIR Geology and Geophysics) will be led by Mike Isaac (Auckland) and includes Steve Edbrooke (Auckland) and Jane Forsyth (Dunedin) and Trevor Chinn (Christchurch). The major object is to complete to publication standard the mapping of

an area between the Taylor and Mackay Glaciers; the work was started by the former Antarctic Coal Measures Study Group in the 1982/83 and 1984/85 field seasons. They also plan to further study the Beacon Supergrouptype sections at Beacon Heights, assess Weller Coal Measures depositional environments, and resolve the current debate about the validity of some Taylor Group formations. Trevor Chinn will concentrate on the glacial geology and geomorphology, following the success of his earlier work in the Convoy Range in 1989/90.

Field camps are planned for Arena Valley, Mount Freya (Asgard Range), Balham Valley, Mount Littlepage, Vishniac Peak, and an unnamed nunatak north of Parker Mesa in the Clare Range. The completed mapsheet will cover 2600 square kilometers and will complete an 8000 square kilometer contiguous block of 1:50,000 geological mapping. The mapping will involve air interpretation, ground traverse and measuring of stratigraphic sections. The party will be in Antarctica from early November until mid-December.

Wind radars and radio waves

Three scientists from the Department of Physics at Canterbury University will spend ten days at Scott Base from mid-November. The project leader is Dr Grahame Fraser; Bob Bennett and Roger Govind are the other members of the party. Their department operates two atmospheric wind radars, one near Christchurch and the other at Scott Base. They measure winds at altitudes of 60-100 km and the data has been contributed to international co-operative observations on global scale changes in the middle atmosphere (between ten and 100 km) including three research projects on the polar middle atmosphere funded by the National Science Foundation.

In conjunction with other radars in the global network the results have shown that there is considerable variability, in, for example, the prevailing winds and the atmospheric thermal tides. There are indications

of variability on the time scale of the solar cycle but so far observations are not available for a sufficiently long part for a definite result to be obtained. The Scott Base observations are important because they extend the coverage of the global radar network to high latitudes and provide information from latitude 78 deg S between the South Pole and the rim of Antarctica between 65 and 68 deg S and they are made in a region responding strongly to solar particle influx variations during the solar cycle.

Studies of very low frequency radio waves from (1-40 kHz) at specific positions are being undertaken this year by Dr Richard Barr of the National Institute of Water and Atmospheric Research Ltd., whose equipment is being fitted to RNZAF C-130 Hercules flights for measurements on flights to and from Antarctica.

The main objectives of the project are to compare the position fixes obtained by the Inertial and Omega navigation systems of an RNZAF C-130 re-supply aircraft with those of a GPS receiver on ten return flights to Scott Base and to make wide band, digital recordings of global VLF signals on the flights in synchronism with GPS fix data and to analyse and publish the results. The project is important because the Omega system tends to fail at high latitudes and GPS provides an excellent solution particularly as satellites are now in polar orbits resulting in the availability of the system all the way to the continent.

The regular programmes

The regular programmes including the determination of corrosion resistance of architectural aluminium alloy in the atmosphere by long term exposure; the investigation of the normal and disturbed mesosphere in Antarctica using equipment installed at three locations at Arrival Heights and Scott Base; maintenance of the seismograph station at Scott Base and continuous recording of three components of the earth's magnetic field are all to be continued.

In addition meteorological equipment used in climatic observations will be inspected by technicians from NIWAR and the programme continued over the winter by

Scott Base personnel. The Atmospheric Division of the same organisation has for several years been engaged in a research programme investigating atmospheric aerosol properties around New Zealand and the Pacific and as part of the programme ground based measurements have been made in the Antarctic. Aerosols are important because of their central role in determining the radiative and cloud forming properties of the atmosphere. One of the main roles of the small particles in the air is their ability to act as cloud condensation nuclei (CCN) essential components of all clouds in the formation stages. It has been postulated that since cloud amount and cloud microphysical properties are two of the major variables in determining climate then CCN may have a direct influence. Previous work has focussed on the general aerosol population but this programme is concentrating on that portion of the atmospheric aerosol which are CCN and over longer more climatically realistic periods. The programme is being undertaken by Gavin Fisher who will visit Antarctica in late October and late November to undertake a series of measurements.

Lake and sea levels

Monitoring of the dry valley lakes, which has been undertaken now for the past 18 years, will be continued. The levels of the enclosed lakes of the Dry Valleys area represent the net balance of inflow of summer meltwater minus annual ablation losses. Because summer temperatures remain close to the threshold for ice melt to occur, the amount of meltwater generated is extremely sensitive to small changes in the summer climate. The lake level record is considered to be the single most valuable record of climatic fluctuation in the Dry Valleys area. As usual, the work will be undertaken by a surveyor from the Department of Survey and Land Information who sometime in late November will visit Lake Vida in the Victoria Valley, Don Juan Pond and Lake Vanda in the Wright Valley, Lakes House, Joyce, Bonney, Henderson, Hoare and Fryxell in the Taylor Valley. This year, the surveyor,

Kevin Taylor of Gisborne, will also take measurements at Lake Keyhole and Hidden Lake in the Koettlitz area which have recently been added to the programme.

The tide gauge at Cape Roberts, one of the most southern installations of its type, was installed in late 1990 and continues to provide tidal and mean sea level data for studies into the southern ocean current and monitoring variations in the contribution of Antarctic ice to the worlds water. Such data is considered important for testing theories on climate change.

A new site is to be investigated this season for the tide gauge at Scott Base that was originally installed in late 1988. A comparison of data from Cape Roberts and Scott Base will provide new information on the tidal regime pattern in McMurdo Sound and can be used to compute predications and determine mean sea level datum.

Environmental reporting

A number of factors, ranging from international agreements to the Protection of the Antarctic Environment to the continuing rise in the water level in Lake Vanda, require that the New Zealand Antarctic Programme begin to assess the environmental impacts of aits activities, past and present.

This season a team comprising Dr Doug Sheppard of the Insitute of Geological and Nuclear Sciences Ltd in Lower Hutt, Dr Joanne Deely from the Institute of Environmental Health and Forensic Sciences at Lower Hutt and Drs Iain Campbell from Land and Soil Consultancy Services in Nelson and Dr Graeme Claridge from the same organisation but based in Wellington will spend almost a month in Antarctica.

Working from Scott Base, and Marble Point they will be assessing the nature and extent of contamination of soil and runoff waters by human pollutants on and about the two New Zealand bases by systematic sampling. For comparative purposes sampling in remote areas will also be carried out. The possible flooding of Vanda Station site necessitates a characterisation and account of the contaminants. They will also be trying

to gain some understanding of the processes by which the contaminants are transported within the soils and permafrost, and, after leaching by meltwaters at Marble Point.

The information obtained by the party

will be useful in future environmental management of the New Zealand Antarctic Programme as well as being of immediate use in assessing the need for site remediation at Vanda Station.

Summer staff at Scott Base for 1992-93 are:

SENZREP: Senior New Zealand Representative in Antarctica Dave Comber, Taupo

Base Manager: Mary Cox, Auckland

Operations Manager: Paul Chaplin, Christchurch

Mechanic: Peter Aitcheson, Dunedin

Technician: Grant Avery (spending a second summer on the ice having arrived at Scott Base in 1991 and wintered over).

Supply Officer: Steve Witton, Kopara

Stores/cargo: Dave Milne, Woodbourne

Carpenters: David Palmer, Dunedin; Terry Newport, Christchurch*

Admin Clerk: Irene Walker, Auckland

Comms Operators: (Senior) Dennis Spring, Nichola Harvey and Simon Burling-Claridge, all from Auckland.

Plant operators: Nigel Travers and Peter Groube from Linton

Canteen manager: Shaun Smith, Wellington. (Summer 1991/92)

Chef: Shane Scott, Mt Maunganui

Domestic staff: Vivienne Taylor from Christchurch and Lizzie Roberts, Queenstown.

Field training: Leader: John Roberts from Mt Cook who has spent the summers of 1987/88 and 1988/89 training personnel in the field. Steve Hall, also from Mt. Cook and Jo Straker from Tokaanu who has also been involved in field training but during the summers of 1990/91 and 1991/92.

Field assistance is being provided this season by Bill King of Christchurch (summers 1974/75 and 1978/79); Brian Alder, also of Christchurch and Neil Sheerin of Wellington.

Winter personnel

Base Engineer: Andy Goodall, Auckland
Engineering Manager: Roger Moffat, Christchurch

Mechanic: Greg Harris, Paraparumu

Electrician: Brian Green, Nelson

Chef: Catherine George, Dipton. (summer 1991-92)

Domestic: Pam Davies (summer 1991-92)

Field/stores officer: Dave Brice (summer 1985/86, winter 1986/87, winter 1988/89).

Technician: Mike Mahon, Christchurch

Senior technical officer (Telecom) Callum McGowan, Christchurch

Base assistant: Rob Johnston, Wellington

Vanda Station: This station will not be manned for the summer and its future is being considered. Plans are being made for its removal because of possible flooding.

An environmental impact assessment of the relevant procedures is currently being undertaken by the Antarctic Environmental Assessment Review Panel, a sub-committee of the Ross Dependency Research Committee. The chairman of the sub-committee is Professor George Kratoch of Christchurch and its members are: Dr Harry Keys, Department of Conservation, Turangi; David Wratt, NIWAR, Wellington, Alan Hemmings now of Greenpeace in Auckland and Dr John Haywood from the Centre for Resource Management at Lincoln, near Christchurch.

*See page 301

Other programmes:

Documentaries: "Life in the Freezer" is a major BBC wildlife series presented by Sir David Attenborough. The series of six 30 minute-programmes is being filmed in the Antarctic Peninsula, at Australia's Mawson base and in the McMurdo Sound area. Two crews are travelling south this season as part of the project, the first, a dive crew of five are spending a month from mid-October filming at the ice edge, at Turks Head and off Scott Base. This team comprises Andrew Penniket, Brady Doak, Jeannie Ackley from Television New Zealand, Mike de Gruy from the BBC and dive supervisor Trevor Dick. The second, a surface crew, includes Sir David Attenborough, Ned Kelly and Hugh Maynard of the BBC and Errol Samuelson of TVNZ will visit Scott Base, McMurdo Station, Capes Evans, Royds and Bird, Vanda Station in the Dry Valleys and Amundsen Scott-South Pole Station. The various sequences are being filmed to illustrate survival in extremes.

