ANTARCTIC

NEW ZEALAND ANTARCTIC SOCIETY

Bulletin Vol.11 No.11

ANTARCTICA

SOUTH GEORGIA
SOUTH SANDWICH IS.
SOUTH ORKNEY Is
Orcadas (Argentina)
Signy I. (U.K.)
FALKLAND IS.
SOUTH SHETLAND IS. (See map below)
ANTARCTIC PENINSULA (see map below)
WEDDELL SEA
Halley (U.K.)
Druzhnaya I (USSR)
Ronne Ice Shelf
Stonington (U.S.)
ELLSWORTH LAND
COATS LAND
General Belgrano II (Argentina)
SANAE II (South Africa)
Georg von Neumayer (Fed. Rep. of Germany)
Dakshin Gangotri (India)
Novolazarevskaya (USSR)
Syowa (Japan)
Molodezhnaya (USSR)
Mizuho (Japan)
ENDERBY LAND
Mawson (Australia)
MAC ROBERTSON LAND
Davis (Australia)
QUEEN MARY LAND
Mirnyy (USSR)
Vostok (USSR)
South Pole
Amundsen-Scott (U.S.)
Trans-Antarctic Mts
Ross Ice Shelf
MARIE BYRD LAND
Russkaya (USSR)
McMurdo (U.S.)
Scott (New Zealand)
Vanda (New Zealand)
ROSS SEA
VICTORIA LAND
Leningradskaya (USSR)
Dumont d'Urville (France)
Casey (Australia)
WILKES LAND
BALLENY Is.

0 500 1000 Kilometres
0 500 1000 Miles

1 Comandante Ferraz BRAZIL
2 Henry Arctowski POLAND
3 Teniente Jubany ARGENTINA
4 Artigas URUGUAY
5 Teniente Rodolfo Marsh CHILE
Bellingshausen USSR
Great Wall CHINA
6 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

SOUTH SHETLAND ISLANDS

0 100 km
0 100 mls

ANTARCTIC PENINSULA

0 100 km
0 100 mls

Larsen Ice Shelf

ANTARCTIC

(successor to "Antarctic News Bulletin)

Vol. 11 No. 11
Issue 131

ANTARCTIC is published quarterly by the New Zealand Antarctic Society Inc., 1978.

ISSN 0003-5327

Editor: Robin Ormerod

Please address all editorial inquiries, contributions etc to the Editor, P.O. Box 2110, Wellington, New Zealand.
Telephone: (04) 791-226
International: + 64-4-791-226

Publication date approximately mid November.

All administrative inquiries should go to Bulletin "Co-ordinator", P.O. Box 1223, Christchurch.

Back and missing issues, P.O. Box 1223, Christchurch.

Contents

Cover: Druzhnaya-3, built in 1986-87 by members of the 32nd Soviet Antarctic Expedition, is near Nurcelle Bay. The pre-fabricated container homes, diesel installation, radio and scientific equipment were established and set up within two to three weeks of arrival by 100 members of the expedition.
Photo: Dr Norbert Roland, Federal Authority for earth sciences and raw materials, Hanover.

NZARP

Diverse scientific programme off to good start

The 1989/90 season of the New Zealand Antarctic Research Programme began on August 22 with the first of the season's flights to the ice. On board were scientists involved in ozone studies and support personnel Mr Dave Geddes, Antarctic Division's Operations Controller who will be base leader for the first half of the season and Bob Dixon, base manager.

The first of the regular summer flights left at 9.40am Christchurch on October 3 arriving at McMurdo at 3pm local time in good conditions. In addition to the regular flights south flown by the US Navy for the National Science Foundation the Italian, Australian and New Zealand airforces will provide logistic support for New Zealand, the United States and Italian research programmes in an operation involving over 70 flights by Hercules and Starlifters and two by USAF C5 Galaxy

Fifty-eight projects, involving 230 scientists, base support and field staff, will be undertaken by New Zealand with most of the scientific activity being conducted in and around Ross Island, McMurdo Sound and the Dry Valleys. Nine divisions of the DSIR will be involved in 27 of the events and scientists from five universities will undertake a variety of activities in 20 events. Other government departments include the New Zealand Meteorological Service, the Royal Navy, the Department of Survey and Land Information and Television New Zealand.

The Antarctic Heritage Trust will continue restoration, artefact conservation and research at historic sites and huts around Ross Island and visit Borchgrevink's 1899 hut at Cape Adare. Land and Soil Consultancy Services will be investigating permafrost dynamics and effects of man-made alterations to the landscape. The RNZAF will supplement VXE-6 operations with one Iriquois helicopter under the agreement by which the US provides logistical support for the New Zealand programme in return for facilities in Christchurch. The Iriquois and a 13 man detachment under the command of Squadron Leader Paul Martin is from No. 3 Squadron based at Hobsonville, Auckland.

Normally dark olive green No. 3812 will be changed to bright red before it is flown south early in October in a US C140 to fly 240 hours in its 12 weeks on the ice. After six weeks the detachment will change and Wing Commander John Hamilton, who is Squadron Commander, will complete the season with 12 men before again removing the blades and preparing the aircraft for return to New Zealand. It is the second time in recent years that the RNZAF has provided such support; the first Iriquois was quickly dubbed "Orange Roughy" but this year, the Squadron has opted for a more formal title and has written to the Mayor for permission to call it "The City of Auckland". The name was previously used on the RNZAF Beaver used by the Trans-Antarctic Expedition of 1956-58.

Handover

In a short ceremony held at 4.30 pm on Friday 6 October in front of Scott Base winter leader Nigel Miller handed over to Mr Dave Geddes, operations manager at Antarctic Division who will be in charge of the programme until December.

Regular programmes

Regular programmes run by the Geophysics Division of DSIR will continue.

The seismological observatory operated at Scott Base is an important component of the international seismic network used to study global seismicity. The data collected at Scott

Base is used to locate earthquakes occurring all over the world and provide information on their characteristics and the dynamic forces causing them. The programme has two components involving the operation of Analogue World Wide Standardised Seismic Network seismographs located at Scott Base and two USGS digital broadband seismographs located in the Wright Valley which send data by radio link to the Scott Base laboratory. These will be checked during the season.

Variations in the strength and direction of the earth's magnetic field have been recorded at Scott Base since 1957 by scientists of the Geophysics Division who now use two La Cour Magnetometers. An absolute proton magnetometer giving declination and inclination is used to calibrate the recordings and the results are reported regularly to centres in New Zealand and the USA.

Data pertaining to the D-region ionisation and winds for the height interval of 40km to 120km are collected hourly throughout the year and stored on magnetic tape and returned to New Zealand for analysis. The transmitter located at Scott Base and receivers at Arrival Heights are automatic and the programme, a continuation of an experimental investigation of the ionospheric D-region using medium frequency pulsed RADAR techniques, run by the Department of Physics, University of Canterbury.

Ozone

Atmospheric ozone is important as it absorbs most ultraviolet and other high energy radiation otherwise harmful to life and prevents it from reaching the earth's surface.

Spring-time stratospheric ozone has been measured in the mid-1980's at levels 50 percent lower than those recorded during the 1960's and 1970's. This thinning of the layer, commonly referred to as the "ozone hole", has been recorded at a number of sites in Antarctica since 1980.

In 1988 the New Zealand Meteorological Service installed a Dobson Spectrophotometer at Arrival Heights near Scott Base for measuring ozone levels above Ross Island. Early in 1989 a Brewer spectrophotometer from the Istituto Di Fisica Dell'Atmosfera in Rome was also installed. A modern automatic machine, it complements the measurements of stratospheric ozone obtained by the Dobson spectrophotometer. Both machines are being used to measure stratospheric ozone levels as part of a project likely to continue for some years.

Dick Hollaway, manager of the Invercargill Meteorological Office flew south on 23 August and obtained the first results for this spring from the Dobson on 14 September. He will continue to make regular measurements until 13 October.

Preliminary results, compared with satellite measurements, indicate levels similar to those recorded in 1987 when the "hole" was the deepest on record. This has surprised observers because factors such as the solar cycle and quasi-biennial oscillation pointed towards results more similar to those recorded in 1988.

Ms Sylvia Nicol of NZMS, Wellington will fly south in mid-October to train the overwintering technician on the Dobson and compare results with those achieved by the Brewer with Dr Carlo Valenti from Rome.

and trace gases

In a combined project with Dr Renate Heuberger of the University of Denver, USA Brian McNamara, a technical officer from the Physics and Engineering Laboratory, at Lauder in Central Otago flew south in August. Their objectives were to measure, from the ground, certain stratospheric trace gases that influence Antarctic ozone depletion and in turn may modify the temperature balance in the Antarctic atmosphere.

Specifically the measurements concentrate on the infrared remote sensing of hydrochloric and nitric acids, two key chemicals in ozone depletion chemistry. It is hoped to show how annual changes in the concentration of these gases is related to the ozone loss.

During the visit Brian McNamara will also check equipment designed to measure oxides of nitrogen in the stratosphere. Results from this experiment will be compared with data taken from similar Lauder equipment being operated at the British Antarctic Survey base at Halley Bay.

Alan Thomas, also from PEL Lauder, will

spend two weeks at Scott Base in early February installing a further infrared measuring system which will check the behaviour of nitric acid in the stratosphere during the months of autumn. This period is of scientific interest because it is during autumn and winter that the Antarctic stratosphere is "conditioned" for the ozone loss that follows in spring.

Atmospheric studies

Collecting, analysing and comparing air samples from the tropopause, will be the task of Greg Drummond and Carl Breninkmeijer of the Institute of Nuclear Sciences, a division of the DSIR in Wellington. The tropopause separates the stratosphere and troposphere and occurs about 9,000 to 10,000 metres above sea level.

Some samples were obtained from a C130 during WINFLY and others will be collected from surface level at Scott Base and the South Pole in September and October and in November and January. Supplementary surface samples may also be collected from Williams Field and the skiway at South Pole Station. They will be analysed for isotopic ratios of a number of trace gases significant in global and air pollution studies.

The project is part of an international programme requiring the collection, analysis and comparison of samples from locations such as the Amazon, North America and Panama.

Pollutants

A preliminary study of ultratrace pollutants in Antarctic snow and air will be undertaken by Dr Chad Dick and Jane Orange from the Chemistry Division of DSIR in Wellington. Samples will be collected at a site on the Ross Ice Shelf, approximately 100 km east of Scott Base.

Air will be analysed for a range of toxic pollutant heavy metals including lead, cadmium, mercury, copper and zinc, and for persistent toxic organic pollutants such as dioxins and pesticides. Natural crustal aluminium and marine sodium and magnesium reference elements will also be determined.

Snow samples will be processed for on site determination of mercury levels and for subsequent toxic organic analysis in New Zealand. Further samples will be returned frozen to New Zealand for metals analysis in Chemistry Division's Ultraclean laboratory.

Surface snow will be compared to older snow collected from a hand-dug pit, in order to establish a historical record of levels of these pollutants in the Antarctic atmosphere. These results will yield information on the relative strengths of natural and human sources of these toxic heavy metals.

Mt Erebus

From mid-November to the end of December Victoria University scientists Dr Ray Dibble and Brent O'Brien, and Dr Hiroshi Shimizu from Shimabara Volcano Observatory, Kyushu, Southern Japan will be studying the eruptions and seismic structure of Mt Erebus.

Supported in the field by Gerry Kennedy, Antarctic Division Field Assistant, the party will acclimatise for two days on the Fang Glacier before spending ten days on the summit plateau and crater rim where they will make seismic refraction tests and service equipment.

A television camera, infrared sensors, infrasonic microphone and wide-band seismometer installed on the crater edge in 1986 and the infrasonic array at Windless Bight, has enabled visual and seismic recordings to be compared and evaluated to assess whether earthquakes trigger eruption explosions or are triggered by them.

Last season it was found that activity was very low, daily earthquake counts ranging from zero to about 20, and few were caused by explosions. During the year the team have used a seismic ray-tracing computer programme to model the velocities inside Erebus and fit the computed seismic arrival times to the stacked seismograms or similar explosion earthquakes. It proved necessary to include theoretical calculations of a very low velocity in the vesicular magma in the lava lake in order to explain a 1.5 second delay in the seismic times relative to the time of the explosion as recorded by video. Mr O'Brien will remain at Scott Base until 21 January 1990 collecting and analysing data for an MSc degree.

Chemical analysis

Scientists from the Chemistry Division of DSIR, Lower Hutt and CFR/CNRS and CEA in France are trying to trace the last winter's history of the Mt Erebus volcanic activity through depositions in the snow. Mt Erebus contains a degassing lava lake which generates a persistent plume. Because the composition varies with the state of the lava lake, snow deposited under and through the plume captures and preserves the various components. By sampling and analysing the plume and the snow, it is hoped a history of the activity of the volcano can be determined.

Working in the crater area Dr Doug Sheppard and Bruce Christenson of DSIR, Dr Francois Le Guern, of CFN/CNRS, Rene-Xavier Faivre-Pieret of IPSN, CEA in France aim to evaluate the mass and evergy transfers from the lake to the atmosphere, obtain knowledge of the plume chemistry and data to enable modeling to extrapolate compositions to the emission temperature and magmatic gas phase. An important aspect of the study is the determination of the contribution of Mt Erebus to the trace metal and other chemical components to the Antarctic environment.

Working at Bratina Island, Scott Base and Windless Bight Dr Steve de Mora, Dave Shooter, Alan Grout and Amanda Gair will spend about five weeks examining aspects of the geochemical cycling of sulphur. Initially this will involve the analysis of reduced sulphur constituents in the meltwater pools on the McMurdo Ice Shelf, many of which were examined in detail in 1987-88. The party will also study "Salt Pond", a small pond with very high sulphate concentrations and odorous gas emissions found during the earlier season's work.

The team hopes to undertake a preliminary study of atmospheric sulphur containing compounds analysing concentrations of reduced sulphur gases on site. Aerosol will be also collected for subsequent analysis of sulphate and methanesulphate. An investigation of dimethysulphide and methanesulphonic acid in the snow and ice will be conducted at Windless Bight as a preliminary study to possible further work on the polar plateau.

Peter Selwyn, also from the University, will carry out a sample collection programme for baseline atmospheric mercury at Cape Adare. Previous studies in which inorganic and organic mercury were measured at Scott Base revealed levels lower than any other published data. Virtually no organomercury was detected. Increased levels of organomercury are anticipated at Cape Adare because of higher ocean productivity. Peter will also assist with the Antarctic Heritage Trust's programme at Cape Adare, requiring travel to Hobart to meet the ship.

Physics

The interaction of light and sea ice will be further studied this season by Dr Bob Buckley and Joe Southon from the Physics and Engineering Laboratory, DSIR and Dr Joe Trodahl and Shaun Riches of Victoria University.

During previous seasons' work the team developed techniques for estimating the net amount of transmitted and scattered light, the scattering and absorbing parameters of ice and the angular distribution of the light within and under the ice. They have also measured the absorption of light by algae.

Television team and artist

Television New Zealand is sending ten of its staff to Antarctica this summer in three teams in November. The project leader is Ian Cumming of Christchurch and the party will comprise Graham Johnson, Mike Ritchie, Peter Nock, Hillary Timmins, Alan Henderston, Graham Ritchie, John Hawkesby, Ian Smith and Craig McMurtrie. In addition to filming feature and news material an evening will be devoted to "It's in the Bag", a popular New Zealand quiz show.