Others involved in the programme this season include:

An RNZAF helicopter detachment comprising a crew and support personnel will be deployed in Antarctica from early November through to January. In addition two officers from the Royal New Zealand Navy are likely to spend part of January aboard a USCG Icebreaker gaining experience of such operations in Antarctica.

Three representatives of youth groups are scheduled to travel south this season. They are: Linda Clarkson of St John's in Mt. Maunganui, Jenny Varcoe from the Scout Association in Hastings and Joseph Fecteau from the Boy's Brigade in Island Bay, Wellington.

In addition to the NZAP information officer three journalists will cover New Zealand activities on the ice during the summer. They are Yvonne Martin from Auckland, Valerie Smith from Taupo and Josie McNeen from Christchurch.

Colin McKenzie and Jim McGregor of Telecom South will carry out the annual inspection, maintenance and installation of Telecom equipment at Scott Base.

At the time of going to press the list of VIP's going south was still subject to confirmation.

NZAP's new director

New Zealand's Antarctic Programme (NZAP), which has replaced DSIR Antarctic has a new director, Ms Gillian Wratt, formerly of the New Zealand Food Institute for Crop and Food Research. She took up her appointment on September 7.

As director, Ms Wratt will oversee the Christchurch staff of NZAP which provides logistic support for the programme. She will also be concerned with research programmes and will work with the Antarctic Policy Unit of the Ministry of External Relations and Trade which has responsibility for New Zealand's international Antarctic policy.

Ms Wratt, who joined DSIR in 1977, has spent most of the last ten years with the organisation. She held the position of Corporate Services Manager in 1991 before the restructuring to the Crown Research Institutes. Ms Wratt was the Convenor of the Crop and Food Research Establishment Unit.

Born in Motueka, Ms Wratt attended Motueka High School. From 1972 to 1975 she was at the University of Canterbury where she gained a B.Sc degree with honours in botany. Before she decided on a scientific career Ms Wratt spent a year building fibre glass trailer yachts. In 1977 however she joined the Plant Physiology Division of DSIR in Palmerston North and in 1979 she was transferred to Wellington where she worked for the Natural Research Advisory Council as the secretary to the primary production committee which was concerned with research programmes and their funding. Then, after 18 months overseas leave in England, Europe and the United States Ms Wratt came to the Crop Research Division in late 1981. Her roles there have been concerned with policy, marketing, public relations and business management.

In 1989-90 she attended Sydney University on a DSIR study award gaining a Masters' degree in Business Administration.



Ms Wratt has previously worked with the New Zealand Antarctic Programme as a field assistant. Early in November 1985 she went south to Scott Base to assist Dr's Warwick Vincent and Clive Howard-Williams in their work on streams and lakes in the Dry Valleys where the party spent three months. The scientists from the Division of Marine and Freshwater Science Research Laboratory in Taupo (now the National Institute of Water and Atmospheric Research Ltd.,) began their studies of nutrient uptake and transformation in algal communities of three streams in 1982 but work in the 1985-86 season included the deep phytoplankton populations of Lakes Fryxell, Vanda, Bonny. They also visited Walcott Bay at the base of the Koetlitz and Walcott Glaciers and made a brief stop at Bratina Island during a helicopter flight back to Scott Base. Ms Wratt returned to New Zealand on 5 February, 1986.

Ms Wratt's outdoor activities have also extended to other parts of the world. During her overseas leave in 1980/81 she did some rock climbing and skied in the USA and Europe. She has kyaked the Colorado River

through the Grand Canyon and has been to Europe as a member of the New Zealand whitewater kayak team. Last year she was leader of an expedition of four women who were the first people to kayak the rivers of the mountainous Himalayan State of Sikkim.
- Jim Caffin.

Stop press: Helicopter crash

Two members of the New Zealand Antarctic Programme and one American serviceman were killed in a helicopter crash near Cape Royds, Ross Island early in the evening of Tuesday 12 October 1992. They were Garth Varcoe, Technical Services Manager with the New Zealand Antarctic Programme and Terry Newport, a carpenter with the summer team. Both were from Christchurch. The American was Benjamin William Micou (Aviation Structural Mechanic) Petty Officer First Class from Michigan.

The pilot Lieutenant Commander Edward Lee Crews of Baton Rouge Louisiana and the co-pilot Lieutenant John C. Seralles of North Patchogue, New York, received severe injuries and were evacuated to Burwood and Christchurch Hospitals on Wednesday 13 October in a serious but stable condition.

A full enquiry into the accident has already begun but it may be four to six months before a final report is available. Services for the three men were held in Christchurch on 19 and 20 October, 1992. A full tribute will appear in a forthcoming issue of Antarctic.

Anare

Mawson's dogs to leave on first voyage of season

Australia's 1992-93 season was scheduled to begin on 16 October with the departure from Hobart in the early evening of Aurora Australis on the first summer voyage to the Antarctic. It is the 46th season of Australia's modern Antarctic operations and involves 185 personnel undertaking research work in the Antarctic and subantarctic regions.

The 97 passengers aboard the Aurora Australis included scientists conducting a diversity of projects in the Prydz Bay region of Antarctica including; investigations of the UV radiation levels over the Southern Ocean south of Australia and the response of phytoplankton exposed to UV radiation; diet and behavior studies of the penguin and seal population, further development of an automated penguin monitoring system and investigations into the impact of human activity on penguins. Upper atmosphere and geological studies and research into the interaction between ice and atmosphere to determine the role of sea ice in global climate change are all part of the programme.

On this voyage Aurora Australis is scheduled to visit Mawson and Davis stations to deploy the first scientists and other expeditioners for the summer and to begin resupply

of the stations, an exercise involving the use of three helicopters to ferry passengers and cargo across early season fast-ice to the stations.

During the summer scientific research is also being undertaken at Casey, and Macquarie Island as well as at Heard Island where a small team have been working since early this year (see Antarctic Vol 12, No.7 pages 236 ff).

A major research programme involves further deep ice core drilling at Law Dome, inland from Casey and subsequent analysis of the cores to provide records of past climatic conditions. Two inter-disciplinary marine science voyages are included in the programme which makes the most extensive use yet of the vessel commissioned in 1991. The first voyage will concentrate on krill and zooplankton destruction with associated studies on the phytoplankton, bottom fauna, oceanography and geology of the region. A second eight-week marine science voyage will see Aurora Australis working along the ice edge in autumn when the winter pack ice is forming. Its task will largely be an examination of the oceanographic structure of the water masses between Hobart and the Antarctic continental shelf. The cruise will form part of the International World Oceanographic Circulation

Experiment (WOCE) which aims to investigate the role of ocean currents in driving the earth's climate and in climate change.

An important component in this season's work will again be aimed at maintaining and improving Australia's environmental management which this year will include the removal of the last of the former Casey station and rubbish from disused tips.

Aurora Australis will again be supported by Icebird which will undertake nearly half of the voyages planned for the season.

Twenty-two dogs and pups from Mawson Station will be taken aboard the vessel to begin their long journey to the mountains of Minnesota in the United States where they will be kept together as working teams at an established adventure training operation. The dogs are being removed from Antarctica under the recently agreed Protocol on Environmental Protection (The Madrid Protocol) Annex II to the Antarctic Treaty. This requires that no dogs be introduced into the Antarctic and that existing dogs be removed by 1 April 1994. It was inspired by the risk that the dogs brought into Antarctica may introduce diseases or attack wildlife.

Several options for relocating the dogs were considered by the Australians but it was decided that it was in the dogs' best interest to retain their working status and to live in a suitable climate. The decision to send them to the States was endorsed by the Australian Antarctic Animal Ethics Committee.

Australia has maintained dog teams on the ice since Mawson station was estab-

lished in 1954. As in other Antarctic territories their role as essential support for scientific projects has long been replaced by mechanised transport and in recent years they have been used mainly for recreational journeys and so their removal will not effect scientific programmes. There are currently 29 huskies at Mawson, 19 are under the age of seven, three pups and seven older dogs.

Nineteen dogs under seven years of age, together with three pups and two dog handlers will travel to Minnesota as part of the resettlement programme. Each will be subject to a veterinary check, vaccinated and closely supervised on the voyage to Hobart where they are due to arrive in late November. The dogs will then be flown to North America and be used in working teams for adventure training or recreation in the snow of the forests of Minnesota. One of the operators conducts an Outward Bound school and the other provides high quality adventure training. It is necessary to send the dogs to the area this summer as the operators want to have them available in early December.

The seven older dogs will remain in Antarctica. In accordance with usual practice they would normally be put down within the next 12 months; those that remain at the end of this time will be sent to Australia.

Australia's Antarctic Division is ensuring that the removal of the dogs is adequately recorded and has commissioned a television film which will cover their full journey from Mawson to Minnesota.



Dorks and Kesha, two of the pups travelling to Minnesota. Photo. S. Rollins -

FRANCE

Assessment of Concorde base continues

French scientists, engineers and technicians are continuing to assess the environmental impact of a proposed new French Base at Dome C. If it is built, the location will be 124 deg 10min E/74 deg. 40 min. S, 900 km from the sea and 1,000km from Dumont d'Urville, and approximately 3,200 metres above sea level. It lies on an upland plateau, virtually horizontal and free of crevasses and where the annual snowfall turns slowly into compact neve.

The structures of the abandoned American Dome Charlie used during the 1970's and 1980's for aircraft repair and recovery and limited scientific programmes may be utilized. Dome Charlie is considered to be of little historical, museological or cultural interest.

Conceived as an idea in 1982 during a working group formed to establish research priorities for the French Southern and Antarctic Territories, the Dome C project has been boosted by the new emphasis on atmospheric research and climate change which is bringing together international scientific associations, government and intergovernmental organisations and the completion of the airstrip at Dumont D'Urville.

Planet wide research programmes including the World Climate Research Programme, the international Geosphere Biosphere Programme, the Solar-Terrestrial Energy Programme, the Planet Earth mission are among those that have recently come into being. Noting, that basic to all these programmes are measurements of geophysical parameters at a great number of points over the earths surface, French scientists, among others, recognise that 14

million square kilometers of Antarctica cannot be ignored and are participating in discussions with the international community. Of equal importance are the specific advantages of a site for geographical, glaciological, atmospheric and astronomical studies at a site clear sky, low water vapour, close to the geographic south pole and the unvarying geomagnetic pole in the southern hemisphere. The climate is particularly harsh and biological and medical personnel would take advantage of the conditions for their research.

A hangar being built at Dumont D'Urville was due for completion early in 1992 and will be used to support planned logistic operations. Personnel, mail and other supplies would be ferried to Dome C by Twin Otter or Dornier 228. Each is large enough for up to five passengers and their baggage and once in operation the aircraft would be likely to make 23 or 24 round trips each summer season. The runway at the station would also be open for C-130 operation at the beginning and end of the season but closed during the period the Adelie penguins breed.

Surface access would be via a signposted route from Cape Prud'homme, the only rocky point offering access to the continent without an ice cliff. It is about five km from Dumont d'Urville and seaborne cargo would be transferred by pontoon. It is envisaged that convoys supporting both construction and subsequent operation of the base would leave from here. Vehicles likely to be used include Kassbohrer PB 270's and Caterpillar challengers each with sleds and high field capability. Convoys would comprise up to

seven vehicles. The route up to D80 has been used many times by French Polar Expeditions, the present signposts would be replaced by radar reflectors to enable the track to be picked out more readily in poor visibility. The 300 km of coastal zone is known to be difficult country characterized by accumulated fresh snow and sastrugi ridges.

Construction of the base is likely to be above ground and the station may comprise two spherical structures up to four floors high, stabilised by piles sunk into the compact neve to compensate for sinking or

leaning. Hydraulic jacks are likely to be used for vertical adjustment and allowance for snowdrift. The two spheres will be connected by a tunnel thus separating cooking, and facilities for heating and power and from other quarters for safety reasons.

Plans to date allow for 15 personnel to winter, 30 to be present at relief times and up to 40 during the summer. Construction is still subject to full environmental impact assessment but if it is to proceed preliminary work may begin this summer with normal operations starting in November 1995.

Korea

Koreans to launch 6th Antarctic Research Programme.

A 6th KARP field programme will be undertaken from December 1992 to February 1993 and includes marine geophysical and general oceanographic surveys as well as a shallow bottom ecology study. The leader this summer will be Dr Soon-Keun Chang, Director of the Polar Research Centre at KORDI, the Korean Ocean Research and Development Institute. Twenty scientists and support staff are expected to be involved. The 6th wintering party, comprising 12 members, will remain at the station from December 1992 to December 1993.

The first Korean Antarctic Research station, King Sejong Station, was established for the Korean Antarctic Research Program (KARP) in February 1988. Named for the Great King Sejong of the Yi Dynasty who created Hangeul, the Korean alphabet, the station is located at the western tip (62 deg 13S/58deg 47minW) of Barton Peninsula facing Marian Cove and flanked by Maxwell Bay, southwestern area of King George Island, South Shetland Islands. It comprises an administration building, marine and sum-

mer laboratories, maintenance shop, residential building, green house, building for power and food storage, and geomagnetic, seismic and meteorological observatories. Last summer three new buildings were added to accommodate a new power plant and to provide additional storage space. No further building is planned for this season.

Logistic support will be provided by *M/V Erebus*, a French ice-breaker based in Punta Arenas, which since 1989 has been available for charter and has supported a number of organisations undertaking antarctic research. She was built in 1983 by Goole shipbuilders Ltd. in England in 1983 to Lloyds ice class classification one, is registered in Kingston and sails under the flag of Saint Vincent and the Grenadines. Her captain, Alain Veyser is described by the Koreans "as a very able and tough man with a good humour." Last year the *Erebus* gave full support to the 5th Korean Antarctic Research Program, this year some of the some of the scientific work will be undertaken from *R/V Onnuri*, a newly purpose-built 1,400

ton ice-strengthened ship, operated for KORDI, the Korean Ocean Research and Development Institute.

The building of *Onnuri* was funded by an OECF loan which was made available in March 1986. Her basic design was worked out by the Koreans between October 1987 and June 1988 and construction began in September 1990 at Mjelle & Karlsen Verft AS, in Norway where she was completed on 11 January 1992. The name *Onnuri* is intended to evoke the idea of exploring the oceans all over the world. She is constructed with a reinforced hull designed for low noise, good sea-keeping capability and low fuel consumption. There are two continuous decks, a main and shelter deck, and an extended forecastle. Deck arrangements allow for the addition and removal of equipment for specialised scientific programmes and she is equipped with laboratory space and essentials for physical, biological geophysical, geological, chemical and meteorological research. This coming season she will arrive at King George Island about mid-January and spend a month supporting oceanographic work in the area.

Scientific programmes in 1992/93 in-

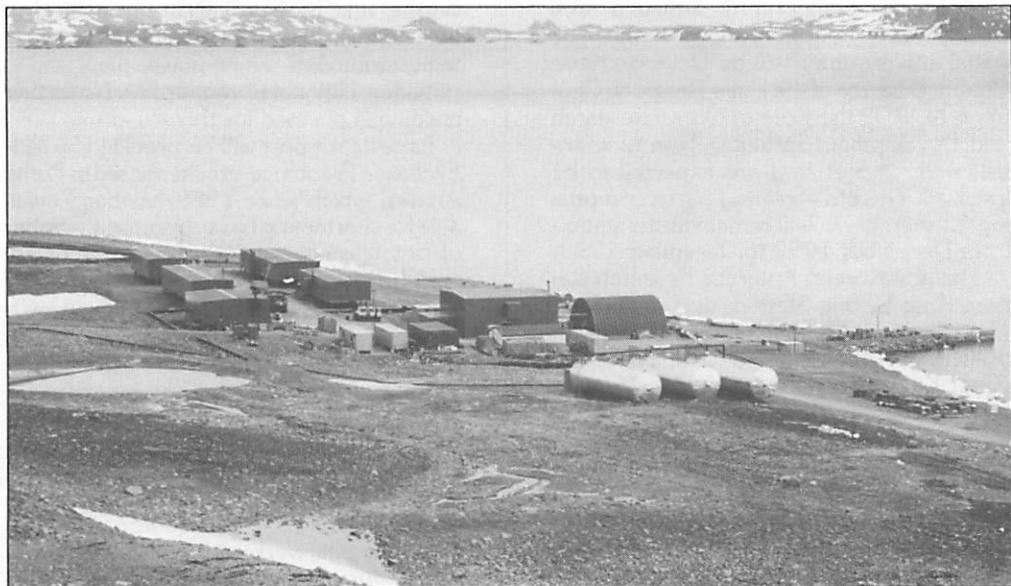
clude a multi-channel seismic (MCS) operation with multibeam echo sounder, gravity and magnetic survey to be conducted at the north of King George and Elephant Islands. The chief scientist is Dr Jeadong Kim of the Marine Tectonics section of KORDI and the main purpose of the survey is to delineate bathymetric and structural changes near the southern end of the Shackleton Fracture Zone which is one of the major tectonic features in the Scotia Sea.

The geophysical cruise is part of the Korean's long-term project in Antarctica. It focuses on the tectonic evolution of the northern Antarctic Peninsula during the late Cenozoic. The tectonic history of the area is extremely important to the understanding of the geology as well as the West Antarctic glacial history.

During the 1992/93 field season, approximately 1,000km of 96 channel (25m groups) MCS data with a 16 air gun array and 2,000 km of bathymetric image and gravity data will be acquired.

A comprehensive oceanographic study

*Two seasons at King Sejong - photos
Dr Soon Keun Chang*



led by Dr Dong-Yup Kim of the Polar Research Centre at KORDI will be conducted in the Bransfield Strait, the northern Gerlache Strait, the southern Drake Passage, and north-western part of the Weddell Sea. The main aim is to understand the structure and function of ecosystem and to clarify the water mass structure in the study area.

Benthic Fauna and Flora (or Coastal Benthic ecology)

Antarctic nearshore waters are characterised by high benthic biomass despite the relatively low water column production. The physiology and behavioural strategies of the benthic organisms which have adapted to the harsh Antarctic coastal environment are, therefore of great interest. The nearshore waters are also vulnerable to the impacts of anthropogenic activities. Human impacts such as oilspills and the construction of bases should be continuously monitored, as part of conserving the Antarctic environment and organisms which up to now have been least affected by human activities. The final goal of the Korean researchers is to provide a baseline data for the protection and

conservation of the Antarctic environment and organisms.

In the 1992/93 season, biomass and species composition of benthic flora will be studied in Maxwell Bay under the leadership of Dr In-Young Ahn also of the Polar Research Centre. Environmental parameters affecting the spatial pattern of macroalgal population will also be investigated in the same area. In addition the growth rate and production of the Antarctic giant kelp *Himantothallus grandifolius*, a common brown alga, will be estimated by tagging and punching the blades, and the role of this giant kelp as primary producer in the Antarctic coastal waters will be assessed.

Experimental studies on the infaunal lamellibranch *Laternula elliptica*, a common Antarctic bivalve, will be continued in order to quantify its role in the Antarctic coastal ecosystem and also to explain the physiological strategies dealing with the highly seasonal food availability. Previous studies indicated that *L. elliptica* may play an important role in enhancing the organic particle flux from the water column and therefore nourishing other benthic organisms in the phytoplaknton-impooverished



nearshore waters.

Sediment flux will be measured in Marian Cove, and the relative importance of Laternula-mediated process to natural sedimental, in organic carbon flux will be assessed. The relation between water column production and metabolic activities of this species will also be investigated in order to get a better understanding of the interactions between benthic and pelagic ecosystems. Benthic invertebrates will be sampled for biochemical studies of natural products. These will be extracted from the organisms and analyzed for commercial application such as essential ingredients in manufacturing medicines and cosmetics.

Environmental monitoring will be undertaken at King Sejong Station during 1993 wintering season when the officer in charge will be Dr Dong-Yup Kim of the Polar Research Centre, KORDI. The wintering team will monitor the variation of water temperature, salinity and nutrient contents in Marian Cove in front of the station and fresh water ponds around the station. The seasonal variation of phytoplankton, zooplankton including krill and chlorophyll as well as the heavy metal contents in the water will be monitored simultaneously. The ecological and physiological study of bacteria is also under consideration.



Dr Kim, leader of the 6th Korean wintering party

Routine programmes involving the use of a Fabri-Perot interferometer, seismograph, geomagnetometer, tide measuring system and weather station will be operated continuously during the wintering period.

Four hundred thousand litres of fuel will be delivered to the Station this summer. The annual consumption of fuel is approximately 250,000 litres. It will be carried on the French Icebreaker *Erebus*. The ship will also deliver six 20 foot long containers of food and supplies.

Jaica

Jamaica to send its first expedition south

The first Antarctic expedition ever to leave Jamaica is scheduled to leave Kingston on 2 January 1993. The two man party will be based at the Chilean Marsh Station in the South Shetlands until 4 February 1993.