For the first time since 1981 an artist will be part of the New Zealand team on the ice during the summer. He is John White, a landscape and portrait painter from Whakatane. Michael Kopp of Radio New Zealand, Wellington and Tim Wilson from North and South, a national magazine based in Auckland will also spend time on the ice.

This summer they will extend their work to UV and visible light measurements and investigate depth dependent interactions on other types of ice varying in age, depth and growth and conditions. Their work, which is significant because the diffusion of light in sea ice determines the energy that reaches life forms in the ocean underneath the ice, will be carried out at locations including Erebus Bay, north of Tent Island, Cape Evans and possibly Cape Royds.

Optical measurements, made by the team, will be supported by other physical property measurements such as salinity and temperature depth profiles.

Meltwater chemistry

Drs Jenny Webster and Kevin Brown of Chemistry Division, DSIR in Wellington will spend a month in the Victoria and McKelvey Valleys. They will be trying to establish the baseline meltwater chemistry of the area which is minimally affected by human habitation. Their results can be compared with analysis from other more frequented draining systems in the dry valleys or used as a future reference should activity in the Victoria and McKelvey Valleys increase.

Sediment studies

The second stage of a three year study of the hydrological, glaciological and sediment transport processes operating in the Miers Valley will be undertaken by Dr Jack McConchie, accompanied by Richard Hawke, Heather Campbell and David Winchester of Victoria University, Wellington.

Work in 1988-89 involved the installation and testing of monitoring equipment at three different sites to collect data to quantify the mass balance of the glacier-river-lake system of the valley, such as the relationship between incoming solar radiation and glacier melt and stream flows. This year the team will measure the amount of incoming solar radiation and calculate the amount reflected back into the atmosphere in order to establish a model stream flow based on net rather than gross solar radiation.

The team will also analyse the nature of both the aeolian and fluvial sediment transported within the valley to the determine the characteristics of the processes operating and how these vary in space, through time and with temperature.

Further investigation of the mud carrying bottom currents in Granite Harbour will be undertaken by Alex Pyne, Ian Goodwin of Victoria University and Per Moller of Lund University in Sweden. The currents may explain the extensive mud deposits in basins of the western Ross Sea. The party will be assisted in the field by Ron Rogers of Antarctic Division.

The study will concentrate on mud suspended and transported from the grounding line of glaciers entering the sea. A current meter and suspended sediment traps will be deployed in Granite Harbour and tidal measurements will be made off Cape Roberts. Current data will be correlated with tidal information from a tide guage located at Cape Roberts. Some sea-floor sampling will be undertaken in this area as part of the study, and evidence of deglaciation will be investigated around the shores of Granite Harbour and towards the south side of Mackay Glacier.

Meteorological

Recordings of wind, temperature, pressure and direct diffuse and global radiation are made daily at Scott Base and during the summer season at Vanda Station. Since January 1988 clean air samples have been taken every two weeks throughout the year at Ross Island. These will be analysed in New Zealand for a range of greenhouse gases including carbon dioxide, hydrocarbons and chlorofluorocarbons to establish the levels of those in some of the world's cleanest air.

The season two technicians from the New Zealand Meteorological Service, Tony Shaw and Bob Heron will inspect the equipment and make necessary repairs and adjustments.

Environmental programme

As a result of work undertaken last season the Environmental Science Group from the University of Auckland will be returning to the Ross Dependency to expand their programme.

This summer they have three major objectives: To develop quantitative repeatable methods for assessing environmental consequences of human presence in selected

areas of Ross Island; to undertake field studies to generate a data base indicating the current extent of human impact within and adjacent to protected areas on Ross Island; and, to provide scientific support for the refinement, implementation and evaluation of the environmental management plan for Ross Island.

The team comprising Professor John Hay, Dr Chris Cocklin, Simon Bridger, Simon Towle and Lisa Martin will work from Scott Base, Capes Evans, Royds, Bird and Crozier and Arrival Heights between the end of December and beginning of February.

Geology

Detailed mapping and analysis of the igneous and metamorphic rocks of southern Victoria Land will be continued by scientists from the University of Otago. Under the leadership of Dr Alan Cooper, Robert Smillie, Charlotte Hall and Brenton Worley will be flown into the Pipecleaner Glacier, Mt Dromedary area to undertake field mapping of the geology. Subsequent laboratory work will be directed at understanding the processes which occur deep in the earth's crust and in the upper mantle.

In their quest to develop a model for the changing geography of the Ross Sea region during the deposition of the Beacon Supergroup strata, from 400 to about 180 million years ago, Victoria University geologists will be seeking answers to two questions this season. The first is whether the deposition of the Beacon was controlled by an adjacent continental margin or by cratonic processes, and the second is what the volcanic sediments in the Traissic beacon reveal about the nature of the continental margin. Their answers will tell them whether the Pacific margin of Gondwana was adjacent to the Ross Sea or whether the Ross Sea region was intracratonic.

The party, led by Ken Woolfe and comprising Dan Zwartz, Malcolm Arnot and Antarctic Division field assistant Tony Teeling will be in the field from November 1 to January 10. Using two toboggans and four sledges they will be retracing the route taken by Sir Edmund Hillary's teams in 1957 across the ice and up the Skelton Glacier before traversing along the Trans-Antarctic Mountains from a point west of the Skelton Neve to above the Taylor and Ferrar Glaciers. They expect to travel about 1400 km.

Taking part in an international programme of research in Marie Byrd Land, West Antarctica is Dr John Gamble of Victoria University. Accompanied by Bill Atkinson of Antarctic Division they will be working with Dr John Smellie and Chrisopher Griffiths, a field assistant from British Antarctic Survey, Dr Bill McIntosh and a graduate student Kurt Panter from New Mexico Institute of Mining and Technology, Socorro, New Mexico.

The party will be flown into the Executive Committee Range by LC130 in mid-November and will spend about nine weeks in the field. The Range includes a number of large volcanoes some over 4,000 metres in height in an area similar in extent to the McMurdo volcanic field, along the Ross Sea coast. An integrated programme of research, involving physical volcanology, petrology of igneous rocks and the location and analysis of lithospheric xenoliths will be undertaken.

Dr Gamble will focus on the xenoliths which are of particular interest because the crust has stretched and basalt magma from the mantle has sampled and transported fragments of mantle and crust to the surface as xenoliths. These structures provide unique opportunities for scientists to construct vertical sections of crust and mantle and enables them to identify processes within the earth's interior. Because they are also useful as solid constraints to geophysical models they may prove valuable in the reconstruction of Gondwanaland history.

Mapping

Further work will be undertaken on New Zealand Geological Survey's 1:50,000 mapping programme which has so far covered four map sheets. The objective of the programme is to assemble and summarise existing geological work and undertake new mapping in areas not previously covered.

This year's team comprises Dr David Pocknall, Trevor Chinn and Richard Sykes of the Geological Survey, Wellington. They will be accompanied by John Skilton, an Antarctic Divisional field assistant. They propose to

begin mapping in the southern part of the Convoy Range, just north of the Mackay Glacier. From seven field camps the team will work their way north during their 50 days in the area where Devonian Quartzes and Pernian coal measures are known to exist.

Fish, skuas and penguins

Further work will be undertaken on the lateral line sensory system in Antarctic fishes by a team from the Zoology Department, University of Auckland. Project leader for this year is Dr John Montgomery who will be accompanied by Dr John Macdonald, research students Andrew Collins and Stuart Ryan and also by Dr John Ryder of the DSIR Mt. Albert Research Centre.

The lateral line system in known to be sensitive to vibration produced by swimming zoo-plankton, and is thought to play an important role in enabling many species of Antarctic fishes to continue feeding during the dark winter months.

Antarctic fishes have evolved to fill differing ecological niches in conditions of extreme cold and low light, and the study will investigate the relationship between the structure and function of the lateral line and each species' habitat, behaviour and food preferences.

The group will be working on the sea ice a few kilometres from Scott Base and at McMurdo Station where Dr Montgomery will be collaborating with American fish biologists Drs John Janssen and Sheryl Coombs.

The Auckland zoologists will also investigate the effects of elevated temperature, stress and anesthesia on the biochemistry of muscle and blood. One common feature of stress in fish is a marked elevation of cortisol and allied steroids, which have not been studied in Antarctic species.

The possible consequences of accidental fuel oil spillages on the survival of Antarctic fish will be studied by Dr Bill Davison, Mike Dougan, Craig Franklin and Jan McKenzie of the University of Canterbury. Working from the fish hut on the sea ice beyond Scott Base, the team will catch and expose fish to varying concentrations of fuel oil in sea water tanks to determine toxic levels.

Subsequently the general health of the fish will be monitored in aquaria with sub-lethal levels of fuel oil. Various physiological tests will also be carried out to determine the effect of oil on gills and blood.

Two scientists from the University of Otago will spend almost three months studying the behaviour of non-breeding south polar skuas at Cape Bird, Ross Island. They will also measure levels of global pollutants in this species and determine whether chemical residues affect mortality or reproduction.

The presence of non-breeding skuas among populations of breeders suggests that populations are limited by territorial behaviour. Gordon Court and Richard Wilson will evaluate whether non-breeders represent a surplus of reproductively capable adults excluded from breeding by territoriality, or whether they fail for other reasons.

As recently as 1977, south polar skuas were thought to remain in the southern ocean during the winter, but research has shown that the bird is highly migratory and may be found as far north as Greenland during the austral winter. As wide-ranging migrants, and being predators, scavengers and seabirds, skuas are the most likely of all Antarctic birds to show high levels of global pollutants, especially as these birds migrate along the coastlines of countries that continue to use persistent organochlorine pesticides like DDT. As seabirds, they also face exposure to heavy metal and PCB pollutants.

Dead south polar skuas and abandoned eggs will be collected from rookeries and other areas in McMurdo Sound and will be analysed for residues of these compounds.

Skuas, like other seabirds, can be used as 'barometers of environmental health' alerting scientists to dangers in the variety and concentration of man-made pollutants in the marine environment.

Since 1981 staff from Ecology Division, DSIR Nelson have been monitoring the Adelle penguin populations in the Ross Sea area and have found a steady annual increase of between 3 per cent and 30 per cent in the number of breeding pairs at nearly all rookeries. They believe that this is linked to the present warming of the Ross Sea climate but although the precise processes are

unknown, year round changes in the sea ice conditions, increased food supplies, lower winter mortality and enhanced breeding success are probably all involved.

Although the study is part of New Zealand's contribution to the International Survey of Antarctic Seabirds (ISAS), the data may in future be used to monitor large scale changes in krill abundance which would affect the health of rookeries. Such monitoring is now an important tool in the implementation of the Convention for the Conservation of Antarctic Marine living resources (CCAMLR).

This season Dr Peter Wilson, Bruce Thomas, Brian Karl and Rowley Taylor will be on the ice in two parties, the first in late November and early December and the second in January.

Routine monitoring of rookery sizes will be undertaken by Peter, Bruce and Brian during the first part of the programme. This will also include aerial reconnaissance photography to determine the location and size of all Adelie breeding rookeries in the Ross Sea area. Ground truth counts will be undertaken at Cape Royds to check on the photographic estimates of numbers. Subsequent work will involve determination of the fluctuations of the population over a number of years and relating these to annual weather data and spring ice conditions to assess the effects of such natural environmental changes on numbers of breeding penguins.

Peter Wilson will return to the ice in late season mid-January with Rowley Taylor and the pair will make a preliminary investigation into the use of aerial photography for counting the number of chicks at selected rookeries. The development of such a technique will allow each season's breeding success to be measured at the time of the departure of the first chicks to sea. It will also give a very sensitive, and immediate, index of the effects of environmental change on penguin numbers.

Botany

A series of dives will be made by a team from Otago University as part of an investigation of the ecology and physiology of benthic marine algae in the Ross Sea. The team to be led by Dr Murray Brown comprises Dr Kathy Miller of the University of California (Berkeley), Johnathon Keogh, Marlise Holmes, a research assistant, and the Antarctic Division's Diving supervisor.

Working at Cape Evans the team will carry out a series of experiments to investigate rates of photosynthesis and respiration in a range of light and temperature conditions on two species of red seaweed. Estimates of biomass and growth rates will also be made. Samples will be collected from under the ice at Cape Evans and examined to determine whether they exhibit any adaptations to the extreme Antarctic environment in terms of photosynthesis, respiration rates, growth rates and chemical composition.

In 1980 a broad plan of plant distribution of the vegetation growing in the Canada Glacier was made by Dr Allan Green and used as part of the consideration of the area as a site of special scientific interest. This year Dr Green and Anne Marie Schwarz of the University of Waikato will revisit the area with Dr Rod Seppelt of ANARE. The broad plant associations will be described and studies made of the potential of these plants to regenerate after damage. Anne Marie will also study the animal population and relate their distribution to the plant communities. A preliminary study of plant communities at Granite Harbour will also be undertaken.

Physiology

The structure and environmental physiology of the cyanobacterial mats on the McMurdo Sound Iceshelf will be studied by Dr Warwick Vincent and Malcolm Downes of the Taupo Research Laboratory, DSIR. They will be joined by Professor Dick Castenholz of the University of Oregan, USA.

Cyanobacteria or blue green algae are the dominant life forms in the non-marine Antarctic environment and this season's programme will enhance the understanding of their distribution and abundance as derived from work carried out in 1987/88. The team will concentrate on the ultrastructure of the ice-shelf mat and how it differs from mats in the stream and pond environments of McMurdo Sound. The nutritional and

(Continued on page 415)

New Zealand team for 1989/90 announced

Six women are among those chosen to help run Scott Base for the 1989/1990 summer season, two others will help with Snowcraft and Survival Training and a further two are part of next year's winter team. The base manager for the summer is R. M. (Bob) Dickson, (36), a secondary school science teacher from Buller High School in Westport.

Scott Base Summer staff

M. G. (Mike) Anthony, (34), Palmerston North; Carpenter.
S. E. (Sharron) Armstrong, (29), Taupo; General Duties.
A. C. (Alan) Belcher, (32), Wellington, Senior Communications Operator.
H. P. (Heather) Dodge, (23), Christchurch; Canteen Manager.
G. R. (Gary) Edwards, (27), Christchurch; Chef.
M. R. (Mark) Fairhall, (20), Renwick; Technical officer (Telecom).
J. S. (Joe) Gray, (20), Auckland; Postal/administration clerk.
D. R. (Don) Hammond, (31), Ngongontaha; Operations Manager.
D. A. (Dave) Hotop, (24), Linton; Plant Operator.
W. P. (William) Jarvis, (26), Auckland; Stores/Cargo handler.
J. C. (John) Lee, (35), Timaru; Stores Officer.
J. E. (Josie) McNee, (25), Timaru; Public Relations Officer.
K. L. (Karen) Norris, (29), Wanaka; General Duties.
J. R. (John) Sime, (24), Outram; Mechanic.
T. R. (Ray) Tautini, (35), Linton; Plant Operator.
F. (Freda) Whaitiri, (26), Christchurch, Clerk (Telecom).
R. K. (Rick) Ohia, (21), Auckland, Communications Operator.
R. E. M. (Robyn) Tauroa, (24), Auckland, Communications Operator.