Leader of the expedition is Professor Meyer-Rochow and his companion will be Walton Reid, a Physics graduate from the University of West Indies. Both men are currently working in the Electron Microscopy Laboratory at the Mona Campus of that University. Professor Meyer-Rochow was based at Waikato University in Hamilton, New Zealand for many years. He is particularly interested in adaptations to extreme environments and is currently in Jamaica to set up a cave research programme. It will be his sixth trip to the Antarctic.

JAICA, Jamaica Antarctic Investigation of Cold Adaptation, as the expedition is known, will collect tissue samples from the large marine worm *parborlasia corrugatus* which is thought to play a pivotal role in the Antarctic ecosystem. They will also investigate how cells of various organisms can operate at sub-zero temperatures.

BAS

40 parties in the field and three marine science cruises for the 1992/93 summer season.

Over 40 field parties will be deployed by the British Antarctic Survey along the Peninsula area, on the iceshelves and on the continent during the summer of 1992/93. BAS scientists will also work in Marie Byrd Land as part of a major international programme. Three marine science cruises will be undertaken.

Significant logistic support will be provided by aircraft using the new crushed-gravel, hard-rock, airstrip opened at Rothera Station last summer and in use for its first full season of activities. The *RRS James Clark Ross*, operating for its second season, and the newly refitted *RRS Discovery* will carry passengers and cargo for resupply in addition to supporting the marine science programmes.

Twenty-one of the field parties will be deployed in the Antarctic Peninsula area from 62 deg S to 79 deg S. At the northern limit geological parties will be deployed by ship. On Hurd Peninsula, Livingston Island, mineralization will be studied, while on Deception Island field mapping will be completed with a focus on unusual syncaldera pyroclastic flow deposits. At the southern limit at 79deg S, one glaciological team will be working on the southern Ronne Ice shelf investigating tides using GPS methods while on the Rutford Ice Stream seismic and electromagnetic anisotropy methods will be used in a continuing study of basal conditions of the ice stream.

Nineteen field parties will be deployed from the crushed-gravel airstrip at Rothera

which became operational for the first time last year increasing the speed and safety of air operations.

Two geologists will work in Marie Byrd Land with US and New Zealand colleagues as part of the South Pacific Rim Tectonic Expedition (SPRITE) project. This year sees the start of a new investigation into the terrestrial ecology of Alexander Island centred on Mars Glacier, including reproduction and population studies, rock weathering work and the initiation of long-term studies of propagule banks in fellfield soils using cloches.

A geophysics seismic party will return to the Ronne Ice Front area to investigate the tectonic structure of the eastern edge of the Antarctic Peninsula Plate; this work was restricted last year when the *RRS Bransfield* was unable to make passage through the pack ice of the southern Weddell Sea to land a depot for the project.

In her first of three marine science cruises *RRS James Clark Ross* will contribute to a major investigation into the biology of the Marginal Ice Zone centred in the Bellingshausen Sea. It is part of the UK contribution to the Joint Global Ocean Flux Study (JGOFS). The programme starts on October 26 when she departs from Port Stanley in the Falkland Islands to where she is scheduled to return on December 18. Two ships are involved in the project, the second *RRS Discovery* will stay in open water, while the ice-strengthened *RRS James Clark*

Ross will enter the pack ice zone, staying relatively stationary as the ice edge migrates south during the transition from spring to summer. The cruise is being coordinated by the UK Natural Environment Research Council and involves marine biologists from a number of UK institutes in addition to BAS staff. The BAS aircraft equipped with ocean colour sensor will overfly the work areas while the ships are on station. The second cruise during 19 days of January is a BAS marine life sciences cruise which will be undertaken in the vicinity of South Georgia. The third, a 46 day cruise will utilise a large suite of marine geophysical equipment on both sides of the Antarctic Peninsula.

A full programme of science is being maintained throughout the year at Bird Is-

land and Signy research stations. Population studies on albatrosses, fur seals and penguins will be continued and telemetry of the location of seals, penguins and wandering albatrosses will be augmented by trials of satellite location of grey-headed albatrosses. Faraday and Halley research stations will maintain their observatory programmes. At Halley, a tow-away 40 tonne garage is to be erected on skis so that it can be moved to prevent it from becoming drifted in.

At Rothera a large satellite receiving system will be installed. Called ARIES (Antarctic Reception of Imagery of Environmental Sciences) it will be used for the routine collection and processing of data which will begin this season.

SWEDARP

International programme for 1992/93

The major section of the Swedish Antarctic programme for 1992/93 will again be carried out in conjunction with Finland and Norway. According to an agreement between the Nordic countries, each of three is responsible for the arrangements every third year. The Norwegian ships, *Polarbjorn* and *Lance*, will support a terrestrial research programme in Queen Maud Land and a marine programme in the Weddell Sea from mid-December to the beginning of March. Swedish work in Queen Maud Land will be undertaken in the vicinity of their stations, Wasa and Svea, and involves building research, focussing specifically on insulation and windload; a glaciological project concerning analysis of Landsat TM and NOAA AVHRR data related to simultaneous ground truth measurements of snow, ice and temperature and a glacio-meteorological experiment in Heimefrontfjella to be under-

taken by three Dutch scientists.

The ship board programmes involve marine chemistry work, physical oceanography, minor biology and atmospheric chemistry.

In addition Swedish scientists will join a British expedition working on South Georgia as part of continuing agreement with the British Antarctic Survey. This year it will be extended to James Ross Island and Vega Island, east of the Antarctic Peninsula with Argentinean logistic support. Six scientists will participate in the expedition involving glacial geology and paleoclimatology.



USAP

36th consecutive season of United States Antarctic activities

For its 36th consecutive season of Antarctic operations the United States is supporting about 120 projects involving 540 investigators and technicians. Seventy five percent of the projects will involve personnel travelling to Antarctica via Christchurch to undertake work at Amundsen-Scott South Pole Station, McMurdo Station, on the sea ice and in the dry valleys. A further 27 projects involving 97 investigators will be operating at Palmer Station, in the Peninsula area and on the research vessels *Polar Duke* and the *Nathaniel B. Palmer*.

In this article "Antarctic" examines the biological, medical, geological, geophysical and glaciological programmes being undertaken in McMurdo Sound, as well as in the Dry Valleys, Victoria and Marie Byrd Lands. Climate studies, ozone depletion work and astronomy, astrophysics and upper atmosphere research being undertaken as part of the United States Antarctic programme will be the focus of another article in a future issue of "Antarctic." Work being undertaken at the South Pole, in the Peninsula area and oceanographic studies will also feature in a future issue.

Biology

For Weddell seals the first year of life is critical for it is during this time that they experience a six-week period of maternal dependence, develop swimming and diving abilities and disperse from natal colonies as shore-fast ice turns to pack and open water. Dr J. Ward Testa and Michael A Castelline from the Institute of Marine Sciences at the University of Alaska will be trying to elucidate some aspects of the physiology, behaviour and survival of the seals during the first year. Using satellite telemetry they will record physical and physiological changes related to the amount of maternal care, weaning

and development of diving abilities and to track the dispersal of pups in their first year. The diving movements of one and two year old juveniles will be studied for comparative purposes. They will also examine the maternal, physical, physiological and behaviour factors that affect the movements of pups during their first year and which may condition them for survival. Tagging and measuring of the pups in McMurdo Sound will continue.

The mechanisms of gas transport in free-diving seals will be studied by Warren M. Zapol and Robert C. Schneider from Massachusetts General Hospital. They will use noninvasive ultrasonography to evaluate the oxygen-storage capacity of the seal's spleen and continuous laser spectrophotometry to study the role of oxyhemoglobin in storing oxygen in skeletal muscle during free diving. They will also study how oxyhemoglobin is diverted to the heart and brain of the animals which dive to depths as great as 500 meters sometimes for over an hour. The heart rate of fetal seals will be examined in order to advance understanding of how adult and fetal marine mammals dive for such long periods.

The foraging and distribution patterns of breeding emperor penguins in the western Ross Sea will be further studied by Gerald L. Kooyman from the Scripps Institution of

Kooyman from the Scripps Institution of Oceanography at the University of California at San Diego. Because the birds are sensitive to even small changes in the marine environment in which they live, they are an ideal indicator species. The project involves the collection of baseline data from the three major colonies in the Ross sea area.

Art L. DeVries from the University of Illinois will continue his study, conducted over the past 30 years, of the evolutionary aspects of antifreezes in fish. His group will focus on the physiological and mechanistic processes involved in freezing tolerance to improve their understanding and examine the synthesis of antifreezes and factors that control it. The project may have implications for human pathologies, nucleation theory and crystallography.

The assembly and stability of microtubules of Antarctic fish in low temperatures will be studied by H. William Detrich III and team of Northeastern University. As part of the project they will analyse the structural features responsible for the functional differences between brain and egg tubulins and characterise the dynamic behaviour of the microtubules and then compare tubulins from antarctic fishes with those from related temperate fishes and warm-blooded vertebrates to reveal the molecular interactions and structural features necessary for microtubule assembly at low temperatures.

The chemical ecology of shallow-water antarctic marine invertebrates in McMurdo Sound is to be studied by William J. Baker and James B. McClintock of the Florida Institute of Technology. Their objective is to identify and quantify the biological chemicals that affect ecological relationships among bottom-dwelling antarctic marine invertebrates. In an earlier project researchers found that biological chemicals have a moderate influence on the ecological relationships in polar communities, a result that contradicts a contemporary theory suggesting that as latitude increases the number of marine organisms using chemical defenses decreases. The team will isolate and characterise biologically active chemicals from invert-

brates that were previously found to use chemical defense mechanisms and evaluate their role as feeding deterrents, antifouling agents or overgrowth inhibitory chemicals and determine their origin as well as examining the storage of defense agents in specific tissues or mucus.

Dry Valley biology

In the dry valleys of Southern Victoria Land a complete microbial ecosystem survives at freezing temperatures in sandstone and in permanently ice-covered lakes. Cold-adapted cyanobacteria, algae and photosynthetic bacteria may possess unique nucleotides and amino-acid sequences either in their DNA or in a key carbon-dioxide-fixing enzyme used in photosynthesis. J. Robie Vestal of the University of Cincinnati and his group are trying to determine if these sequences are present and to establish whether they account for the enzyme's ability to function at subzero temperatures. Using the latest techniques of molecular biology they will selectively isolate various cyanobacteria, algae from the sandstones and algal mats. If the species does possess these unique qualities the team will have gained new insight into their mechanism of cold-adaptation and the evolutionary relationship with those existing in temperate areas.