Field personnel

W. P. (Bill) Atkinson, (42), Twizel; Field Leader with a Victoria University party working in Marie Byrd Land. Bill Atkinson was a member of the New Zealand programme of 1981-82 and 1983-84.
C. M. (Kate) Averill, (27), Lyttelton; Field Leader, Snowcraft and Survival.
S. C. (Simon) Cox, (25), Dunedin; Field Leader with a team from the University of Otago working in southern Victoria Land. Simon Cox was previously with the programme in 1986-87.
C. B. (Charlie) Hobbs, (33), Mt. Cook; Field Leader, Snowcraft and Survival.
G. A. (Gerry) Kennedy, (29), Mt. Cook; Field Assistant, Snowcraft and Survival.
J. R. (Reyn) Naylor, (35), Christchurch; Diving Supervisor, formerly with NZARP in 1988-89.
J. H. (John) Skilton, (29), Havelock; Field Leader with a team from the New Zealand Geological Survey who will be involved in the geological mapping of the Convoy Range in southern Victoria Land for subsequent publication as part of the NZGS 1:50,000 series. John Skilton was with NZARP in 1988/89.
A. M. (Tony) Teeling, (32), Fairlie; Field Leader with Victoria University team involved in study of the tectonic history of the Ross Sea region during Beacon Times. Tony Teeling was with New Zealand programme in 1984-85.
M. L. (Maryann) Water, (30), Mt. Cook; Field assistant, Snowcraft and Survival.

Vanda Station 1989/90

B. J. (Bryan) Freeman, (44), a school teacher from Milton; Leader.

S. J. (Stu) Thorne, (42), Wanaka; Field Maintenance Officer.
G. F. (Garry) De Rose, (28), Greymouth; Hydrological Technician.

Winter 1990 Scott Base

B. J. A. (Bruce) Calder, (25), Dunedin; Electrician.
A. M. (Al) Gillespie, (32), Wellington; Senior Technical Officer. Al Gillespie was on Raoul Island 1981-82.
D. E. (Doug) Henderson, (25), Kaitaia; Field/stores.
C. J. (Tuppence) Loe, (25), Dunedin; General Duties. Tuppence Loe was with the New Zealand programme in 1988-89.
B. P. (Bruce) McGregor, (23), Christchurch, Technician. University student completing a degree in Electrical Engineering.
P. R. (Pedro) Nelson, (41), Whangarei; Mechanic. Pedro Nelson wintered with the New Zealand programme 1981/82 and 1984/85 and was awarded the Polar Medal in 1986.
A. F. (Tony) Oskam, (26), Christchurch; Base Engineer.
A. T. (Alister) Pringle, (41), Christchurch; Supervisor (Telecom).
D. J. (Dave) Robertson, (27), Mosgiel; Senior Technical Officer (Telecom).
W. A. (Wendy) Strid, (35), Auckland; Chef. Wendy Strid was cook, Medical Officer and deputy-leader at Campbell Island in 1986-88.
D. E. (Duncan) Webb, (31), Christchurch; Engineering Manager.

B-9 splits apart

The giant iceberg B-9 has split into three pieces off Cape Adare, after drifting for 22 months and 2,000 kilometres in the Ross Sea. B-9 split into two major pieces, B-9A (76 x 35 km) and B-9B (100 x 35 km) on 3 August about 30 km east of Cape Adare. A further fragment B-9C broke of B-9A on about 12 August, reducing its size to 56 x 35 km.

Icebergs B-9A, B and C are now likely to follow the current which carried the "Aurora" through this area when it was beset in the pack ice between August 1915 and February 1916. They may be able to be seen by New Zealanders and Americans flying between Christchurch and McMurdo Sound this summer. Unless they run aground, the bergs could leave the shelter of the pack ice in January-March 1990. They would then be likely to break up in the stormy Southern Ocean. Harry Keys, Department of Conservation, Wellington.

Argentine Station in use again

Argentina's summer station Tenlente Camara on Half Moon Island off Livingston Island in the South Shetlands, inactivated 30 years ago, is being brought into use again. It was opened on April 1, 1953, and since 1959 has been reopened occasionally in the summer season.

Half Moon Island (62 deg 36 min S/59 deg 55 min W) is crescent shaped and about 1.25km long in the entrance to Moon Bay on the ease side of Livingston Island. Tenlente, which is accessible only by sea, consists of six buildings with an area of 5264 square feet. Moon Bay lies between Edinburgh Hill and Renier Point and was named in 1935 for the island, known to sealers in the area before 1921, by Discovery Investigations members aboard the Discovery II.

(Continued from page 413)

photophysiological attributes required by the algae to allow the communities to survive and grow and the adaptation features contributing towards their survival and growth in the ice shelf environment will also be examined.

Smaller scale comparative studies will be made at Pony Lake at Cape Royds, Bratina Island and the Fryxell Stream and Lake Vida.

ANARE

First phase of Programme in Prince Charles Mountains launched

The first phase of a three year scientific programme in the Prince Charles Mountains was successfully completed by teams from ANARE last summer.

Preliminary work on this programme began two years ago when fuel was delivered to Mawson for use in the summer of 1987-88. Autumn and spring traverses followed. Seven apple huts and two seatainers containing equipment for the expedition were delivered and a kitchen caravan set up. Dovers, as the camp is called, is 70 deg 14 min S/65 deg 51 min E, and has been established in an area with little or no crevasses on a moraine extending from the southeast corner of Farley Massif towards the rail of the Mount Jacklyn moraine.

The camp was complete prior to the arrival of the main expedition of seven who sailed on Icebird from Hobart to Mawson 75km north of the base. During the afternoon of 18 November they were flown directly into the Prince Charles Base by Dick Smith and Giles Kershaw in the Australian Geographic Twin Otter chartered for the season by ANARE. With unloading at Mawson complete two expeditioners were flown by helicopter to Depot Peak where a meteorological camp and fuel depot was established. One day later, 23 November, the entire team reached Dovers and after a week of bad weather the field parties were deployed.

Mini-traverse

On December 4 a mini-traverse comprising a D7, a Hagglund, Quad motorbikes and heavy scientific equipment arrived. Team members repaired equipment for the end of season traverse prior to returning the vehicles to Mawson and scientific work began in earnest.

Geomorphological studies undertaken in the Pagadroma Gorge focussed on coal and fossil layers in the Beaver Lake area and included soundings on the Lake which is an arm of the sea and outlet of the Amery Ice Shelf and subject to tides. Holes were bored in the lake and depths sounded with a weight and string revealing a V shaped valley extending far out into the lake at depths of over 200 metres.

Studies of the structural and metamorphic history of the proterozoic gneisses in the Amery Peaks area were undertaken to ascertain the evolution of the rocks by dating and pressure-temperature mineralisation. Another scientist, working in the Porthos Range undertook similar work as well as cross-referencing the geology of the region to the Prydz Bay Coast.

Another party undertook geological studies in the topographically variable region south of the Aramis Range in the Mount Lanyon and Mount Meridith and in the nunataks in the Brocklehurst Ridge.

They also made a brief visit to the contact zone between the seidments and proterozoic

New Brazilian Ship

Brazil's relatively new oceanographic ship, the Almirante Alvaro Alberto, made its first voyage to Antarctica in the 1988-89 season. Now nearly 16 years old the 652 tonne diesel-engined vessel was built in Texas at Port Arthur as a tug and supply ship. Port Arthur is inland on the western shore of Lake Sabine and is connected with the Gulf of Mexico by the Sabine-Nechos Waterway.

Until 1982 the ship was called the Grant Mariner. Her name was then changed to Polar 901, and she became the Almirante Alvaro Alberto when bought by the Brazilian Government for use on seismographic research projects.

at Radok Lake and spent time on each of the massifs to the west of Beaver Lake.

Galciological programmes relied on global positioning satellites which appeared each morning and located the large number of stakes placed in the glacier confluence between the Scylla, Charbdis and Lambert Glaciers with great accuracy. The data collected will enable flow rates to be compared with those measured in 1962 and 1968.

A surveyor from the Australian Surveying and Land Information Group, with field assistance, covered most of the northern area of the PCMs from 22 camps. The objective was to locate as many small features visible on the French system of spot satellite pictures as possible and use them to correct photographic data for mapping purposes. They also made VHF radio checks with Mawson so that a series of relay stations could be established in future.

Logistic support was provided by three Squirrel helicopters chartered from Helicopter Resources. The expedition forecaster received satellite images from Noah 10 and 11 which were automatically gridded and combined with observations made locally and from Mawson. The success of the expedition was attributable, in part at least, to the good weather conditions.

Polar Queen chartered for 1989/1990 season

The Australian Antarctic Division has chartered the Norwegian vessel Polar Queen at a cost of Australian $2.43 million to support its Antarctic operations this summer. Icebird will be the major resupply vessel for the stations in 1989/90 and although Aurora Australis, the new Antarctic research and supply icebreaker, is due to be launched in September her main contribution this summer will be a six week marine science cruise undertaken as part of her maiden voyage early next year.

Polar Queen, which is now eight years old, is owned by Rieber Shipping based in Bergen, Norway and has completed five trips to the Antarctic with the West German and Italian expeditions and has visited the Arctic on many occasions. She is about the same size as the ill-fated Nella Dan, has an ice-strengthened double hull and can carry 53 passengers and 2400 cubic metres of cargo.

During the season the Polar Queen will make four voyages and visit each of the permanent Australian bases between mid-November and late March. Two Jetranger helicopters will be carried to Casey station to support scientific field work.

Polar Queen will also be used to undertake short marine science cruises aimed mainly at collecting live krill for study at the Division's specially designed cold room laboratories in Kingston where Australian scientists have pioneered techniques to enable them to keep large numbers of krill alive for as long as seven years. Such research has already enabled research of stocks over a period of time providing valuable data on the ecology and physiology of krill and its role in the Southern Ocean ecosystem. It is helping in the development of management policies.

Base leaders announced

A public servant, an Army officer, a geologist and a geophysicist have been selected to lead Australia's four Antarctic stations in the 43rd year of ANARE operations.

Joan Russell as Station Leader for Casey is the third woman in the world and the third Australian woman to take charge of a permanent Antarctic station. She comes from the South Australian Department of Personnel and Industrial Relations and has held a range of administrative and academic positions in South Australia.

Major Robert Parker, who is to be leader at Mawson, has served as Commander of the LARC (Light Amphibious Resupply Craft) detachment moving stores and personnel between the ship and shore over two summers. He has been a member of the UN

Peace Keeping forces in the Middle East, on HMAS Tobruk in Papua New Guinea and until recently was working at the military Headquarters at Hobart.

Canadian born John Rich, Station Leader for Macquarie Island, is a geologist from Western Australia who has worked for 15 years in the Arctic, subarctic and the Australian outback as an exploration geologist and as a commercial helicopter pilot.

Station leader at Davis will be Jon Akerman, also from Western Australia. A geophysicist, by profession, he has supervised operations in remote locations in Australia, Indonesia, the Tibetan Plateau of China, Papua New Guinea and the Amazon region of South America.

The four joined Antarctic Division in Hobart in August and will travel to their new posts during the summer to spend 1990 in charge of between 16 and 26 men and women at Australia's bases.

CHINARE

China's newest base to be completed this summer

Zhong Shan, China's new base in the Larsemann Hills area of Prydz Bay was built last summer and 14 personnel are spending the winter there. It is one of four bases within five kilometres of each other in the area. The others are the Russian's Progress 1 and 2 connected by a minor road constructed last season and Australia's Law Base.

An inspection of the base site was made by two representatives of the National Antarctic Research Committee, one of them being the deputy-director Mr Chen Dehong. They were passengers aboard the ANARE supply ship Icebird when she sailed from Hobart on her first voyage of the season on October 21.

On November 12, 1988 the two CHINARE representatives were flown to Davis from the Icebird in the "Australian Geographic" magazine Twin Otter loaned to ANARE for scientific support. It was piloted by the owner, Dick Smith, and Giles Kershaw, who ferried supplies and staff from the ship as the ice edge extended 140nm from the station.

Soon after their arrival at Davis the Chinese flew first to the Amanda Bay Emperor penguin rookery and then to Nella Fjord where the Twin Otter landed on the ice close to the Soviet Base Progress which is 3km from the Australian Law Base.

After inspecting the site of their new base and Law Base the Chinese flew back to Davis on November 13 from Progress. On November 17 the Twin Otter flew from Davis to continue the Amery Ice Shelf radio-echo-sounding project for ANARE and also transferred the Chinese representatives to Mawson from where they returned to Hobart in Icebird.

Soon after their arrival at Davis the Chinese flew first to the Amanda Bay Emperor penguin rookery and then to Nella Fjord where the Twin Otter landed on the ice close to the Soviet Base Progress which is 3 km from the Australian Law Base.

After inspecting the site of their new base and Law Base the Chinese flew back to Davis on November 13 from Progress. On November 17 the Twin Otter flew from Davis to continue the Amery Ice Shelf radio-echo-sounding project for ANARE and also transferred the Chinese representatives to Mawson from where they returned to Hobart in Icebird.

Materials for the Chinese base were carried south in the Ji Di operated by the National Antarctic Research Committee. Formerly a refrigerated cargo ship the Finnish-built vessel (1050 tonnes) can accommodate a crew of

25 and 15 scientists. She was built for Baltic operations in 1971 by the shipbuilding group of Rauyma-Repola, and until 1985 was registered as the Rhea. in 1986 she was bought by the Chinese and converted for polar work.

Powered by a 1700hp diesel the 50m Ji Di has a maximum speed of 14 knots and a range of 12,000 nm at 12 knots. She has two decks and a third in No. 2 and 3 holds.

The Ji Di called in at Hobart in January to pick up additional supplies and was subsequently stationed at the ice edge five kilometres off the coast near the Larsemann Hills while waiting to land the prefabricated modular station units. Persistent sea ice prevented the bulk of supplies being landed initially but in the meantime the site which had been surveyed by a Chinese team, was levelled and prepared by Soviet bulldozers.

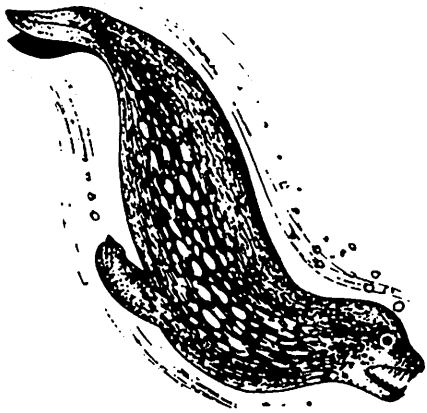
In mind-January the ship was able to move into a position about 200 metres offshore from Progress 2 and the team used barges for unloading. During the night a kilometre of the tongue of the Dalk Glacier calved and drifted about two kilometres. The calving trapped the Ji Di, the wave pushing her close to the shore where she could not manoeuvre. Fearing that she might be holed all personnel from the lower decks were evacuated to tents adjacent to the base site. For a week she remained at the site before the bergs drifted allowing her to be moved to a safer position while the rest of the ice broke up. Unloading was resumed from about four kilometres offshore in late January.

By the end of February four major buildings — administration and living quarters, sleeping quarters, powerhouse and a meteorological office — had been completed. All but the meteorological office were completely prefabricated and constructed from shipping containers mounted on steel supports set in concrete foundations. Science and recreation buildings will be constructed next season.

New Soviet Base near Australians & Chinese

During the 1988-89 season members of the 33rd Soviet expedition constructed a new station Progress 2 on the coast within two kilometres of Law Base. The station will be used by the 24 man Soviet wintering party in the Larsemann Hills. Progress 1 (67deg 24' S/76deg 24' E) which opened on 1 April, 1988 and is 64 metres above sea level near the edge of the ice cap about three kilometres from Law Base was used as the main station until the end of the season. It will be maintained during the winter for use by the Soviet summer teams.