The cryptoendolithic microorganisms which colonise the upper few millimeters of limestone rocks in the ice-free regions of Antarctica live in an extreme environment near the absolute limits of their physiological potential. Minor changes in the environment could destroy them. By using automatic data loggers E. Imre Friedman from the Florida State University and her party will monitor the microscale climate inside the rocks to quantify the environmental conditions. Computer models, based on the measurements, will help them identify their environmental threshold. The team will also document how dead microbial communities degrade and form trace fossils by collecting samples for subsequent analysis using elec-

tron microscopy.

In temperate regions, seasonal environmental changes and biogeochemical cycles influence freshwater lake ecosystems. The mixing and diluting of lake water, however can obscure the importance of some of the biogeochemical processes. Working at Lake Fryxell Brian Howes and Craig Taylor of the Woods Hole Oceanographic Institute will study the rates and pathways of carbon, nitrogen, sulfur and water-cycling at ecosystem level and use the data to produce a model of the carbon cycle of the lake for comparison with other similar ecosystems. Specifically they will determine the relative importance of the physical versus the biological processes in controlling the composition and distribution of bioactive and nonbioactive gases in the dry valley lakes. By examining the processes controlling the elemental cycling of a relatively simple physical environment they hope to enhance understanding of aquatic systems, especially marine and estuarine sediment systems and stratified water columns.

Working at Lake Bonney, a permanently ice-covered lake, John C. Priscu and his party from the Montana State University will study the water-column transformation of nitrogen. The lake presents a special situation in which the turbulence and upper trophic levels are virtually nonexistent and in which microbially-mediated processes dominate biogeochemical reactions. From data on the nitrogen dynamics they know that phytoplankton are nitrogen deficient, that nitrous-oxide concentrations in the east lobe of the lake are the highest-recorded in nature; that bulk denitrification does not exist in the east lobe and that nitrogen values in the west lobe are the highest ever measured in an aquatic system. They will measure the microbial regeneration, use of ammonium nitrate and nitrous-oxide production and the distribution of nitrifying and denitrifying bacteria to determine the dynamics in a system lacking the top-to-bottom regulation.

Working with investigators from the National Aeronautics and Space Administration Robert Wharton and colleagues from

the Desert Research Institute will demonstrate the potential uses of a basic telepresence system that can see and move. The system will be attached to a submersible remotely operated vehicle and used to map the biological, chemical and physical characteristics of ice covered Lake Hoare in the Taylor Valley. With the data obtained they will develop a three dimensional profile of temperatures, light, current, dissolved oxygen and microbial distribution and morphology.

Sea-ice bacteria

Biologists estimate the sea-ice microbial communities contribute to between 10 and 50 percent of primary production in polar marine environments. The communities develop in the lowest 20cm of the landfast congelation ice and are made up of algae, bacteria, yeast and protozoa. The algal component is well studied but little is known about the bacterial community. James Staley and his team from the University of Washington will characterize, identify, name and classify strains of sea-ice bacteria in Antarctica waters and compare them with the results of similar work in the Arctic to determine whether separate species have evolved in the two different environments.

Medicine

Failure to adapt to prolonged isolation and extreme environmental conditions in the polar regions can adversely affect both individuals and the organisations with which they are associated. Building on results of preliminary work conducted in Antarctica and the Canadian High Arctic Dr Lawrence Palinkas of the University of California at San Diego and his associates will be trying to establish the social and psychological characteristics that will enable them to predict how the individuals working in these regions will perform and adapt. They will acquire data by using a battery of psychological screening instruments and standardized de-

briefing protocol. In addition they are seeking to clarify fundamental relationships among environmental stress, coping resources, personality traits and performance and will build a data base for comparative and cross-cultural studies of human performance and adaptation in polar regions.

The disposal of human sewage under polar conditions can be especially difficult and the release of untreated sewage into McMurdo Sound has drawn considerable attention. Little is known about the persistence of sewage and pathogenic bacteria under these conditions and so G.A. McFeters and associates from Montana State University will study and describe the key issues related to the potential public health hazard and environmental impact of releasing untreated waste into McMurdo Sound.

Geology and geophysics

The rock strata exposed in the Transantarctic Mountains were deposited in a major foreland basin that developed adjacent to the Gondwanid mountain-forming belt during the late Paleozoic and early Mesozoic. Major features in the region include a foreland basin exposed in the central Transantarctic Mountains, a possible high (elevated) region along the foreland basin and an intracratonic basin exposed in southern Victoria Land. The Nimrod and Byrd glaciers are located between the two stratigraphic basins and because data from the area is limited the relationships between the two are unresolved. Sedimentologic and stratigraphic analysis will be undertaken by John L. Isbell and colleagues from Byrd Polar Research Centre at Ohio State University to identify the mechanisms that controlled their development and evolution. From this they will be able to identify and correlate the strata between the central Transantarctic Mountains and southern Victoria land, establish the nature of the Beacon stratigraphic sequence and the depositional environments of the Permian strata between the two glaciers, determine what controlled the formation and evolution of the basins

and ascertain whether or not the Paleozoic high exists. In addition they will be able to identify depositional patterns for use in reconstructing the regional geography before it was offset by the Byrd Glacier fault.

Geologists have concluded that magmas with distinctly different compositions can occupy the same chambers simultaneously. The close associations of certain igneous rocks with basalt and scarcity of rocks of intermediate compositions have led petrologists to propose varying processes to explain the phenomenon. Isolated observations suggest that possibly the inward-spreading, partially crystalline meshwork or solidification from along the roof of sheet-like basaltic intrusions thicken to the point of gravitational instability and begin to tear internally opening at gashes and lenses which are then filled by intervening melt. The process is called solidification front instability or SFI and the Antarctic offers some of the best examples in the world. The diabase sills will be studied by Bruce Marsh and colleagues from John Hopkins University who will undertake analytical investigations to delineate the physics and chemistry of SFI and compare their data with complementary field work undertaken at Stott Mountain, Oregon and Zora in Pennsylvania.

William A. Cassidy, John W. Schutt and Ralph P. Harvey from the University of Pittsburgh will continue their search for meteorite fragments in the Allan Hills area. Field teams from the United States, Japan, and more recently some of the European countries, have collected approximately 16,000 fragments representing between 2,000 and 5,000 distinct impacts on the ice sheet making the antarctic collection comparable in size to the total number of meteorites collected from sites worldwide over time. The fragments are useful for investigating possible changes through time in the meteoroid flux at earth, measuring the cosmic-ray flux in past eras, searching events in which asteroid parent bodies were disrupted

and defining the abundances and characteristics of pre-solar system organic molecules.

Also working in the Allan Hills area will be a team from the Byrd Polar Research Center who during the 1989-90 summer found that the region was unique because of the diverse types and ages of the plant fossils there. The rock strata, contained not only Permian and Triassic fossils but also Jurassic fossils, which are rare in East Antarctica. Beside the more common compression/impression floras they found permineralised peat in both Permian and Triassic rocks as well as silicified wood. This season they will collect samples for subsequent analysis to determine the taxonomic, paleoecological, paleoclimatic and other biogeographic information that can be compared with other better known floras in Antarctica and Gondwana.

Focussing on the David Glacier in the Allan Hills area will be Teresa M. Mensing and Gunter Faure of Ohio State University with their project designed to confirm that the east antarctic ice sheet in this area has become thinner in the past 100,000 years and to use rocks deposited by the ice to study the geology of this ice-covered area of East Antarctica. They will also collect samples of Jurassic basalt and dolerite from the locally exposed nunataks for geochemical and isotopic study aimed at testing the hypothesis that these rocks were altered hydrothermally by renewed volcanism during the post-Jurassic.

A Paleomagnetic study designed to establish and refine the early Paleozoic reference poles in East Antarctica is being undertaken by Anne M. Grunow from the Byrd Polar Research Center at Ohio State University. The study results in data that can be used to determine the positions of the magnetic pole over time and also the movement of continents.

The tripartite United-States-New Zealand-United Kingdom examination of rock outcrops in Marie Byrd Land will be com-

pleted this year. The goal is not only to complete geographic coverage of the antarctic section of the Pacific margin, but also to develop an integrated picture of the tectonic development of West Antarctica within the framework of both the Gondwana and Pacific Ocean basin evolution. Americans involved in the project include Ian W.D. Dalziel and Dennis Kent from the Institute for Geophysics at the University of Texas at Austin. (See pages 295 and 309.)

In cooperation with the German National Antarctic Expedition John C Behrendt from the US Geological Survey in Denver will be involved in an aeromagnetic survey over the northeastern Ross Ice Shelf. It is designed to determine whether the Terror Rift in the Victoria Land Basin continues south of Ross Island and to establish the presence or absence of submarine and subglacial volcanoes and subvolcanic intrusions associated with the late Cenozoic rifting. (See, Antarctic Vol 12. No. 8 page 258).

In Gondwana reconstructions, Marie Byrd Land is juxtaposed with portions of New Zealand and the Campbell Plateau. The breakup of the Pacific margin of Gondwana is reflected in well-documented Cretaceous and early Tertiary extension and rifting in the region and a series of magnetic anomalies records the opening of the Tasman Sea and splitting off of New Zealand about 85 million years ago. Events in Marie Byrd Land may relate to the tectonics of the Gondwana Pacific margin before and following this rifting and although there are many parallels between the area and New Zealand it is unclear whether they were part of the same unit. Working with the German National Antarctic Expedition Bruce P. Luyendyk and David L. Kimbrough, University of California at Santa Barbara will conduct an aerial geomagnetic survey of the northeastern Ross Ice Shelf. This will extend their previous studies of exposed Late Precambrian and Early Paleozoic metasediments, gneisses and migmatites, carboniferous and Cretaceous plutonic rocks and Cenozoic and Quaternary volcanic rocks. Data from petrologic, geochronologic and paleomagnetic studies will be used to recon-

struct the tectonic evolution of Marie Byrd Land.

Focussing on the transects parallel and perpendicular to the Transantarctic Mountains Terry J. Wilson and party from the Ohio State University will map the orientation patterns of faults, fractures and dike swarms between the Ferrar and Koettlitz Glaciers. Their objective is to determine the history of structural movement along the boundary between East and West Antarctica during the early stages of the breakup of Gondwana in the Jurassic as well as during the formation of the Mountains in the Cenozoic. Their results will help establish the direction of displacement associated with these fractures and test conflicting hypotheses on the relative movement of East and West Antarctica during the Gondwana breakup. The data will also provide a three dimensional picture of the structure of mountains that will be useful for modeling the processes associated with rifting and uplift of a mountain chain.

Understanding the tectonic framework across the west antarctic rift system is critical for deciphering the evolution of the Pacific margin of Gondwana. It also contributes to defining the characteristics of wide and narrow modes of continental extension and determining the geological controls of the dynamics of the west antarctic ice sheet, earth's last great marine-based ice sheet. This season Donald Blankenship from the Institute for Geophysics, University of Texas at Austin and Robin Bell from the Lamont-Doherty Geological Observatory and John Behrendt from the US Geological Survey at Denver will continue their integrated geophysical experiment which includes airborne radar and surface altimetry augmented by satellite imagery. CASERTZ, (Corridor aerogeophysics southeastern Ross transect zone), will also involve an airborne gravity survey and the taking of aeromagnetic measurements within a carefully selected west antarctic corridor that covers the western portion of the Byrd subglacial basin and easternmost portion of the interior Ross embayment. They intend to image the tectonic fabric across the west antarctic rift

system and to characterise the distribution of sedimentary basins, volcanic rocks and important ice-dynamic boundaries within this corridor.

The evolution of West Antarctica during and following the breakup of Gondwana remains a significant problem. A critical aspect is determining the timing of movements among the west Antarctic plates and the opening of the Ross and Weddell Seas and the uplift of the Transantarctic Mountains. The tectonic evolution of these features has generated magmas at limited times. Because movements accompanying the evolution have not exposed other middle crustal levels, apatite fission-track analysis has, and is proving, to be the most effective technique for dating low-temperature thermal histories. These techniques will be used by Edmund Stump and colleagues from Arizona State University on samples collected during the season to help solve the problem.

The early history of the seafloor along the Marie Byrd Land margin will be studied by Robin E. Bell and others from the Lamont-Doherty Geological Observatory. The team will map the magnetic lineations, gravity anomalies and topography and where possible seismically determine the depth of the basement rock. The study will integrate the tectonic lineations determined from gravity, bathymetric and seismic information with magnetic anomalies from which they hope to construct the history of the spread of the seafloor in the region.

Detailed field and laboratory studies of the Cenozoic volcanic rocks of Marie Byrd Land is being undertaken by William C. McIntosh and Philip R. Kyle of the New Mexico Institute of Mining and Technology. Their objective is to extend detailed field coverage of the West Antarctic volcano exploration (WAVE II), to the Marie Byrd Land volcanoes, known so far only at reconnaissance level. Subsequent laboratory work will include geochemical and isotopic analyses, radiometric dating and surface exposure dating. This is a cooperative program involving scientists from New Zealand and the UK as well as the States.

Philip Kyle will also be working on Mt.

Erebus where recent work has shown the mountain to be an important source of aerosols in the antarctic atmosphere and the most likely contributor of significance quantities of chlorine, fluorine and other trace components to the snow falling on the east antarctic ice sheet. Data collected so far has important consequences for chemists trying to decipher paleoenvironments from snow and ice-core analyses. This season the Mount Erebus Volcano Observatory will be established at McMurdo Station. It will facilitate continued surveillance of the volcano and expand scientific understanding of the degassing behaviour of an "open vent" volcano. Measurements of sulfur dioxide taken at Erebus between 1983 and 1991 are among the most extensive and detailed made at any volcano over a long period.

The Dry valley seismograph project yielding data for use in the Worldwide Standardized Seismological Network to provide azimuthal control for locating seismic events in both hemispheres is to continue.

Glaciology and glacial geology

George H. Denton and colleagues from the University of Maine will be assessing the mechanisms of the antarctic ice sheet and paleoclimatic evolution through the last glacial cycle of the region of the Ross Embayment. Hypothetically, during the glacial maximum the ice sheet expanded as sea level fell and thinned in the interior of Antarctica due to decreased accumulation but scientists do not know accurately how the sheet really responds to climatic change. Working at carefully selected sites the party will examine in detail the glacial geology and isotopic chronology. They will then integrate the record with ice core glaciochemistry from the McMurdo Dome in order to produce the first isotopically dated antarctic paleoclimatic curve. The information should allow them to disentangle important paleoclimatic forces of ice-sheet evolution, evaluate hypotheses of ice-age climate dynamics that require rapid synchronous global change and test the sensitivity of the west

antarctic ice sheet to climate change.

Pieter M. Grootes and Edwin D. Waddington from the University of Washington will obtain a climate record of the Holocene and the final part of the last glaciation from the McMurdo Dome, a small ice dome near the head of the Taylor Valley. The comparison of this isotope proxy climate record with a radiocarbon-dated proxy record derived from perched deltas, strandlines and moraines in the nearby McMurdo Dry Valleys will provide data that could be crucial for interpreting both the isotopic oxygen-18 fluctuations observed in ice cores during the Holocene and the lake levels and ice positions at this time. The comparisons should reveal the response of the east and west antarctic ice sheets to the glacial-interglacial temperature increases and sea-level rise.

In another project David M. Harwood and associates from the University of Nebraska focus on the Cenozoic glacial and climate history of Antarctica. They are trying to identify marine biogenic productivity in former antarctic seas and embayments to determine hidden stratigraphy in subglacial basins by studying ice-transported microfossils to enhance the use of diatoms as tools for interpreting past events, including sea-level change, sea-ice cover and paleotemperatures, for dating samples and to provide antarctic stratigraphic records to be used in interpreting deep sea data.

Because of the important role of the antarctic ice sheet in global climate, scientists need to know more about global-scale paleoclimatic problems, principally by constraining interpretations of the deep sea oxygen-isotope record. Investigations being undertaken by Michael L. Prentice and Harold W. Borns of the University of Maine focus on the detailed geological study of the Sirius Formation in the Allan Hills - Coombs Hills area to determine its relationship with alpine glaciers and ice sheets, its age and stratigraphy and the source of the marine microfossils in the formation. Data obtained will provide a critical test for the leading hypothesis of the origin of the Sirius Formation and contribute significantly to resolv-

ing the question of antarctic ice-sheet response to Tertiary climate warmth. The data will also permit the testing and fine-tuning of ice sheet models.

Through high-energy nuclear reactions, cosmic rays can produce radioactive forms of certain elements in quartz on exposed bedrock. Using accelerator mass spectrometry researchers have been able to establish exposure ages ranging from 10,000 to 50,000 years for a variety of surfaces, the oldest exposure times found are those measured in bedrock samples in Antarctica. Start-

ing this season and continuing next summer scientists from the Woods Hole Oceanographic Institution led by Mark D. Kurz will measure cosmic-ray-produced nuclides to obtain surface-exposure ages of glacial moraines. Their objective is to define the chronology of antarctic glaciations, with obtaining new dates for the Late Wisconsin Ross Sea drift as a priority.

This article has been adapted from the 1992/93 United States Antarctic Program.

Sub-antarctic

Rare southern right whales spotted at Port Ross

Airforce and Department of Conservation staff on board an RNZAF Andover spotted 50 rare southern right whales in the harbour of Port Ross, Auckland Islands some 465 km south of Bluff on 24 June 1992. The numbers were reminiscent of records two centuries ago. More than 70 of the whales were seen in the unusually clear and calm waters of the island's harbours; they included seven calves, one an albino.

The right whale, named because of the ease by which it was harpooned and the large quantities of oil it yielded, was slaughtered to the verge of extinction by New Zealand and Australian shore whalers early last century.

Whale expert, Dr Alan Baker of the National Museum said 50 was the largest number of the whales reported together since the days of commercial whaling adding, "It is very significant and suggests a comeback for the species."

The Andover flight from Invercargill was made to drop mail and supplies to Meteorological Service and Department of Conservation staff stationed on Campbell Island

and to test the suitability of the plane for photographic inventory work of whales, Hooker's sealions, fur seals and albatrosses. The was the first significant census of whales on Auckland Island since a short-lived and unsuccessful whaling venture in 1849, and a coast watching operation during the second world war. It also confirms a report by a Stewart Island fisherman of 100 whales in the island's harbours two winters ago.

New team at Campbell Island

The 1992/93 team staffing New Zealand's remote Campbell Island is led by Scott Freeman from Wellington. He is an employee of the New Zealand Meteorological Service. Other members of the party are Helen Donaldson, also of the Met Service in Wellington, who will be met officer, and Alan Lorking, an electrical technician from Wellington, Steve McAllister, a mechanic from Auckland.

Steve's brother Gus has stayed on from last
Continued on page 322

IWC

44th meeting concludes with moratorium retained

The 44th meeting of the International Whaling Commission concluded in Glasgow on 3rd July, 1992 with the retention of the ban on commercial whaling and conditional endorsement of a revised management procedure. However during the meeting Iceland walked out, (as it stated it would last year), Norway announced its intention to resume commercial whaling, and Japan stated that it would continue to kill minke whales for scientific purposes. The French proposed that a whale sanctuary be declared in the southern hemisphere covering an area from the Antarctic ice edge to 40deg south. In the meantime, however, the future of the organisation and the moratorium remain uncertain.

During the moratorium conservation nations have sought to encourage the development of a procedure designed to prevent the over-exploitation of whale stocks which occurred earlier this century, but have not wanted to vote into a place any arrangement which might bring closer the possibility of a resumption of commercial whaling. (The principal objective governing the IWC as agreed to in 1946 is "the orderly development of the whaling industry." Despite the establishment of a moratorium on commercial whaling in 1985, whaling countries have continued to kill through programmes of 'scientific research', which required whale carcasses to gather information. Those claiming that it is an indigenous activity have been allocated quotas.)

When voting in favour of a moratorium on commercial whaling in 1982 the IWC agreed that a comprehensive assessment of whale stocks would be undertaken and that by 1990 the effects of the moratorium would be reconsidered. As part of that process, the Scientific Committee has been developing a Revised Management Procedure (RMP) for calculating catch limits, should commercial whaling be allowed to resume.

Pro-whaling countries, recently encouraged by the advice of the scientific committee that the RMP was ready to be implemented for some whale stocks, in particular southern hemisphere minke stock a tougher line this year pressed hard for its adoption. Conservationists were also encouraged by the "few green members of the scientific, committee to accept the Catch Limit Algorithm (CLM), the mathematical formula by which catch limits will be set should commercial whaling ever resume in its present form in case it became further diluted.

New Zealand abstained on the vote to adopt the CLA, because the delegation felt that the Revised Management Scheme still contains too many uncertainties and fails to provide adequate protection for the southern minke whales. Application of the RMP as it stands would result in the depletion of the stocks of minke whales in the Southern Hemisphere (some of which spend much of their lives in New Zealand waters) by 100,000 whales over the next century.