The icebreaker Akademic Federov and supply vessel Vitus Bering visited the Larsemann Hills to resupply Progress 2 and to change over expedition personnel. A Mil-8 helicopter and an Antonov-2 biplane carried aboard the Vitus Bering were used to support Soviet summer operations in the area. In addition to the building team which have remained over the winter, a variety of meteorological programmes have been undertaken along with geological and topo-geodesic research in the summer.



Peru's first station is on King George Island

Peru, which established its first Antarctic station on King George Island, South Shetlands, in February this year, had its claim to Antarctic Treaty consultative party status approved at the special consultative meeting in October 1989. It lodged documentation in support of its claim for the SCM meeting in Paris September 1988 but then expressed the wish that this be considered after its second expedition.

Soon after its accession to the Antarctic Treaty in 1981 Peru sent observers south with Australian, Chilean, Brazilian, and United States expeditions. Two Peruvian Navy officers, Lieutenants A. Leon and H. Koechlin, joined the United States Coast Guard icebreaker Polar Sea at Palmer Station on Anvers Island off the Antarctic Peninsula and travelled to McMurdo Station as guests of the United States programme during the 1981-82 season.

A Peruvian oceanographer and hydrologist, Mr Hector Soldi, joined an Australian National Antarctic Research Expeditions (ANARE) team in the 1982-83 season to observe expedition methods and do marine biological research at Casey Station and the sub-Antarctic station on Macquarie Island. In 1984 a Peruvian guest scientist wintered at the Argentine station General San Martin in Marguerite Bay off the Antarctic Peninsula.

First expedition

Peru's National Commission on Antarctic Affairs sent the first Peruvian expedition to Antarctica between January and March of 1988. The expedition used the Peruvian Navy's oceanographic ship Humboldt and selected a suitable site for the first base in Admiralty Bay, King George Island. Scientists aboard the ship made studies of the marine ecosystem in Bransfield Strait.

Built in Callao and commissioned in 1980, the 1980 tonne Humboldt carries a crew of 48, and her two diesel engines give her a speed of 14 knots. She is 249.6m long, has a beam of 14.4m and a draught of 12.7m.

In December last year the second expedition sailed for the South Shetlands with 64 crew, scientists, and a Peruvian Army team of engineers which had designed the base and was assigned to build it. The site selected was in Mackellar Inlet (62deg 52 min S/58 deg 29.5m W), which forms the north-west head of Admiralty Bay. Martel Inlet forms the north-east head and the two are separated by the Keller Peninsula, (62 deg 05min S/58deg 26 min W) where the Brazilians built their station Commandante Ferraz on Plaza Point in the summer of 1983-84.

Machu Picchu

Machu Picchu, which was completed in the last week of February, consists of three-prefabricated buildings. Later a helicopter pad will be added. It is named for an ancient Inca ruined city on a 2040-metre mountain of the Peruvian Andes 88km north-west of the ancient city of Cuzco, discovered in 1911 by an American missionary, Dr Hiram Bingham.

Fog and strong winds delayed the planned opening of Machu Picchu by the Minister of Defence, General Enrique Lopez Albujar, on February 24. He, the Minister of Fisheries, Mr Romulo Leon Alegria, and some 50 military officials, politicians, and scientists, were unable to fly from Punta Arenas to King George Island until February 26.

Ship aground

Only hours after the opening ceremonies the Humboldt ran aground on rocks at the entrance to Marian Cove (62 deg 13 min S/58 deg 48 min W) when entering Maxwell Bay shortly before midnight on February 26. Marian Cove indents the south-west part of King George Island between Collins Harbour and Potter Cove.

An attempt by the Royal Navy's ice patrol ship Endurance to tow the Humboldt off the rocks failed in the early hours of February 27. All 64 crew and scientists were ferried from the Peruvian ship to the nearby Chilean station Teniente Rodolfo Marsh. The Endurance, which had undergone makeshift repairs after colliding with a submerged fragment of ice seven or eight days earlier went to the rescue from Potter Cove where she had been sheltering with the Royal Fleet Auxiliary Service chartered South Atlantic forward repair ship Stena Seaspread (6061 tonnes).

Stormy weather prevented experts aboard the Endurance from making a full inspection of the Humboldt to determine the extent of the damage. On February 28 a Chilean Navy report from Punta Arenas said the ship was listing 2 deg to port but did not appear to be taking on water and was not in danger of sinking.

Oil Slick

But the Chilean report also said that an oil slick 130m long had been sighted floating towards the coast. Two of the Humboldt's fuel tanks, which held 110,000 litres of diesel fuel, had probably been punctured. However, nothing could be done to free the ship from the rocks or determine the full extent of the oil slick because of 30-knot winds.

More bad weather with winds up to 64 knots on March 1 continued to impede efforts to refloat the Humboldt or clean up the oil slick, now 150m long and 5m wide. A Chilean Navy communique from Santiago confirmed that the two fuel tanks had been spilt, and a minor amount of oil was leaking from them.

Marian Cove is relatively close to the South Koreans' King Sejong Station on Barton Peninsula. Peruvian officials established an operations centre at the base and prepared for the Humboldt to be brought in for repairs. Pending the arrival of the Chilean Navy cutter Yelcho, the Stena Seaspread stood by to monitor any oil pollution and assist in salvage work.

Soon after dawn on March 2 the Yelcho arrived with men and equipment for refloating the Humboldt and cleaning up the oil. The first priority was to contain the spill. Better weather enabled men from the cutter to encircle the grounded ship with floating booms to prevent the oil from spreading. A check on the extent of the spread was made by a Chilean Air Force helicopter which overflew the ship from Teniente Marsh, and the crew reported that the slick had spread to 1km in length and 50m in width.

Chilean Navy frogmen and scuba divers from King Sejong and the Uruguayan base Artigas in Collins Harbour were able to make a thorough inspection of the Humboldt and confirm previous reports that the damage was not serious. They also plunged into the icy Antarctic waters which had invaded the ship when she struck, sealed the fractured oil tanks and shut off the slow leak.

By March 4 preparations for refloating the Humboldt and towing her to the South Korean base for repairs were well in hand. Among the facilities at King Sejong, which was opened in the 1987-88 season, is a substantial pier. It was built on Fildes Peninsula opposite the station for unloading the supplies from ships. Also the Stena Seastrand is fully equipped to handle hull and machinery repairs.

Footnote: H.M.S. Endurance had resumed her ice patrol and support programme by the time the situation in Marian Cove was under control. Her collision with the submerged ice fragment had not received the same media attention.

When the accident occurred towards the end of the second week in February the ship was carrying a naval complement of 140 and six civilians including the Governor of the Falklands, Mr William Fullerton, his wife, and an aide who were making a three week Antarctic tour.

An official report from Port Stanley on February 20 said the ship had suffered minor damage in a collision with a submerged fragment of ice while proceeding through an ice floe at four knots. Flooding was under control and there was no pollution.

After the accident the ship made for Deception Island where divers were able to investigate the extent of the damage. There were no later reports of whether makeshift repairs had been carried out aboard ship or by the Stena Seaspread.

BAS

Improved facilities to support expanding science programme

Following the Falklands conflict in 1982 the British Government decided to strengthen activities in Antarctica and made provisions for an immediate and major increase in funding to implement an expanded programme of research. Net expenditure by BAS in 1985/86 was £12.1 million with £11.7 million in 1986/87 and £14.9 million in 1987/88. The latest figures are not yet available.

Plans were drawn up for an extension to the Cambridge headquarters building to provide accommodation for an increased number of scientists and support personnel as well as laboratory facilities. Designed by the Culpin Partnership of Richmond, Surrey around the concept of the old four divisional structure of BAS (which was re-organised into six divisions in 1985) construction began in 1984, was completed in July 1988 and the building formally opened on 16 June 1989 by HRH Duke of Edinburgh.

The new building is now occupied by Marine Life Science, Terrestrial and Freshwater Life Science, Upper Atmospheric Science and Geophysics Divisions of BAS. It contains improved facilities for the provision of central services such as electronics and mechanical construction laboratories, computing services, registry and archives accommodated in two large air conditioned and humidity controlled rooms providing storage for all material relating to the history and development of BAS through Fids and Operation Taberin. A library, common room and fully equipped kitchen and conference hall are included in the new complex.

Outside the main accommodation block a "scientific pad" has been constructed comprising a series of covered bays facing into a cargo handling yard. These are being used to store bulky scientific equipment, specimens, house refrigerated and cool laboratories and containerised facilities for ships or bases.

The old building, which is being refurbished, will continue to house administration, including the Directorate, the Geology and Ice and Climate divisions.

The cost of this aspect of BAS expansion is approximately 5.5 million.

Bases

Refurbishing and improvement of all BAS bases in Antarctica will continue into the mid-1990's by which time it is hoped Signy Station will have been completely rebuilt.

Rothera

The modernisation and refurbishment of Faraday was completed in 1985 when work began at Rothera making it the largest of the BAS stations. At 67deg S this is the southernmost BAS wintering station on the Antarctic Peninsula and the hub of the earth sciences field programmes — geology, glaciology and terrestrial geophysics. BAS air operations are centred on Rothera which also plays a co-ordinating role for communications with all parties in the field. The main accommodation block has been enlarged to take 76 science and support staff, provide laboratory space for scientists and workshop facilities for the storage of equipment, a new dispensary and sickbay. The library and equipment, a common room suite and a large dining room area are included. The base commander, radio communications, air operations and meteorological staff are accommodated in a separate building.

"Antarctic" thanks Drs David Drewry and David Walton, David Jones and Bernard Moran for material and assistance in the preparation of this article.

Last season a new "Miracle-span" building was erected for housing skidoos and sledges and provide covered area for the maintenance of vehicles separate from the main garage/workshop.

Halley

First occupied by the Royal Society Expedition in the International Geophysical Year the present Halley is the fourth to be built at the site on the Brunt Ice Shelf in the Weddell Sea. Very high snow accumulation has buried (and subsequently crushed) successive stations, making them uninhabitable. The 1980 design of two storey modules housed in a wooden 'Structaply' tube, allowed an outer tube to take the load of superimposed ice. It was only reasonably successful but work by base personnel has allowed Halley to continue to function until a fifth base could be constructed along entirely new lines.

The new design allows for a base built on a large platform raised above the ground by steel piles and jacked up above accumulating snow. Developed by the United States for their DEW-Line early warning stations on the Greenland ice sheet, the design was adopted by the West Germans for a small summer-only station on the Filchner Ice Shelf. The technique has been used at Halley for several of the cabooses comprising the upper atmospheric sciences village.

The design for Halley-V was completed in 1987 by Christiania-Nielsen and comprises a large accommodation platform and two smaller science platforms, one for upper atmospheric work and another for ice-climate research. The main platform will support living accommodation, communications facilities, power generation and other utilities. There will be gangways to the snow surface and a small crane at one end to lift heavy items onto the platform. Space is also provided for two ISO container/laboratories to be deployed on the platform. The main and UAS platforms will be linked by an ARMCO tube a ground level serviced by shafts as the vertical distances increase.

It was originally intended to construct the station over a two year period at a location 16km ESE of the present base but in 1987-88 changes to the ice shelf resulted in the breakout of the lower ramp and calving of parts of the headlands protecting the traditional unloading area at Mobster Creek. Alternative plans were devised but the ramp proved workable with bulldozing and Bransfield sailed two weeks early from Grimsby with additional plant and structural materials for an early start on the erection of the platforms during the season. Base buildings will be erected on the platforms this summer.

The move from Halley IV to Halley V involving the transfer of the complex scientific experiments is planned for 1990-91.

Signy

When rebuilding operations at Halley are complete work will begin at Signy where BAS intends to replace all the old structures, except Sorlle House and the boatshed with a new integral research base on the same site in Factory Cove. Preliminary designs have been developed for the arrangement of living accommodation and laboratory facilities and it is envisaged that the new station will be able to support 40 personnel during the summer.

Aircraft and airstrip

Until 1990 BAS will continue to support scientific activities out of Rothera with its three existing ski-wheeled de Havilland Twin Otter aircraft, although a fourth has been purchased. At present they use a skiway near the station on Adelaide Island. It is 275 metres above sea level and exposed to strong and gusting winds which have severely damaged aircraft in the past. The weather conditions at the skiway, especially the persistence of low cloud have also restricted flying operations throughout the summer to around 1000 hours.

Plans were developed in the mid-1980's to construct a gravel airstrip at Rothera Station and in 1987-88 these were advanced to a stage where they could be presented to government for funding.

At the same time a Comprehensive Environmental Evaluation was undertaken under the provisions of the Antarctic Treaty by Drs Nigel Bonner and Ron Lewis-Smith to assess the impact of the runway development

on the Rothera locality. "Weighing carefully the likely damage to the environment against the benefits accruing from the science supported by the development of the air facility the CEE demonstrated unequivocally that there is likely to be little deleterious influence," according to the Director, Dr David Drewry.

Rothera Point is one of the least biologically interesting parts of the whole of the northern Marguerite Bay region and no unique features of the environment are likely to be destroyed by the airstrip construction.

Late in 1988 the airstrip proposal received appropriate backing and funding.

Construction of a hardpacked gravel runway at Rothera is due to begin this season with operations possibly commencing from it in 1991-92. The runway will be about 915m in length aligned from Honeybucket Island to Sea Island across the isthumus connecting Rothera Point from the main part of Adelaide Island. The strip will be 45 m in width with provision for a hangar and hard standing apron.

Bulk storage for aviation gasoline will be provided with direct pumping from ship to shore eliminating the need for the "Annual drum roll", involving the transportation of several thousand drums of aircraft fuel from Rothera some six kilometers to the skiway on the ice plateau above the Wormald Ice Cliffs. Some of the operational benefits of the runway over the present skiway include the safer flying environment at sea level with a higher cloud ceiling and less (exposure to) gusting winds. It is estimated that the operating window for aircraft will be increased by one third. The installation of fixed navigation aids will further improve safety. Damage to aircraft tethered out in the open skiway by strong winds will be reduced with the hangar where maintenance and repair can be undertaken.

BAS also plans to acquire a larger aircraft to operate between Mount Pleasant airport in the Falkland Islands and Rothera and to deploy personnel to deep field locations within Antarctica. The de Havilland Dash-7 was identified as having most of the Survey's requirements and although the company is no longer producing the model BAS hope to acquire a low hours airframe within the next year. Work to develop a ski suitable for the aircraft to land in deep field locations is underway at present.

The Dash-7 will be capable of carrying up to 20 persons and their equipment from Falklands to Rothera obviating the need to operate the Damoy air camp on Weincke Island early each summer. It will be possible to put in field parties and fuel depots at 1000km distance with a payload of 2.5 tonnes. The Twin Otters, with their greater flexibility but more limited range payload characteristics, will be used in close-support of field operations for local movement of personnel and for remote sensing activities.

A fourth Twin Otter, fitted with ski, will be purchased to support field operations. in 1987 money was made available to purchase a new airplane from de Havilland in Canada but the company was acquired by the Boeing Corporation of America and the production line shut down in 1988. BAS acquired one of the last air frames on the production line and the airplane has now been fitted with ski and avionics required by BAS by another Canadian aircraft company. The designation VP-FBL has been given to the new aircraft which is likely to be flown to Rothera in October 1990.

New ship

RRS John Biscoe, now 32 years old, was extensively modernised in 1979 with the provision of an after work deck, A-frame, suitable winches and internal laboratory space to undertake marine research principally in the life sciences through the BAS Offshore Biological Programme (OBP). A new ship is now needed to support RRS Bransfield, the sophisticated marine research programmes proposed for the future as well as base operations.

By early 1988 the overall concept of the new ship had been developed and BAS went out to tender with a detailed specification. A contract was signed on 21 March between NERC and Swan Hunter Shipbuilders Ltd, Wallsend, Newcastle-upon-Tyne, for the construction of a new combined logistics and

research vessel. Worth over £30 million it provides for delivery by 22 May, 1991 of a vessel 99.04 metres in overall length, with a beam of 18.85 metres, gross tonnage of 5500 and displacement of 7067 tonnes.

The new vessel will be called the RRS James Clark Ross after the explorer who discovered the north magnetic pole and made three visits to the Antarctic, when he was intent on locating the south magnetic pole. In the course of this expedition he discovered the immense embayment south of the New Zealand known as the Ross Sea as well as Ross Island and the active volcanoes of Mounts Erebus and Terror, named after his two ships. Victoria Land was named by him after the Queen. It later became a key area for exploration by British expeditions in Edwardian Times. During the course of later voyages he visited the South Shetland Islands and the Antarctic Peninsula. The James Ross Island archipelago off the north-eastern tip of the Antarctic Peninsula now bears his name as its first visitor.

RRS James Clark Ross, which will be ice-strengthened to class 1A and capable of breaking 0.8 metre of ice continuously at 2 knots, will be comparable in size to RRS Bransfield and considerably larger than the John Biscoe. She will have a maximum speed of 16 knots and service speed of 12 knots with an endurance of 55 days. The propulsion system is diesel electric, based on the "powerhouse" principle, comprising four Wartsila Diesel engines generating up to 8,500 horsepower at the shaft. This system provides the necessary power to permit the ship to break level ice up to 800 mm thick at a constant speed of 2 knots. Care has been taken in the design of the hull and the installation of machinery on a comprehensive flexible mounting system to ensure quiet operation of the vessel in science mode avoiding interference with sensitive equipment internally or external to the ship. Bow and stern thrusters (White Gill 10T and 4T) and a "joystick" control system will allow good station keeping capability for overside operations.

It is intended that the new vessel will support marine biology including biological oceanography as well as marine geophysics and geology. In addition to Antarctic work the vessel will be available for use by NERC-supported marine research personnel for up to two months each year.

Research facilities comprise over 370 square metres of wet, dry and environmentally-controlled laboratories to accommodate chemists, biochemists and microbiologists materials. Working laboratories have easy access to the main work deck and control positions have clear oversight of the main operational areas. Containerised laboratories can be located on the after and fore decks. There will be a gravity meter room, rough workshop, electronics and scientific workshops as well as underway instrumentation and control rooms, a cool specimen room and scientific freezers. There will be a 25 metre long clear after-deck, three metres wide starboard working deck to midships, which will be served by a 20 tonne capacity articulated after "A"-frame and a midships gantry of 30 tonnes safe working load for heavy coring work as well as hydrographic duties. All working decks will be equipped with a matrix of holding down points for temporary fitting of portable winches, containers and other scientific equipment.

The fitted winches, all located below decks, comprise a pair of cantilevered-drum traction winches of 30 tonnes and 5 tonnes pull respectively. The larger traction winch has five storage drums for 15,000 metre of tapered trawl warp, 8,000 metres of 29 mm Kevlar for heavy coring, 8,000 metres of standard 16 mm coring warp, 10,000 metre of armoured coaxial electro-mechanical cable and 3,000 metres of single core electro-mechanical cable for net control. The smaller winch has three storage drums for 8,000 metres of 10.8 mm single conductor cable, 9,000 metres of hydrographic wire and 5,000 metres of Kevlar for clean chemistry work. The vessel can also accommodate a twin warp trawling system, the winches for which are envisaged to comprise 2 x 5,000 metres of 26 mm wire, twin Gilson winches located at boat deck level complement the warp arrangement.

The cargo facilities comprise two holds capable of carrying 1,500 cubic metres of general cargo, bulk aviation fuel tanks for 250 tonnes of turbine fuel to support Antarctic air operation and up to 300 tonnes of cargo diesel fuel for the stations. A large scientific equipment hold below the main working deck aft is complemented by permanent and portable magazine capacity for up to 30 tonnes of seismic explosives.

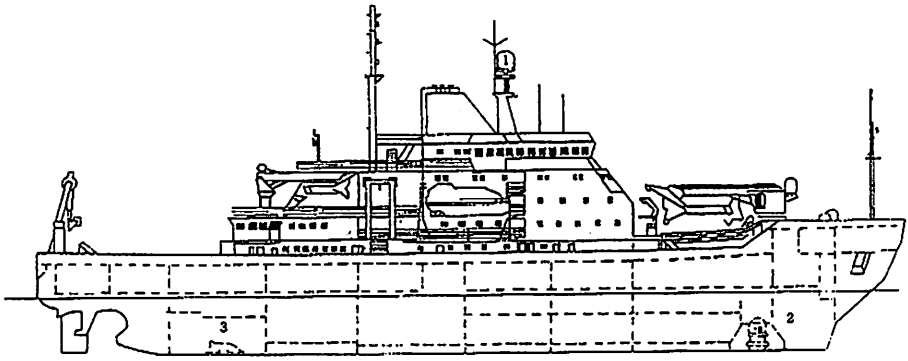
Data preparation and computer rooms will be provided, the latter equipped with a VAX based system and data communications based on a fibre optic ethernet linking all navigation, scientific and accommodation areas as well as headquarters at Cambridge via satellite.

Accommodation comprises 20 cabins for scientific personnel of which 16 are single with an option "Pullman" type berth for additional short term personnel transportation. Four cabins provide four berth accommodation for short term transit but could serve as single berth accommodation for senior scientists on research cruises. The chief scientist's suite is located at bridge deck level overlooking the main science working areas. Accommodation is also provided for 25 officers and ratings.

RRS James Clark Ross, currently under construction will complement to work of RRS John Biscoe in supporting British activities on the ice.

RRS James Clark Ross

Length OA	99.04m
Length BP	90.00m
Breadth Mld	18.85m
Depth Mld	9.80m
Draft	6.30m
Service Speed	12 kts
Max. Speed	16 kts
Bollard Pull	65T
Ice Breaking	0.8m at 2kts
Complement	77
Machinery	Diesel Electric
Propeller	Fixed Pitch
Bow Thruster	White Gill 10T
Stern Thruster	White Gill 4T
Laboratory Area	340sq m
Endurnace	55 days at 12 kts



USAP

33 projects to be undertaken from McMurdo Station

Working out of remote field stations and at three research bases, 341 scientists and technicians participating in the 1989-90 US Antarctic programme will conduct 95 field projects relating to atmospheric processes, climate, astronomy, glaciology, biology, earth sciences and the antarctic oceans. Of these 33 projects will be undertaken from McMurdo Station and include sea ice and dry valley work, 17 requiring dedicated LC130 support to remote field camps; 21 projects will be based at Amundsen-Scott South Pole Station.

Approximately 300 personnel will travel to McMurdo Station on more than 70 flights planned for the season by the National Science Foundation, and the RNZAF, the RAAF and the Italians. A further 16 projects involving 37 personnel will be undertaken at Palmer Station or from the Polar Duke.

Major construction activities include the shell of the fourth new dormitory building at McMurdo, continuing work on the new science building and the up-grading of the utilities system.

Personnel involved in the major summer research programme began flying south on October 3.

The eight flights which made up WINFLY (and were made between August 22 and August 29) carried some 200 persons to McMurdo for pre-season preparations and seven science projects. They included Dr Lawrence Palinkas of the Naval Health Research Centre, San Diego, who is studying the effects of overwintering on station personnel and scientists involved in fish studies, and comparative work on benthic invertebrates.

Fish

Fish have evolved unique traits to survive in frigid Antarctic waters. Art De Vries of the University of Illinois and his team are continuing their studies of sugar-protein molecules that act as antifreeze in the fluids and tissues of Antarctic fish.

The suborder of fish called Nototheniodei, dominate Antarctic waters but have not developed special ocular adaptations to allow them to function in the dark. In other dark habitats a mechanical sensory system called the lateral-line comprising cells sensitive to changes in pressure may have a role in feeding. In a combined project with John Montgomery from the University of Auckland, scientists from Loyola University, Chicago will test behavioural and physiological responses to check theories that the lateral line system can be used to identify prey and that fish living in deeper waters have more sensitive systems. Anatomical studies of the system will also be undertaken.

Another group of scientists, headed by H. William Detrich, of the biology department at Northeastern University will investigate why critically important structures within the cells of Antarctic fish continue to function at temperatures at which those of warm-blooded vertebrates break down. They will examine microtubules, filamentous, tube-like assemblies of proteins which are necessary for cell division, nerve growth and regeneration, the transport of chemicals within cells, and for the determination of cell shape.

Benthic community

Contrary to the theory which proposed that sponges in high geographic latitude produce fewer toxic or noxious compounds because fish prey on them less, scientists in 1984 found that 56 percent of the 16 marine sponges sampled in McMurdo Sound produced compounds poisonous to fish. This season scientists from the University of Alabama, Birmingham led by Dr James McClintock, will

extract compounds from abundant and conspicuous sponges in McMurdo Sound and test them on various marine invertebrates and vertebrates that interact with them in their natural habitat. Sponges showing biological activity will be chemically analysed to isolate and describe active metabolites they produce and tested for anti-viral and anti-tumour activity. From the results they hope to learn more about the geographic and taxonomic patterns of toxicity in marine sponges.

Many benthic invertebrates, including polar species, produce larvae that live as plankton before maturing and their survival is critical to replenishment of the population. Working in the McMurdo Sound area from August to December a field team from the Universities of California, Southern California and Maryland are trying to clarify whether larvae are nourished by particulate food, dissolved organic material, yolk provided by the parent or a combination of the three by sampling feeding and non-feeding varieties and comparing the results with work undertaken in the different nutritional and seasonal environment of Monterey Bay.

Earlier work has revealed that benthic community assemblages in McMurdo Sound have strong east-west and north-south density gradients related to gradients in primary production. Six scientists from the Scripps Institution of Oceanography, University of California are attempting to explain how productivity gradients are functionally linked to the benthic system by focussing on aspects of microbial and meiofaunal ecology selected aspects of acrofaunal dynamics and physical oceanographic processes. Samples will be collected by divers for analysis and work on regional and local currents will be continued and initiated. Ice cover will be evaluated and sediment traps used to characterise study areas near Hut Point Peninsula and along the western McMurdo Sound from Keottlitz Glacier to Marble Point including Explorers Cove at New Harbour and Salmon Bay.

Seals

A team from the University of Alaska, led by Dr J. Ward Testa, will make use of data obtained in a 20 year population study of seals in the McMurdo Sound region during the spring and summer by attaching satellite linked time depth recorders to the seals to obtain information on the winter movements and diving. The Weddell seals usually return to the same area each year. The recorders will relay information on the seals' location and transmit summaries of the duration and depth of dives. From the results they hope to obtain a better understanding of age related differences in behavioural traits and explain demographic features and selective pressures on the life history of seals. Such information can be extended to studies of other large animals.

The physiology of diving in emperor penguins and weddell seals will also be studied in McMurdo Sound and at Cape Washington.

Food webs

Research suggests that nano and microzooplankton, too small to be grazed by larger zooplankton are important to the transfer of carbon through polar food webs but because of the large number of energy transfers involved they may be less efficient than metazoan food chains in transferring energy to higher trophic levels. Understanding the role of the two food chains is important in the development models of energy and material flow through polar ecosystems. Working in McMurdo Sound scientists from the Wood Hole Institution of Oceanography will focus on aspects of the system such as seasonal and spatial variation in distribution of nanozooplankton, microzooplankton, microalgae and bacteria and investigate growth rates and the impact of grazing by these communities on algae and bacteria.

Four teams of scientists will probe the Ross Sea to study how nutrients are cyclied through organisms, water and sediments. Antarctic waters are among the world's most biologically productive, with life forms blooming every austral spring. Scientists believe that this bloom results from the release of nutrients from melting sea ice. The Antarctic food web depends on abundant phytoplankton, including one-celled diatoms. An unsolved mystery these scientists hope to solve is why the carbon cycle appears disconnected from that of silica, the main component of the galls-like cell walls of diatoms, and why sedimentation rates are so high.

Annually about 75 percent of all silica deposited in the world's oceans by rivers and hydrothermal sources occurs in Antarctic waters according to David J. DeMaster of North Carolina State University, the leader of one of the teams. However Antarctic sediments account for less than 10 percent of the global organic carbon budget. Solving these mysteries could aid in the global modelling of the production and sedimentation of material generated by living organisms.

Ecosystem

Southern ocean primary productivity derives largely from microalgal photosynthesis in the water column and sea ice but production appears to be limited by available light and temperature rather than by nutrients. Previously scientists from the University of Southern California have sought to understand the optical properties of sea ice in relation to microalgal photosynthesis and photobiology of related microbial communities. Adopting a new approach, a team led by Dr Cornelius Sullivan, will try to characterise the photophysiology of individual algal species under natural conditions rather

New NSF contract: $US250 million over six years

A contract worth $US250 million over six years for logistic and operational support in Antarctica has been awarded by the United States National Science Foundation to Antarctic Support Associates. A joint venture, ASA will take over support services on April 1 next year from ITT Antarctic Services which has provided them since April 1, 1980 but was unsuccessful in its bid for a new contract.

Under the contract ASA will be eligible for two additional terms, each of two years, beyond the initial six-year period. This could increase the total value of the contract to about $US500 million.

Partners in the joint venture are Holmes and Narver Services Inc. (HNSI), a subsidiary of Holmes and Narver Inc, which operates from Orange, California, and EG & G Inc, based in Wellesley, Massachusetts. Both companies have previous operating experience in Antarctica. Holmes and Narver Inc, was the NSF support contracter from 1968 to 1980; EG and G Inc. operated the wooden research vessel Hero in the Antarctic Peninsula area for NSF in the early 1970's.

With HNSI as managing partner, ASA will provide direct support to NSF scientific research projects in Antarctica as well as operation and maintenance of facilities, vehicles and equipment at US Antarctic stations and field camps. The stations include McMurdo, Palmer on Anvers Island off the Antarctic Peninsula, and Amundsen-Scott South Pole. Contract activities will also include construction work at the Antarctic stations, operation and maintenance of the ice strengthened research vessel Polar Duke which replaced the Hero, and other specialised support in communications safety, and environmental protection.

Antarctic Support Associates will establish headquarters in Denver, Colorado. It will also operate staging facilities at Port Hueneme, headquarters of the US Naval Support Force, Antarctica, Christchurch, New Zealand and Punta Arenas, Chile. The two firms in the joint venture have had a working relationship for more than 35 years.

Footnote: Antarctic science and logistics are among three priority areas of science for which New Zealand's Ministry of Research, Science and Technology is seeking to attract bids under a new $5 million priority research contracts scheme. The other priority areas are atmospheric research and climatic change, and administration of new technologies for industry growth.

Operated by the Foundation for Research, Science and Technology, the programme provides for bids of a minimum of $50,000 in research outputs per annum. There will also be a special fund to encourage smaller research agencies and individuals to bid for contracts.

than from cultures and from these data hope to develop sea-ice ecosystem models of production for the southern ocean.