A compromise was reached when a reso-

lution accepting the draft specification for the calculation of catch limits was adopted. The majority of Commission members, however, agreed that before the moratorium could be lifted a revised management scheme should be agreed. This scheme, as envisaged by conservationist nations in Glasgow, would set minimum data standards. It would also provide guidelines for conducting surveys and analyzing the results, establish a fully effective inspection and observation scheme and ensure that the total catches over time are within the limits set under the RMS and allow for the incorporation of the draft specification and other elements of the RMS into the schedule.

In the meantime endorsement of the CLA brings the Commission closer to having to decide whether to lift the moratorium and allow the resumption of commercial whaling; or risk the major whaling nations leaving the IWC and possibly setting up their own organisations to "harvest" marine mammals. (The whaling nations of Norway, Iceland, Greenland and the Faroes have already established NAMMCO (North Atlantic Marine Mammal Commission), through which they intend to reach agreements on quotas to harvest whales and seals in their region. Japan has indicated some interest in possibly setting up a similar organisation in the North Pacific, in association with Korea, China and Russia. In international law however, the IWC is recognised as the most appropriate forum for whaling issues.

Estimates

With nearly all stocks of great whales still greatly reduced by the long lasting impacts of commercial whaling this century, the main focus of the whalers' attention is the minke whale, smallest of the baleen (filter feeding) whales, which was considered in 1946 to be too small and unimportant to be mentioned in the original IWC Convention although they were listed in the in the sched-

ule, the other legal document for the IWC. Key stocks are the northern and southern minke whales. Japanese-sponsored sighting cruises to the Antarctic, where minke whales congregate in the summer to feed, have led to a population estimate of 760,000 animals. The Japanese want to resume commercial whaling on this population, and would expect to be awarded quotas of 2 to 3,000 whales per annum under the catch limit designated by the scientific committee. The Japanese also want to hunt minke whales in their 200-mile zone, claiming that whaling is an essential cultural activity in some areas, namely those serviced by the half dozen coastal ports utilised by the Japanese whalers. (Ninety small fishing vessels whale on a part-time basis from Norwegian ports and the main Icelandic fleet consists of six-catcher boats.)

Sanctuary

Full discussion on a French proposal for the establishment of a sanctuary in the southern oceans has been deferred until next years meeting. The document, as distributed, sets out arguments for establishing a large sanctuary covering the feeding ranges of at least one biological population of each of the globally distributed species of large whales. It also gives arguments for selecting the Southern Ocean for that purpose "because a sanctuary there would contribute to the rehabilitation of a marine ecosystem which has been severely, (hopefully not irretrievably) damaged by human exploitation during this century. The proposal integrates well with other current international actions towards protection of the entire Antarctic region. Given the distance from industrial centers, the vigour with which environmental protection and conservation measures are now being developed by the international community, the Southern Ocean offers the best prospects of all the world's oceans for securing a satisfactory habitat for

cetaceans - and other marine life - in the long term. Almost all the proposed area - circumpolar, reaching from the ice edge to 40deg S - has the legal status of High Seas and so is an especially appropriate object of international consensus. No Southern Hemisphere nations have declared any interest in resuming commercial whaling and, unlike the arctic region there is there is no aboriginal substance whaling with which the establishment of a sanctuary might conflict. Insofar as the proposed sanctuary would impinge on or include small areas under national jurisdictions most such areas are already given special status with respect to whales and no conflict with them appears to be likely.

Such sanctuaries are provided for by the IWC convention and the principle was strongly supported by New Zealand delegation who consider, according to a statement prepared at the meeting that "The Antarctic environment is unique. It is a major feeding ground for important stocks of whales. Our knowledge of the whale stocks there remains rudimentary in many respects, notwithstanding past whaling and more recent scientific search. A sanctuary would allow further research, yet provide for the conservation of important whale stocks." The proposal has been referred to CCAMLR and SCAR for comment.

Killing

Although much of the debate at the meeting this year centred on the RMP, the Commission considered among other important issues, humane killing and small cetaceans.

A three-day workshop on whale killing methods preceded the IWC meeting, at which discussions were held on the use of explosive grenades, heavy calibre rifle fire and electric lances to kill whales. The discussions and examination of methods are ongoing but from the evidence provided conser-

vationists concluded that harpooned whales are generally exposed to far greater suffering than would be acceptable for domestic stock; whalers argued that hunting could not be compared with domestic slaughter, and that most harpooned whales are dead within five minutes of first being struck. In their view, such times to death compared very favourable with most hunting situations. Nevertheless, it was acknowledged that sightings systems for harpoon guns are essentially over a century old and that most modern technology provides opportunities to develop guidance systems for harpoons that would ensure a more lethal strike.

The others

For years, members of the IWC have disagreed over the organization's role in managing dolphins, porpoises and small whales, and in the meantime, three species have almost become extinct while the prospects for some others look bleak. In the absence of any other recognised authority, New Zealand and other like-minded nations have pressed the Commission to act more positively to protect endangered and threatened small cetaceans. This year the Commission approved five resolutions (a record number) on small cetaceans and Brazil advocated a *modus operandi* for future policies.

Finally, the Commission acknowledged the dangers posed to whale population by the effects of global pollution and climate change.

Industrial pollutants such as poly-chlorinated biphenyls (PCBs) and other chlorinated hydrocarbons readily accumulate in marine mammals, and may result in a loss of fertility and a failure of the immune system. Increased penetration of ultraviolet light through the 'ozone hole' over Antarctica may already be causing a reduction of 10 to 20% plankton productivity during the spring months when production is at its peak. Such

drastic changes in the balance of the Antarctic ecosystem may have profound effects on whale populations.

The New Zealand delegation to the meeting was again led by Ian Stewart and comprised David Taylor from the Ministry of External Relations and Trade, Mike Donoghue from the Department of Conservation. Scientific committee delegates from New Zealand included Mike Donoghue and Dr Elisabeth Sloten of Otago University.

The 1992 meeting of the IWC was chaired by Mr Luis Sleisher and the next meeting will be held in April-May 1993 at Kyoto in Japan. Items on the agenda will include the RMS and the Southern Ocean proposals. By hosting this meeting Japan, and the other pro-whaling nations are sending a clear message to the IWC that the meeting may have important ramifications for the future of the International Whaling Commission.

Antarctic protection under review

A major review of protected areas in the Antarctic region is currently underway in the wake of the recently negotiated Protocol on Environmental Protection to the Antarctic Treaty. The Scientific Committee on Antarctic Research (SCAR) and the World Conservation Union (IUCN) have joined forces to convene two workshops covering, respectively, subantarctic island and the Antarctic continent, to review the existing protected areas, identify deficiencies in management and guide the future planning of areas for special protection and management.

The first workshop, held in Paimpont, France, 27-29 April 1992 brought together 28 scientists and managers from all seven countries that administer sub-Antarctic Islands - France, United Kingdom, Norway, South Africa, Chile, Australia and New Zealand. It was the most widely representative and comprehensive forum ever held to discuss subantarctic island conservation. Information on the conservation status of the islands was up-dated, and nine subjects were discussed, ranging from legal, administrative and planning provision to the impacts and control of introduced alien species of animals and plants, tourism management and marine issues.

The second workshop, convened at the British Antarctic Survey in Cambridge, United Kingdom, 29 June-2 July 1992, included 26 participants from key Antarctic countries. Subjects reviewed included the design and planning of protected areas, surveillance and regulation of the use of areas, tourism, information management, communication and education.

Recommendations from the meetings will be conveyed to the Treaty Parties and the administering authorities of the various islands. The proceedings of both meetings will be published later this year. - *Paul Dingwall*

For further information contact either Dr Peter Clarkson at the SCAR Secretariat C/o Scott Polar Research Institute, Cambridge, U.K. or Paul Dingwall, IUCN C/o Department of Conservation, P.O. box 10-420, Wellington, New Zealand.

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season to assist with a maintenance programme and Jacinda Amey from the Department of Conservation will be completing her work programme over the summer. Both will return to New Zealand in February by which time a further appointment will have been made for the forthcoming winter.

Antarctic Visitor Centre opens in Christchurch

On 31 August the eminent British botanist, Professor David Bellamy, opened the \$7 million Visitor Centre at the International Antarctic Centre in Christchurch. Bellamy, who used an ice ax to shatter an artificial wall of ice, announced "This is the most significant centre I've had to open. I give the International Antarctic Centre ten out of ten." It was open to the public on 1 September.

Designed by Christchurch architects, Warren and Mahoney, the centre was inspired by the ice bergs, ice shelves and glaciers of Antarctica.

An Australian exhibition designer, Tim

Hobson, whose company T.J. & L.E. Hobson Pty Ltd Sydney, had been commissioned to develop, design and produce the exhibition, assembled a team of specialists. These included Hewitt Design Associates (exhibition design), Upset Pty Ltd (set makers and designers), the Production Group (special effects), Bytecraft Pty Ltd (theatrical

Dave Hawkey, Manager of the visitors centre, Professor David Bellamy and George Bellew, Chief Executive of the Christchurch International Airport on the opening night.



lighting) Sound Design Studios Australia Pty Ltd (sound) and Montage Multi Image Ltd (audio visual).

Well-known Antarctic and alpine photo-journalists, Kim Westerskov, Colin Monteath, Jonathan Chester and Mike Perry, contributed hundreds of images.

The exhibition has been designed to compliment the fine historical and natural history displays at the Canterbury Museum and focuses on the Antarctic environment and scientific research.

Features include an exhibition gallery with a 2500 litre aquarium containing Antarctic fish, a terrarium, and simulated ice cave, a spell binding 12 minute audio visual on a 13 metre wide screen, Antarctic experience using sophisticated sound and light technol-

ogy, Antarctica from space, teaching laboratory, functions room Antarctic shop and the 60 degrees South Cafe and Bar.

The education programme has been developed in close consultation with education groups and authorities and is designed to consolidate and extend knowledge following a visit to the Centre. Education and Exhibition Manager, Lindsay Johnston teaches a wide range of topics in the social studies and science curriculum to all age groups.

Centre Manager, Dave Hawkey believes the Visitor Centre will bring a very real experience to those who are unlikely to ever experience the real thing. "Very few people get the chance to go to Antarctica and it holds a fascination for most of us," he said. - *David Harrowfield.*

Last chance for Mawson's Hut

At Cape Denison in Commonwealth Bay, East Antarctica, are five timber huts and structures associated with Mawson's Australasian Antarctic Expedition 1911-14.

The main hut generally known as Mawson's hut consists of two huts linked when a third eastern station did not proceed. There are also three small huts; the magnetograph house which remains in fact, transit house which is still standing but in poor condition and the magnetic absolute hut, now in ruins.