Dry Valley Lakes

From late October a team led by Drs Diane McKnight and Richard Smith, from the US Geological Survey, Arvada will continue research on biogeochemistry of Antarctic Dry Valley Lakes. Taking advantage of the relatively simple seasonal cycle and the closed ecosystem of Lake Fryxell they will determine how important hydrologic cycles are to the biogeochemical processes within the lake and study the response of predominant cycles to seasonal change. By measuring the key autotrophic and heterotrophic processes and related chemical parameters, as well as determining the internal cycling of carbon, nitrogen and sulphur and by quantifying the lake hydrology and developing sampling devices to operate during the winter they hope to collect data which can be used to learn more of the internal biogeochemical cycle in non-antarctic lakes.

Another team of scientists aims to describe the photophysiology of distinct plankton populations in Lake Bonney in relation to the unchanging physical regimes which exist in what they believe to be the relatively stable environment of a permanently ice-covered lake. This will be tested along with examination of habitat preference for vertically stratified population, time kinetics of photoadaptation, rhythmicity of photosynthesis and physiological mechanics for observed photosynthesis versus irradiance patterns. Their work, to be conducted over five months, will provide a model for stuyding photoadaptation as it occurs over the growing season.

Richard Smith of the US Geological Survey in Boulder, Colorado, will lead a six-person team studying life in Lake Fryxell which is permanently covered by ice. Sunlight penetrates allowing photosynthetic algae and bacteria to grow in the water below. Because Lake Fryxell is a simple, relatively closed system, it is ideal for study of the movement of carbon, sulphur, and nitrogen within organisms, the water and the sediments allowing scientists to describe basic aspects of nutrient cycling that should also characterise lakes in temperate zones. The team will deploy special equipment that for the first time will detect and measure nutrients in Lake Fryxell year round.

Nematodes

Worms with unsegmented, threadlike bodies called nematodes are known to be important for carbon and nutrient cycles in deserts because of their interaction with plants and the decomposition cycle but little is known about their distribution and function in the ice-free regions of Antarctica. Drs David Bird and Diana Freckman from the University of California will examine their distribution and trophic structure in the Wright, Taylor and Marshall Valleys relating their abundance and species composition to physical and chemical properties of soil. Because numbers may be limited by energy or moisture and temperature laboratory analysis will be undertaken to determine adaptation. Wind dispersal of nematodes will also be studied.

Fossils

During November and December botanists from the Byrd Polar Research Centre will, for the second season, collect samples of fossil floras from numerous locations in the ice free valleys of southern Victoria Land. The sites will be logged at the time of collection and the samples assessed under laboratory conditions for the quality of preservation, diversity and types of plants present and the potential for further collecting. The team leaders are Drs Edith Taylor and Thomas Taylor.

Meteorites

Meteorites are useful for investigating possible changes through time in the meteoroid flux of the earth, measuring cosmic-ray flux in past eras and searching events in which asteroid parent bodies were disrupted and defining abundance and characteristics of pre-solar organic molecule. As part of an ongoing study eight scientists in two teams under the leadership of Dr William Cassidy of Department of Geology and Planetary Sciences, University of Pittsburgh will lead a party of two teams of four scientists. The first will recover meteorites, study the Lewis Cliff Glacier Tongue and

sample ice and the second will collect meteorites and map sites in the Thiel Mountains and near Pecora Escarpment.

Tectonic history

Geologists from the Southern Methodist University in Dallas, Texas under the leadership of Dr John W. Goodge will evaluate the metamorphic evolution of the Precambrian basement terrains exposed in the Miller and Geologists Ranges of the central Trans-antarctic Mountains, including the evolving physical condition, fluid composition and regional thermal gradients. The geometry, styles and kinematic history of deformation within these rocks and the strain mechanisms that operated during metamorphic deformation will be characterised and the data from high grade rocks compared to structures within the adjacent lower-grade sedimentary sequences. The ages of metamorphism and deformation that pre-date post-tectonic granites will be determined and mineral-age data used to establish a crustal thermal history and develop petro-tectonic models of the Proterozoic orogeny for the area. Their results should help establish a tectonic and paleogeographic framework for evolution of the ancient continental margin.

Gondwanaland reconstructions

In Gondwanaland reconstructions, Marie Byrd Land is juxtaposed with portions of New Zealand and the Campbell Plateau. While the Pacific margin is well documented in terms of Cretaceous and Tertiary extension and rifting in the region, a sequence of magnetic anomalies records the opening of the Tasman Sea and splitting off of New Zealand about 85 million years ago. Many geologic parallels exist between New Zealand and Marie Byrd Land and although scientists know of the existence of a sequence of Cretaceous metamorphic events related to the rifting of Gondwanaland they are still unclear as to whether they were once part of the same unit. They hope to ascertain whether similar events occurred in this part of Antarctica by sampling and studying various exposed metasediments, carboniferous, plutonic and volcanic rocks in the Fosdick Mountains of the Ford Range where they believe the centre of a metamorphic core complex formed during rifting may exist. The team are from the University of California and led by Dr Bruce Luyendyk.

Another group from the Universities of Kansas and Nevada, under the leadership of Drs Rowel and Margaret Rees are seeking to understand the regional and depositional setting of Cambrian limestone sequences in the Pensacola Mountains, as well as their subsequent tectonic history. Such information will help them reconstruct the evolution of the ancient Pacific margin of Gondwanaland as well as that of East Antarctica. This season they will map and sample Cambrian successions in the rarely visited Argentina Range and will sample and measure sections in the more studied Neptune Range. Existing data suggests that the successions in the two areas are very different and they hope their work will explain this.

Volcanic crusts

Geologists from Northern Illinois University will be building on previously collected data on the nature of the upper and lower crust in southern Victoria Land as recorded in alkaline magmas of the Erebus volcanic province over the last few million years. Recently they found that 450-500 million year old dikes like those in southern Victoria Land exist some 600 miles north in northern Victoria Land and this summer will expand their knowledge of the Antarctic crust by sampling contemporaneous alkaline magmas of the Hallet volcanic province. This will help them understand better the geologic and tectonic history of the Trans-antarctic Mountains as well as the tectonic history of Gondwanaland.

Further work on the crustal structures will be undertaken by a team from the Byrd Polar Research Center led by Dr Terry Wilson in two stages. During stage one they will measure and map the orientation patterns of faults, fractures and igneous dike swarms at various sites along the front of the Transantarctic Mountains including Granite Harbour and between Mount Doorly and Marble Point. The second stage will focus on magmatic intrusions and fracturing from an older phase of uplift best exposed along the

polar plateau margin. They will be working near Allan Nunatak and Coombs Hill in the north and Shapeless Mountain and Mount Fleming in the south and from the data hope to establish the regional significance of the orientation patterns.

Seismic

A team from the US Geological Survey's Albuquerque Seismic Laboratory have previously surveyed sites and installed equipment in southern Victoria Land's ice-free valleys which will eventually transmit data in real time via a geosynchronous satellite to the US but in the meantime it is temporarily stored at Scott Base. When combined with data from the Worldwide Standardized Seismological Network it will provide needed azimuthal control for locating seismic events in both the Northern and Southern hemispheres. This summer the equipment will be maintained, cleaned and checked by Dr Nicholas Orsini and two others.

Mt Erebus

Dr Philip Kyle and others from the New Mexico Institute of Mining will spend up to six weeks each measuring the sampling volcanic gases and making video observations of the lava lake on Mt Erebus in order to monitor the latest eruptive cycle.

The lake is the top of a magma chamber and functions as a window through which the processes operating within a magma chamber can be observed. Work will also be undertaken on the nucleation and growth of anorthoclase phenocrusts (crystals often 88 mm long) well developed in older lavas and in the active lava lake and samples of volatile acid gases and trace metals collected from the plume.

Subsequently work will be undertaken on the West Antarctic Volcano Exploration (WAVE) project involving American, New Zealand and British personnel. Marie Byrd Land is one of the largest alkali volcanic provinces and contains a unique record of late Cenozoic glacial and volcanic history of Antarctica. Reconnaissance and recent studies have been limited to Mt Takahe and Mount Murphy but scientists know that earlier interpretations of the subglacial origins of the volcanoes are incorrect. They will study the geochemistry, volcanology and tectonic history of the volcanoes in the Executive Committee Range. Paleomagnetic measurements will be made and each volcano will be mapped and sampled.

Glacial indicators

Working from eight camps in various dry valley locations a team from the Wood Hole Oceanographic Institute under the leadership of Dr Mark Kurz will collect samples and measure quartz from sandstone boulders in dated moraines of Arena Valley to help date glacial deposits in the ice free areas of southern Victoria Land. These provide ideal sites for the use of the helium exposure age method previously used on meteorites and terrestrial rocks. From their results they hope to resolve some questions about the method and define better the history of the Antarctic ice-sheet and its relationship with global climate as well as understanding better the distribution and retention of helium with quartz.

Subglacial bedrock ridges disrupt the flow of the east Antarctic ice sheet exposing stratigraphic sections of old basal ice ablating to form supraglacial moraines. A team led by Dr Gunter Faure of the Department of Geology and Mineralogy will map the surface elevation and thickness of ice entering the Walcott Neve and Law Glacier from the Beardmore Glacier area to document the effect bedrock topography has on local ice-flow patterns. Oxygen-isotope techniques will be used to identify the composition of the Pleistocene-Holocene boundary in exposed ice, selected fragments from subglacial moraines will be studied to learn about the ice-drainage basin on the east Antarctic craton and they will look at the geochemistry, mineralogy and isotopic composition of silicate spherules found abundantly in the area's glacial sediments. By integrating the information they hope to explain the occurrence of meteorite and silicate spherules along the east Antarctic ice sheet margin and in other parts of Antarctica.

Evidence from the ice free valleys of southern Victoria Land and near the Beardmore Glacier also indicate that a younger massive over-riding by a polar ice

sheet occurred in the later Tertiary. Glacial, geologic and soil studies of lateral moraines suggest a less massive (later) Quaternary expansion that featured peripherial thickening and interior thinning relative to present situation.

Dr George Denton, of the University of Maine and eight other scientists will each spend up to three and a half months in the field collecting data to develop a glacial chronology, stratigraphy and description of tectonic uplift through critical time intervals represented by these glaciations. Operating from ten locations they will acquire data which they hope will improve the Antarctic glacial chronology and associated tectonic history of the Transantarctic Mountains and to allow numerical ice-sheet reconstruction that will lead to atmospheric modelling experiments of the influence of these sheets on southern-hemisphere climate.

Ice-coring

Ice cores provide valuable information on past atmospheric constituents and climate. In 1967 and 1968 glaciologists drilled and collected a 2,164 metre long core near Byrd Station. Returning to the site, which is now called the Byrd Surface Camp, during the season Dr Chester Langway of the State University of New York at Buffalo will lead a team planning to drill a 200 metre core and make a 50 km traverse taking 20 metre cores from selected sites. They estimate the 200 metre core will span about 100 years of snow accumulation extending from the present surface and overlapping with the profile of the earlier core. It will be measured and analysed along with the smaller cores and snow samples, collected as part of the programme.

They hope the data will provide new, continuous information for the last millenium from this location as well as updating information on the short and long-term changes in accumulation and climate variability, anthropogenic trends, volcanic disturbances and variations in the chemical composition of the atmosphere as reflected in snow layers. They will compare the record with cores obtained from other sites in the Antarctic as well as with significant geochemical and climatological signals and with similar environmental records obtained from studies of the Greenland ice cores. Three members of PICO (Polar Ice Coring Office) will be deployed at the camp to drill.

Hormones

In recent years researchers have determined that personnel who spent months in Antarctica made much greater quantities of thyroid hormones which play an important role in controlling metabolism. Dr Lester H. Reed of the Naval Medical Research Institute, Bethseda and his team will expand their biochemical and cellular studies to try to find out how and why individuals make more thyroid hormones and what the physiological implications of these higher levels might be.

NOTE: Further programme details will appear in our next issue

---

New Health, Safety, and Environmental initiative

Congress has sent a bill to the President that will enable the National Science Foundation (NSF) to launch next year a $180 million five year initiative aimed at providing improved health care and safety for US scientists and support personnel in Antarctica as well as lessening the environmental impact of the programme there.

The new US Antarctic programme initiative, included in the NSF budget for the 1990 Fiscal year was cleared by Congress on October 31.

Goals include improving medical facilities and providing field parties with safety experts who have medical training; achieving year-round operations with modern technology and minimum risks; cleaning up debris of past operations and bringing current operations into agreement with prevailing environmental regulations, attitudes and new technology.

Under the new initiative NSF will focus on waste disposal, environmental monitoring, communications and emergency facilities. More than half of the first year appropriation of $10 million (included in the NSF FY 1990 budget) and $30 million of the total $180 million will be for environment activities.

Fuel loss at Amundsen-Scott South Pole Station encourages new safety measures

An intermittent leak in the fuel system at Amundsen-Scott South Pole Station is suspected to have caused the loss of 43,895 US gallons of diesel fuel arctic (DFA) into the snow over an unknown period. Discrepancies in fuel supplies and usage were first discovered in August, 1989 but when no leaks could be located the difference was attributed to measurement error.

Amundsen-Scott South Pole Station is one of three year round research stations operated by the United States Antarctic Programme, funded and managed by the National Science Foundation. It is located at 90 degrees south on an ice sheet 9,200 feet thick and comprises three large geodesic dome and steel arches which cover buildings used to store gear and utilities.

DFA is essential for base operation. The station obtains its power and heat from three 250 kilowatt diesel-electric generator sets, one always in operation with another on standby and a third being maintained.

Nearly all of the station's supply of diesel fuel for the generators, and vehicles is stored in nine 25,000 gallon capacity rubber bladders housed under the arches and piped to a day tank in the generator room. The total fuel capacity under storage is 225,000 with additional fuel outside in a 10,000 gallon bladder and in 55 gallon steel drums.

Adequate fuel remains at the station to support normal operations until the austral summer season begins in late October when fuel resupply can begin.

Traditionally usage is just over 160,000 gallons per year but has increased recently because of a higher level of activity at the station. In 1989, 20 operation and management personnel and scientists undertaking research into the atmosphere and astrophysics have spent eight months isolated at the station where temperatures can drop down to minus 75 deg F. It is too cold for aircraft operations except during 12 to 16 weeks of the summer when the base is resupplied.

Daily measurements of fuel supplies are taken by "dipping" a stick into the tanks and correlating the height of the fuel against a table giving the number of gallons. Usage is read from a meter on the pipe supplying the fuel to the generator room.

On July 17 the staff reported 11,546 gallons of fuel on hand, 31,635 gallons lower than the previous week; normal fuel usage is about 2,500 gallons. Despite repeated searches between the time the initial discrepancy was discovered and August 21, employees at the station found no leaks in the lines or the bladders and based the discrepancy on the differences between the two measuring systems.

According to the manufacturer measurement error on the meters can occur at temperatures lower than 30 degrees F but in weekly reports of 25 July, 1 and 8 August usage figures determined by the meter were normal. On 16 August, usage, based on dipping, was reported as 5,067 gallons, about twice the usual figure. Four days later a pipe joint was repaired and the following day a significant leak in another joint, previously inspected, was discovered and repaired. By August 24 fuel loss was estimated at 43,895 gallons but the snow beneath the leak showed no evidence of sustained saturation.

On 27 August a report received in Washington from the station read "Fuel bladder dipping figures this week indicate that the leak discovered 21 August in the fuel arch was the source of fuel loss at this station. It is believed that the leak was of long term duration to have allowed the loss that we have experienced." Although experienced trades-

men suspected the leak they had been unable to locate it indicating that it was probably intermittent. Fuel consumption at the station has been normal since August 21.

The snow surface below the location showed no evidence of leakage or of the fuel dripping onto it and it is likely that the fuel has percolated down into the ice sheet and probably spread at the transition area between the firn (permeable ice) and the hard ice where it is likely to remain indefinitely. Snow at the surface is barely discoloured by the fuel and this contributed to difficulty in locating the spill.

With the nearest living organisms at Mount Howe, 165 miles away, the impact of the spill to considered negligible, however, measures to provide for visual or other indicators of fuel loss are being considered by the National Science Foundation. Currently these include dying the fuel to make it visible on snow or wrapping pipes in material which will change colour when exposed to fuel. Engineering improvements are also being examined. Additional flights to the station are planned for the season to replenish the lost supplies.

Note: Just as "Antarctic" was going to press another spill was reported at Williams Field, McMurdo Sound. New stainless steel tanks destined for the airfield are part of the seagoing cargo due to arrive in January.

West Germany

Nine women will run West German base

West Germany's permanent research station, Georg von Neumayer (70 deg 37 mins S 80 deg 22 min W) on the Princes Marthat Coast of Queen Maud Land, will be run by a team of nine women this summer and next winter. The scientists and technicians will spend 14 months in Antarctica from the middle of December. Since the station was established on the Ekstrom Ice Shelf in Atka Bay on February 24, 1981, men have been responsible for the winter operations.

A 30-year-old geophysicist, Monica Margaret Sobiesiak, was the first to suggest four years ago that a team of women could take over from successive all-male teams. With a fellow-geophysicist, Estella Weigelt, she drummed up support from women scientists. The Minister of Research and Technology, Beinz Riesenhuber, was amazed to learn of the number of highly-qualified women who had applied for the nine positions.

As in the case of past and present all-male teams the station manager is a doctor. She will have a staff of two meteorologists, two geophysicists, an engineer, electrician, cook and radio operator. The two youngest are 27; the oldest is 33.

All the women have husbands or companions in West Germany. None has children so 14 months away from home are not expected to create extra domestic problems. The women's lives will be lonely after the summer research teams have departed, usually towards the end of February. They will be cut off completely from the outside world for nine months and accessible only by radio.

Winter teams can bring a reasonable amount of personal effects with them but pets or pot plants are not allowed. There is no ban on alcohol and sparkling wine is usually served to celebrate birthdays and other appropriate occasions. Two and a half minutes of one telephone call a week are free and the service is sure to be used in full.

Wintering at George von Neumayer means living six metres between snow and ice in two steel tubes 50 metres long and 7.5 metres in diameter. These tubes are the main part of the station. Inside them are modules which contain living and sleeping quarters, a galley and mess, a sick bay, laboratory, workshop, radio operator's room, two generator rooms,

and a snow melting facility.

On the Ekstrom Ice Shelf the mean temperature in winter can drop to minus 46.1 deg Celsius. Minus 35 is usually normal in July. Snowstorms between 64.75 and 97 knots have been recorded in past seasons. Temperatures indoors are far more acceptable. They are between 18 deg and 20 deg C and make life beneath the snow more like home.

Selection of the first winter team of women has been made partly on the basis of their physical and mental stamina and their ability to work in small groups. They have undergone endurance tests in the Otztal Alps on the border of Austria and Italy which lie mainly in the Austrian Tirol and have peaks rising to the highest, Wildspitze (3777m). Although all the women have had thorough scientific or technical training they have been back to school again since their selection to learn to handle the technical and scientific equipment they will be using at Georg von Neumayer.

Subantarctic

Major New Zealand expedition to the Auckland Islands

New Zealand's Department of Conservation has organised a major expedition to the Auckland Islands involving 28 science and management staff from the Department, the National Museum, National Archives, a camera film production team from Television New Zealand and artists preparing work for the Southland Museum and Art Gallery's proposed "Roaring 40s Gallery".

Responsibility for management of New Zealand's subantarctic islands passed to the Murihiku District of the Department of Conservation on 1 April, 1987. The office is based in Invercargill (in the province of Southland) and its staff have recognised the potential for development of adventure tourism and education as part of its conservation strategy.

Led by Lou Sanson, operations manager and senior conservation office Andy Cox, who is the expedition's field operations leader, both from the Department's Southland District office the first party in the team sailed on the frigate Southland from Lyttelton on 27 October. The vessel is undertaking a routine sovereignty patrol. A second party is traveling south on the Acheron.

The Auckland Islands which lie at latitude 50 deg South, comprise one large and five smaller islands and a number of detached rocks and islands. Their total area is 72,600 hectares. Discovered in 1806 they have an infamous history from the days when sailing ships took the great circle trading route from Australia to Cape Horn. Eight ships and 100 lives were lost between 1864 and 1907, the most famous being the wreck of the "General Grant" in 1866.

Isolation has contributed to the survival and international recognition of the Islands for their unique flora and fauna. They have the southernmost tree-fern in the world and also dense Rata forest. Forty-nine species of bird breed on the Islands, including three species of penguins, 17 albatrosses and petrels. The Islands are also home to New Zealand's largest indigenous mammal the Hooker's Sea Lion, with a total population of no more than 6,000.

Because of the shipwrecks, pigs, goats, rabbits, sheep and cattle were introduced to the islands as food for castaways and these have had a dramatic effect on the vegetation and the wildlife, particularly on the mainland Auckland Island. The wild goats have

extensively modified the coastal vegetation of the northern mainland island.

A major purpose of the expedition is to remove the last of the wild goats not yet taken by Landcorp for their selective breeding programme whereby goats have been bred true-to-type at Ahaura on the West Coast but interchanged with feral bucks at Snowdon in Southland.

Scientists will make vegetation surveys to assess the impact of animals on the Islands. Others from DOC include Dr Cath Walker, a specialist in snails from Nelson; Dr Peter Moore, a biologist from Wellington studying Yellow-eyed penguins; Rhys Buckingham, an ornithologist, and Brian Rance, a botanist from Invercargill. Other DOC personnel included Kingsley Timpson and Dave Anderson (Stewart Island), Chris McMullen, John Peterson and Pete McClelland all from Invercargill.

Conservator

Also on board Southland was Jack Fry, former conservator at the National Museum, who will complete a chemical and wood conservation programme of Castaway depot and the historic sites of Port Ross. The depot was built by the crew of SS Stella between 1-9 May, 1880 and provisioned for shipwrecked sailors. Andre Apse, a photographer, is also with the expedition.

On November 13 a further group left subsequently on the Acheron. They included Ken Scadden from National Archives who is undertaking an historic interpretation of the sites and a crew from "Wildtrack", part of Television New Zealand's Natural History Unit in Dunedin. Dave Randal will be the presenter, and Kate White, the director of forthcoming programmes on the wildlife and megaherbs of the Auckland Islands for which Paul Donovan is camera man and Lloyd Pearson is on sound. A newsperson will accompany the team.

Also included in the two parties of the expedition are six artists — Hamish Campbell (Havelock North), Bill Hammond (Lyttelton), Gerda Leenards (Wellington), Shaun Burdon (Dunedin), Linda James (Christchurch) and Chester Nealie (Helensville). Four art-photographers — Laurence Aberhart (Bay of Islands), Helen Mitchell (Wellington), Lloyd Godman (Dunedin) and Ian MacDonald (Auckland) — are part of the team.

Work produced by the artists will be part of the Trust Bank Southland Art Foundation exhibition which is to tour New Zealand after display in Invercargill. It is then hoped that part of the exhibition will be permanently housed in the proposed "Roaring Forties" Gallery to be accommodated in a newly completed 280 square metre building as part of the Southland Art Gallery and Museum redevelopment. Funded by local charities, from accrued funds and by the Department of Conservation the whole complex is expected to cost approximately $2 million and is the main element of Southland's contribution towards New Zealand's 1990 celebrations.

Interpretation

The "Roaring Forties" interpretation gallery will emphasise human and natural history of New Zealand's subantarctic islands. Experience oriented it will draw on the combined talents and resources of the Musuem and Art Gallery and Department of Conservation in bringing alive the natural nd historic heritage of New Zealand's subantarctic islands as an international attraction which will include a simulated Rata forest and an "aurora" ceiling and audio visual presentation.

Five island groups in New Zealand's subantarctic will be represented. They include the Antipodes, the Snares, Campbell Island, the Auckland and Bounty Islands. The islands are rich in "human" history. Early sealing parties were left on Bounty, Snares and Antipodes for months at a time and occasionally abandoned altogether. The convict crew of The Adventure spent seven years on the Snares. Auckland and Campbell Islands were a focus of the whaling industry. Attempts were made to establish a British colony — the Hardwicke Settlement — on the Auckland Islands.

Links with Bluff are strong, particularly in terms of servicing of the early whaling and farming operations and castaway depots as well as the war-time coast-watch stations. Material from Australia's Macquarie Island will be shown in the centre designed to cater for visitors to Southland, many of who will never see the subantarctic islands.

Subantarctic tourism

The islands under sail

Applications to New Zealand's Department of Conservation by tour operators to visit New Zealand's subantarctic islands have increased from none in 1987 to one cruise with 18 passengers in 1988, two cruises with 36 passengers in 1989 and an application to send nine cruise ships and five tour boats with a total of 1700 passengers in 1990/91. One of the vessels visiting the area in a more traditional way is SV Tradewind, owned and skippered by Mark Hammond of Dunedin.

This season she will make three trips to the sub-Antarctic Islands; the first from Hobart to Dunedin via Macquarie, Campbell and the Aucklands, Snares, and Stewart Island from 19 November to 17 December. Prior to the second and third trips, which are from Bluff to Bluff return, the vessel will take part in the 1990 Tall ship event in the North Island of New Zealand early in the new year. The subsequent sub-Antarctic trips are scheduled for 21 February to 13 March and 17 March to 2 April. The costs are $7344, $4987 and $3890 respectively. Unlike last season's voyages, the vessel will be fully crewed and passenger participation is voluntary.

Last season Canterbury Branch member Ian Harkess took the second voyage undertaken by Tradewind and provides this account of visiting New Zealand's sub-Antarctic Islands under sail.

Tradewind is a square-rigged topsail schooner of 205 tons (laden) or 107 tons gross registered tonnage. She is 123 feet long overall and 92 feet at deck level with 82 feet at the waterline and 21 feet across. The mast is 104 feet and the hull of lugger design. Her career has included fishing, motor/sail cargo, motorised cargo and houseboat.

SV Tradewind was built at Capelle, the Netherlands in 1911 and originally named Anne Marie. Renamed and modified several times, she was brought by her present owner Mark Hammond as the Aaltje Willen and further modified in Amsterdam during January and March 1987 prior to taking part in the First Fleet Reenactment as part of the Australian Bicentenary celebrations of 1988.

Last season she made three voyages to the sub-Antarctic islands. The first to Macquarie, Auckland, Snares, and Stewart Island finished in Dunedin while the second to Campbell, Auckland, Snares, Stewart concluded at Bluff from where the third voyage left for the Snares, Auckland and Campbell Island and concluded in Dunedin. She carried a permanent crew of eight and 20 trainees who were expected to stand watch for four hours at night and three during the day as well as acting as helmsman, assisting with sails and

the associated rope work, cleaning, polishing the brass and cooking.

On 22 January, three French, four Australians, two Americans and 11 New Zealanders boarded SV Tradewind. Personal gear was stowed and the trainee crew instructed in fire, man overboard, life jacket and safety equipment drills followed by familiarisation and the rules of the ship.

Large quantites of stores and gear required for the voyage were loaded, unpacked and stowed on the Monday morning. Some of the supplies were destined for the remote meteorological station at Campbell Island. By 11.10 am the outer and inner jib, upper and lower topsails and the foresail had been raised and with supplementary motor power the ship left the Birch Street Wharf, a camera crew from Television New Zealand and a small crowd of wellwishers who had gathered for the occasion.

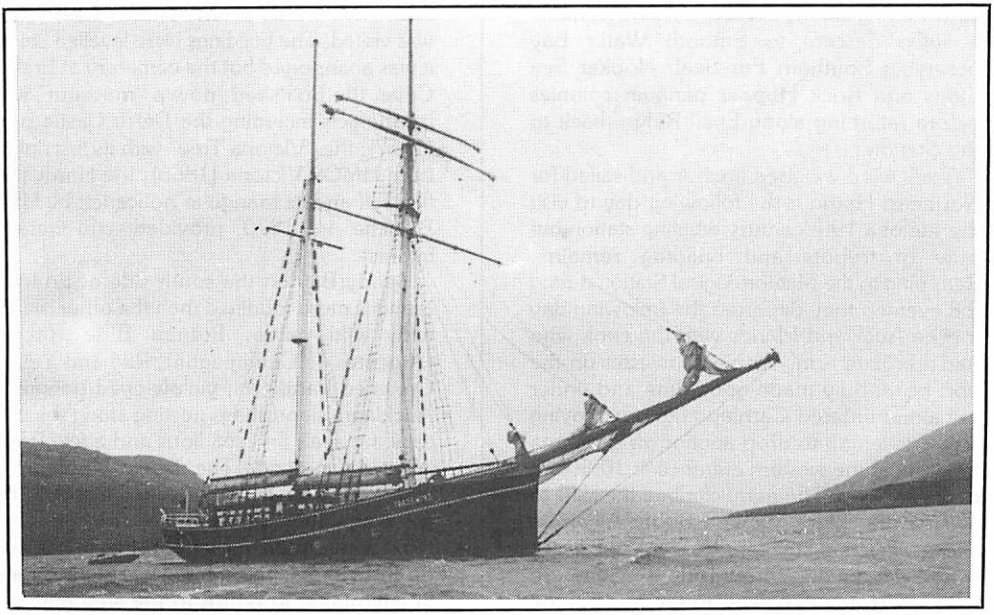
Outside Tiaroa Heads Tradewind ran into a steep swell and a 35 knot SW wind. The sails were reefed and the ship plugged into the heavy seas. At 3 pm "for the comfort of those on board" the ship turned about and found shelter for the night in a bay four miles north of Otago Harbour.

Heading south into a longer swell the following day Tradewind made five knots under motor-sail. Cape Pigeons, various albatross and other seabirds followed closely and during the afternoon the crew exchanged greetings with Sealord, a fishing boat which passed close to starboard. Only five of Tradewind's complement attended the 5-6 pm happy hour, and even as they grew accustomed to the motion of the ship and its routines, few had large appetites.

The long swell continued but by 27 January the vessel was under sail with no motor but in the rough conditions safety harnesses were essential on watch. The log read 451 nautical miles.

Campbell Island was sighted at dawn and the views of Courrejolles Point and Bull Rock off the North Cape and the headlands of the eastern coast were spectacular. Tradewind entered Perseverance Harbour and anchored off the Meteorological Station at 11.30 am.

SV Tradewind at anchor off the Meteorological station, Campbell Island. Photo: Ian Harkess.



The launch Aurora escorted the party ashore to a welcome from the base staff and an afternoon exploring the environs comprising Beeman Hill, the remains of the Tucker Cove Coast Watching Station, Camp Cove and the first homestead. Hooker Sealions were observed. The following day the party tramped through Dracophyllum and peat bog to the western coast and North West Bay with fine views of Courrejolles Point and Dent Island. They passed nesting Royal Albatross and admired the megaherbs Stilbocarpa, Pleurophyllum, Bulbinella, and Anisotome in flower. At Windlass Bay there were remnants of last century's whaling activities and a small colony of Elephant Seals while in Northwest Bay a large colony of Sea Lions could be observed. The party climbed Mount Menhir, descended to the Rock Hopper penguin colony at Rocky Bay and returned, via Mount Dumas, to the station to celebrate a 20th birthday.