The site has been designated as historic monument by the Antarctic Treaty parties and was entered in the Register of the National Estate, Australia, in 1978. The Protocol on Environmental Protection to the Antarctic Treaty (the Madrid Protocol) and the Burra Charter adopted by the Australian section of ICOMOS* in 1978 require

Mawson's Hut to remain in Antarctica.

Access to Commonwealth Bay is subject to climatic and logistics constraints. For these reasons little work has been carried out since the AAE departed from Cape Denison. The last work was undertaken by two privately organised and funded expeditions known as "Project Blizzard" in 1984-86.

Major problems

A particularly bleak report on the condition of Mawson's Hut was conveyed to authorities by passengers who landed from the 100 metres cruise ship *MV Frontier Spirit* on 22 January, 1991.

Serious problems identified by "Project Blizzard" and others include the failure of major structural component, severe weathering of exterior cladding, extensive ponding

of meltwater, fungal growths and corrosion to metal fittings and artifacts.

Technical committee

Formation of an interim Mawson's Huts Conservation Committee on the Frontier Spirit, has led to the establishment of a Technical Committee in Melbourne. The committee is now developing a Conservation and Management Plan, works programme and fund raising strategy.

Chaired by Sir Peter Derham, the committee comprises William Blunt, co-convenor and architect from Sydney, (William was also prime mover for Project Blizzard); Malcolm Currey, Secretary, Sydney; Linda Hay, Assistant director, Australian Antarctic Division, Hobart, Rod Ledingham, Field Operations Officer with Australian Antarctic Division, Duncan Marshall, General secretary of the Australian Council of National Trusts, Canberra, Dr Michael Pearson, Deputy Executive Director of the Australian Heritage Commission in Canberra, John Monteath from Sydney, Janet Hughes, a materials conservator from Hobart and David Harrowfield, research officer with the International Antarctic Centre, Visitor Centre in Christchurch. New Zealand.

Conservation Plan

The Committee, with support from the Australian Antarctic Division, Australian Heritage Commission and the Australian Council of the National Trust, is developing a Draft Conservation and Management Plan. The programme will require the approval of the Minister for the Arts, Sport, the Environment and Territories (the Australian Minister responsible for Antarctic matters) before work can proceed.

Stage One establishes policy for long-term conservation. Subject to finance it is planned for a four (possibly five member party), consisting of a field leader, doctor,

conservation architect and archaeologist to work at Cape Denison next summer. A detailed assessment will be made of the site and emergency repairs will be undertaken on Mawson's Hut. Data loggers are likely to be installed to monitor environmental conditions and the data collected, transmitted by satellite. The Expeditions Polaires Francaises has agreed to transport the party on *L'Astrolabe* from Hobart to Cape Denison. (If sufficient funds are available the party working at the site this season will be led by Andrew Jackson of Australia's Antarctic Division and comprises Mike Pearson of the Australian Heritage Commission, Peter Sullivan, a doctor from the Division, Peter Marquis-Kyle conservation architect from Allom, Marquis-Kyle an architectural firm in Sydney. They plan to leave Hobart on the *L'Astrolabe* on January 9. The ship will call first at Dumont d'Urville and then proceed to Commonwealth Bay.)

Stage Two, planned for the 1993-94 season, will involve up to ten expeditioners and is likely to require a chartered ice-strengthened ship. Where necessary, ice will be removed from Mawson's hut to enable structural repairs. A reversible coating being trialed at Mawson Station may be applied to the cladding and ground penetrating radar used to examine foundation and to locate artifacts. Any artifacts will be returned to Australia only for conservation and if considered to be at risk. - *David Harrowfield*

To enable this work to be undertaken, substantial funds are necessary. The fund-raising programme includes a proposal to erect in Melbourne, a full scale replica of Mawson's hut. Contributions may be sent to Sir Peter Derham, Mawson Huts Conservation Fund, Prime House, 10 Queens Road, Melbourne, Australia 3004. -

**The hut, which is protected by the Antarctic Treaty, was placed on the Register of the National Estate, Australia, in 1978. In accordance with the Burra Charter, (a document embodying the philoso-*

phy of ICOMOS International Commission on Monuments or Sites, an independent organisation with its headquar-

ters in Paris and objective of promoting conservation standards world wide) set up in 1979.

Greenpeace

“Pelagic” chartered for 1992/-93 campaign

The environmental organisation, Greenpeace, is chartering the yacht Pelagic for this season's campaign which will be focus on the area around the Peninsula and the South Shetlands and include the monitoring of the krill fleets. The vessel will leave on 1 January from Usushaia and the voyage is expected to last about six weeks.

Pelagic will be captained by Skip Novak of the United States. The voyage leader is Janet Dalziell of New Zealand and the crew comprises a First Mate, Judy Crossley from Australia and seamen Peter Malcolm also from Australia, and Henk Haazen from the Netherlands. Jorge Gutman from Argentina will be seamen/medic. The campaign scientist is Ricardo Roura Argentina, and cameraman/photographer Bruce Adams from New Zealand.

The vessel was designed specially to operate in a remote areas on long term projects. Built in Southampton England in 1987 she has a special retractable keel and rudder which when raised enables her to be moored in harbours from which deeper vessels would be excluded. Her hull is made of welded mild steel and she is 16.5 metres long with a beam of 4.5 metres and displacement of 25.0t. She carries a 145 square metres of sails and a Perkins 4236 65 HP diesel which gives her a speed of six knots. She is fitted with satellite navigation, radar, depth sounder, VHF and single band marine radio. and can accommodate six to eight

persons for up to four months.

The Greenpeace party will be assembling in Auckland about a week before Christmas for programme familiarization, discussion and briefing and will fly out together on Christmas Day for Usushaia.

In the meantime the organisation's vessel *MV Gondwana*, owned by Rainbow Warrior Holdings, a subsidiary, or the "marine division" of Greenpeace International remains tied up at the Western Viaduct in Auckland. The vessel, valued at between two to three million US dollars, has so far attracted interest from organisations involved in offshore and Antarctic work.

Historic letter find at Cape Geology.

In late 1911 Scott sent a party of four men, his western party, to carry out a geological survey in the Granite Harbour area about 140 km north of McMurdo. The party, Taylor Debenham, Forde and Gran, man-hauled two sledges across the sea-ice to Cape Geology. On arrival they constructed their small granite hut, from granite blocks and seal-skin roof, in which they carried out their cooking on a blubber stove.

The remains of the hut and some associated artefacts are still present at Cape

Geology. The party gave the name Botany Bay, to an adjacent bay because of Taylor's Australian origins, its isolation and rich plant life.

Using Cape Geology as a base, the party made further man-haul trips to inland mountains such as Mt Sues.

The original plan was that the group would be picked up by the ship to return to Cape Evans. The ship, however, was blocked by ice and did not appear. So, on 14 January, 1912 the party set off with one sledge to walk back to Cape Evans over the rapidly decaying sea-ice. To cover the eventuality that the ship would appear late, Griffiths Taylor left notes at several locations so that they could be found. It was the first note, addressed to the Captain Pennell, that was found in 1992, 70 years later almost to the day, by the 1992 Waikato expedition. The note was in a small rusty tin that was in a crack between two rocks about eight metres from the Granite Hut. It had probably been

missed by previous visitors because of snow cover in the crack. Although rust-stained the letter is easily legible and reads:

Dear Pennell,

We have left these headquarters, Camp Geology, for a more accessible one on Cape Roberts which is on the route any ship or party must take to search the Rendevous. We shall wait at Cape Roberts (eight miles east of this) until January 31st and then push overland via the Piedmont to Cape Bernacchi and Hut Point. Fuller details on the signal flag 500 feet up the Rendevous Bluff and one mile east of this.

Griffith Taylor

It is quite surprising that it has remained intact for so long despite the warmth and moisture at Cape Geology. At present the letter is being photographed and checked at Waikato University while its final home is discussed. - Alan Green

Bellingshausen

"Antarctic" is interested in running a series of short articles which help explain some of the anomalies in southern polar history. R.K. Headland, Archivist at the Scott Polar Research Institute in Cambridge has made the first contribution. Others are welcome. They should be no longer than 500 words and addressed to the Editor, P.O. Box 2110, Wellington, New Zealand.

Robert Headland writes "The name of this prominent polar explorer has been rendered with an uncommon number of variations of which problems with transliteration and access to original records are mainly responsible. Among his distinctions is that of being the leader of the second circumnaviga-

tion of Antarctica (1819-21), which was the first expedition to sight the Antarctic continent (Armstrong 1971, Bevilov, 1971). During a visit to Estonia it was possible to examine, at the University of Tartu, the explorer's baptismal entry. This was arranged with the guidance and assistance of Dr Vello Paatsi of the District Museum of Tartumaa.

The University Archives hold the parochial register of the Lutheran Church of Kihelkonna for the appropriate period. In entry 101 are recorded, in the Latin alphabet, his prenomens (fore names for we mortals), as Fabian Gottlieb Benjamin. The date is not entirely clear as an amendment has been made to the number of the day. The original date, the first digit of which is obscured by an ink blot, appears to 9 September 1778 (Julian, which is 20 September, Gregorian). The numeral 15 has been

subscribed at the first digit.

Fabian Gottlieb Benjamin von Bellingshausen was born on the island of Saaremaa (previously Osel) at Lahetaguse manor near the village of Lumanda, 28 km from Kuressaare. His family was of Hanseatic descent, resident in Estonia for several centuries. Vello Paatsi (1980) has written a concise biography. There is little remaining at the explorer's birthplace but a stone monument inscribed in Estonian and Russian was placed there in 1964. It reads 'Here was born on 20 September, 1778, the famous sailor and discoverer of the Antarctic Continent, F. Bellingshausen (Vinni 1991).' The museum in the castle at Kuressaare includes an exhibition showing his local connection and voyages. In central Tallinn his residence bears a commemorative plaque. He died in Kaliningrad (Konigsberg) on 13 (Julian)/25

(Gregorian) January 1852 at the age of about 73. A statue of him stands in that city.

ARMSTRONG, T.E. 1971

Bellingshausen and the discovery of Antarctica. Cambridge Polar Record. 15 (99): 887-889

BELOV, M. I. 1971

Comment on Dr T. Armstrong's paper Cambridge, Polar Record. 15 (99): 890-891

PAATSI, Vello, 1980

Mida teha Fabian Gottlieb v. Bellingshauseniga ?

Tartu, Eesti Loodus, October 1980; 665-672

VINNI, K. 1991 *Letter to Scott Polar Research Institute Unpublished at 92 [Bellingshausen]*



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