Philatelic mail and a climb of Beeman Hill with its commanding view of Perseverance Harbour and the Station filled the Sunday and the following day the party was taken down the Harbour in the Lancer to climb Mowbray Castle and to Northeast Hut. They passed a large nesting colony of Royal Albatross, made a steep descent to Smooth Water Bay observing Southern Fur Seal, Hooker Sea Lions and Rock Hopper penguin colonies before returning along Lyell Ridge, back to the Station.

Tradewind weighed anchor and sailed for Northeast Harbour the following day to visit the site of a 19th century whaling station but now of trypots and building remains. Returning to the Meteorological Station during the evening they departed the following day for the Auckland Islands with the cook who had a broken arm. With a souwester on the port beam they made good time and under sail alone entered Carnley Harbour moving down its length to drop anchor off Breaksea Point, near the western entrance at 10.50 am on 2 February. The party climbed the cliffs to observe the Light Mantled Sooty Albatross and walked along the tops to near Cape Lovitt before descending through dense Southern Rata forest, in full flower, to the head of the Western Harbour.

Tradewind subsequently negotiated the Victoria Passage, a gap of 90 feet between rocks with very strong tidal eddies and sailed past South West Cape and up the western coast to Bristow Point to look at Disappointment Island before sailing back through the passage and north to the head of Carnley Harbour. The area of Rata cut by the crew of the German freighter Erlangen in 1939 was clearly visible (Antarctic Vol. 11 No. 1) and they visited the Grafton, wrecked in 1864, and the campsite at Epigwaitt where the survivors spent the following 19 months.

The site of No. 2 Coastwatching station at Tagua Bay and the Lookout Station dating from 1940 with its commanding views of Carnley Harbour was visited before the party walked up Wilkes Peak.

On 5 February Tradewind sailed up the eastern coast and into the picturesque Hanfield Inlet, featuring the southern-most occurrence of Tree Ferns and, where Ratas were in flower. The party then made their way past Kekeno Point to Ranui Cove and the No. 1 Coastwatching station and Lookout, with a panoramic view of Port Ross.

The site of Hardwicke, the Enderby settlement which survived from 1849-1852 was visited. The buildings were levelled before it was abandoned but the cemetary at Erebus Cove, the Boatshed, now a "museum" with its artefacts including the Derry Castle punt (1887); the "Victoria Tree" with its inscription from HMCS Victoria (1865); the Hardwicke flagstaff and its triangular notice left by HMS Blanche in 1870 provided considerable interest.

Sandy Bay on the south side of Enderby Island is more modified than the other islands with wild cattle, French Blue Rabbits (Argentes de Champagne), Red and Yellow Crowned Parakeets, yellow-eyed penguins, Auckland Island shags nesting along the cliff-tops, fur seals and sea lions and a few Royal Albatross nesting. The Derry Castle reef, where the barque was wrecked in 1887, the grave amd memorial to the 15 sailors lost and the stormy conditions left a lasting impression on the visitors who overturned their Lancer in attempting to return to the ship and had

to stay on Enderby overnight in a force ten gale gusting to force 12.

At 8 pm on 7 February the ship left the Auckland Islands and late the following afternoon approached the five islands of the western chain of The Snares, sheer rugged rocks with no vegetation, and seas breaking over them. The main islands particularly the pinnacles of Broughton Island and off the North Promentary were notable. Hoving-to off Boat Harbour the ship was visited by Sooty Shearwaters (mutton-birds) but the party were unable to land and the following day berthed at Oban in Halfmoon Bay on Stewart Island before sailing for their final destination at Bluff.

Bahia Paraiso

Sunken Argentinian supply vessel; a continued concern

Reports from Palmer Station in early November indicate that the Argentinian navy's supply vessel Bahia Paraiso which sank off Anvers Island in January 1989, has rolled further on to her side and slid down the slope on which she rests. Five or six feet of the side of the vessel are visible at low tide but at high tide she can hardly be seen. Occasional rainbow coloured patches, about two feet across, suggest slight intermittent fuel loss probably from the tanks. Environmentally there is no visible impact but the National Science Foundation is sending a team comprising groups from four or five institutions to the site in March 1990 to assess the effect on the whole ecosystem.

Bahia Paraiso, the 430 foot Argentinian ship carried tourists, and fuel and other petroleum products to resupply Argentinian stations in the Antarctic Peninsula region. In the morning before the accident many of her 81 tourist passengers including 41 Americans had begun arriving at the American National Science Foundation's Palmer Station at 9 am on January 28 to meet science and station personnel. After two and a half hours they returned to the ship to continue their trip to other sites in the Peninsula region. As the ship left the harbour area it struck an underwater ledge ripping a 30 foot, 10 metre, gash in its side and grounded about 2 miles or 3.2 km from the station. One crew member sustained minor injuries.

The ship's captain called for assistance and 26 members of the Palmer Station crew took small motorised rubber boats (zodiacs) to transport people from the ship to Anvers Island. The operators of tourist ships nearby were contacted and asked to assist. The Society Explorer, owned by the Seattle Tour Company, arrived as life-rafts were being thrown into the water and left the area with 132 passengers and crew from the stricken vessel. The Illyria, a Greek ship chartered by the New York based firm Travel Dynamics arrived at 11 pm and took on 80 passengers and crew.

Bahia Paraiso's evacuees were disembarked at the Chilean station Teniente Marsh on King George Island, flown to Punta Arenas by the Chilean airforce and on to Argentina by the Argentinians.

The first group of the remaining 104 crew members from the Bahia Paraiso left the station on board the Chilean Cruz de Forward on 1 February and the second on board the Spanish ship Las Palmas on February 4.

At the time of the accident the ship's 37 tanks contained about 250,000 US gallons of various types of fuel intended for the ship and for resupply of the Argentinian stations Esperanza 200 miles south of Palmer Station. An estimated 200,000 gallons of diesel fuel, 21,000 gallons of JP-1, a lightweight fuel used by the ship's two helicopters, 18,000 gallons of lubricating oil, about 450 55 gallon drums of diesel and 217 canisters of compressed butane and propane gas.

As the ship grounded oil seeped from the hull forming a 0.4 square mile (1.59km) fuel slick. After about four hours the slick spread east towards the west and south beaches of Togersen Island, into Arthur Harbour close to the station where personnel reported fuel thick enough to discolour the water and the sea ice and that it was washing up on nearby beaches.

During the next 24 to 26 hours a light film to the south and southwest of the station was noted but fuel was particularly visible around Shortcut Island and in an area formed by Hermit, Christine and Limitrophe Islands. It was more concentrated in the channel between Christine and Limitrophe Islands.

By 31 January winds, currents and tides had freed the ship which drifted to a new location near De Laca Island about 1.25km from the station where it beached, rolled over and sank leaving about 20 percent above the water. Barrels of fuel and canisters of gas broke from the deck and floated from the ship to be collected, where possible, by station personnel and the Argentinian crew.

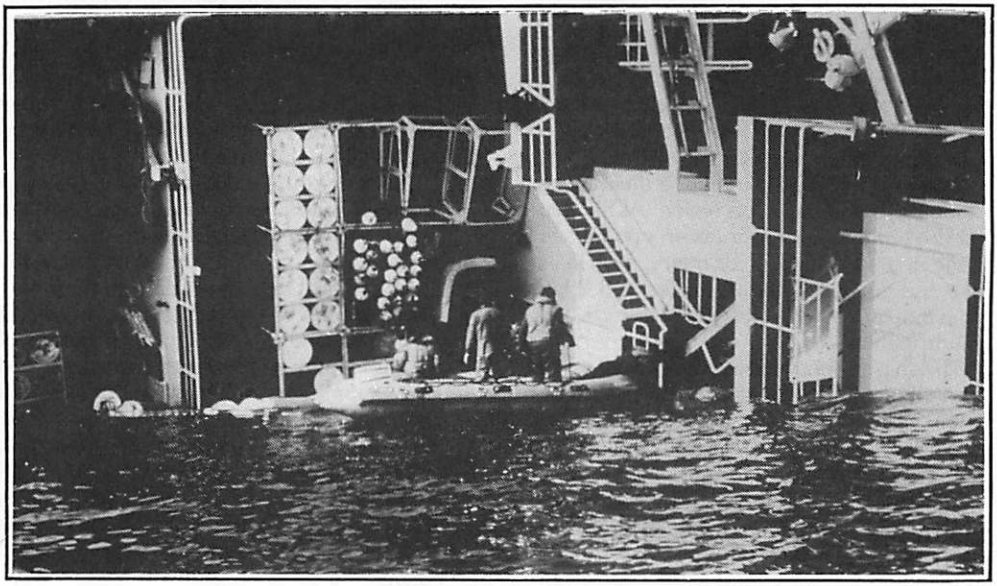
Fuel spilled from the tanks was carried south and southwest for about 3 miles and after reaching the shores of Janus, De Laca and Hermit Islands split into two, one stream flowing towards the Christine, Limitrophe and Hermit Islands and the other past Leggard and Jacobs Islands away from Anvers towards the Newmayer Channel. By February 1 it was estimated that slicks of fuel and pools of sludge floated in an area of 6 miles (10 km) around the station.

US officials had begun organising containment resources and discussed with the Argentinians ways of minimising the impact. Between 4 and 7 February Chilean and Argentinian aircraft and ships surveyed the site. On the fourth the Argentinian Navy Ship Almirante Irizara arrived and two days later the Chilean Tender Yelcho reached the site. Its crew placed a containment boom around the stricken vessel.

The following day a US team of 13 arrived. They had flown from the Naval Air Station at Norfolk, Virginia leaving at 2 am on the 7th aboard a US Air Force C5 Galaxy for Punta

Continued on page 449.

"Barrels of fuel and canisters of gas broke from the ship to be collected, where possible, by station personnel and the Argentinian crew." — Photo Ted de Laca.



Swan's polar double

Men of seven nations walk to North Pole

Robert Swan, British leader of the International Icewalk Expedition, which reached the North Pole on May 14 after a 56-day journey across the treacherous ice of the Arctic Ocean from the Canadian high arctic, is the first man to walk to both Poles. In the 1985-86 southern summer he reached the South Pole on foot with two companions.

This time he had seven companions — an Englishman, Rupert Summerson, an Australian, Graeme Day, a West German, Arved Fuchs, a black American, Darryl Roberts, a Japanese, Hiro Onishi, and a Canadian Inuit (Eskimo), Angus Cockney. The team was resupplied by air and had radio communication with support teams at its departure point, Cape Aldrich, and Resolute, a Canadian research station on Cornwallis Island at 74 deg 42 min N/94 deg 54 min W. They walked and skied nearly 1000 km hauling plastic sledges loaded with tents, stores and supplies.

On the afternoon of March 20 the eight men set out from Cape Aldrich on the Aldrich Ice Shelf which is south-east of Aard Hunt Island (83 deg 10 min N/74 deg 30 min W), the northernmost point of the Canadian Arctic and the starting point for other expeditions attempting to reach the Pole. The weather was good but satellite picture of the route, especially the first 160 km, showed 12-metre ice walls, indicating extremely difficult going ahead.

Because of very low temperature and atmospheric conditions radio communication with the Cape Aldrich and Resolute support teams was difficult at times. There was little news of the first two weeks' struggle to find a way through towering pressure ridges to flat ice where the team could have respite from hours of walking and make better progress on skis.

In the third week of April two detailed dispatches to "The Times", London, from Robert Swan revealed that conditions were appalling.

The eight men had covered more than one third of the journey but still had to battle more pressure ridges 10 to 12 hours a day, and at times made only 8 km instead of averaging 16 at least.

Early in the second week there was no radio contact with Cape Aldrich for three days. Graeme Day almost exhausted the radio batteries but finally made brief contact on April 13. After a dark and dank day on April 14 the party made better progress. The weather warmed and frostbite abated. But ahead of the weary men the Arctic Ocean's ice was starting to break up, and there were reports of large open leads at 88 deg N.

At the end of a grim day in a mess of ice floes forcing up heaps of old hard ice, which, at times, was unsurmountable, the party camped at 85 deg 40 min N, having covered 290 km from Cape Aldrich. Hopes for an airdrop of supplies on April 15 were tempered by fears that with no radio contact the pilot might miss the party which had had no time to mark out a landing strip. On the previous week's drop the pilot found the party merely by chance.

In the next report from 86 deg 20 min N 71 deg 33 min W, after the party had advanced another 74km Swan reported that Roberts had been limping for most of the journey in obvious pain from his frostbitten toes which Dr Malakhov had to dress morning and night. Summerson was battling dehydration, Fuchs had a frostbitten nose, Day was sore from the harsh straps of his pack and Onishi had flu, probably brought in on a resupply flight.

Despite their weariness and physical ills the

eight men did not stop their science and medical schedules, and the collection of evidence on the dangers to the environment caused by air pollution and ozone depletion. Summerson continued to shovel snow samples into plastic bags for pollution testing, and others noted the Arctic haze on the horizon like smog — a product of atmospheric pollution.

By April 18 the party had brief relief from the almost impossible terrain. Two hours of ski-ing became possible on large flat ice floes. But progress was then checked by chaotic ice and fresh snow, and the day's run was only about 11 km.

Suddenly the weather was warming rapidly. It was alarming because there were open leads of water ahead. Already the party was spending hours crawling across skis laid as bridges over smaller leads. Dr Malakhov, a seasoned Arctic traveller, organised the crossing with great efficiency. The base camp was asked to prepare the amphibious sledges in case of wider leads near the Pole.

April 19 was almost too hot — about minus 20deg celsius — and was marked by rough sea ice and grainy snow. The party had to travel between two and four hours west to avoid a large lead some 18 m wide and find a crossing point — a thin bridge of fresh ice. The last three hours were on flatter ice. On the next day the party was able to ski 18 km on the flattest ice of the journey to date.

After nearly 40 days the party was reported from London to have covered 354 km and to be almost halfway to the Pole. At the start of the second week in May the eight men were 87 km from 90 deg N, and on May 13 had come within a day's walk of their goal.

On May 14 they were there, but Swan did not lead his team. He walked the last few metres to 90 deg North to give Summerson the honour of becoming the first Briton to reach there on foot. It was a first for everyone else, Australian, West German, Japanese, Inuit and Russian (from the Canadian side).

Swan had scored a double; Darryl Roberts, the 23-year-old New Yorker, gained a triple first. He was the youngest man, the first American on foot, and the first black American since Matthew Henson, the only black explorer in Arctic history, reached the Pole with Peary and four Eskimos 80 years earlier.

Robert Swan and his men were at the North Pole; the next job was to bring them back from the ice they had walked across for eight weeks. At the expedition's support base in Ottawa there was concern about the ability of the ski-equipped Twin Otters to land on rough ice in poor visibility.

It took nearly 24 hours for the weather to clear. The Twin Otters, which had to fly 1000 km from Ellesmere Island, made their first landing under low cloud on a cracking ice floe halfway out from the land to pick up drums of fuel for the return flight. Their next landing was on a short and rough strip marked out with black plastic bags by Swan and his men during the previous 24 hours.

Twelve visitors climbed out of the aircraft and walked 100 m across the ice towards a silent group of sunburnt, frostbitten men. Hands were shaken, backs slapped, and Hiro Onishi bowed to his visiting countrymen. Then came a jeroboam of French champagne; the flags of seven nations were flown in a chilly wind whipping across the snow in a temperature of minus 15 deg C; the journalists asked questions and cameramen recorded publicity shots for the expedition sponsors.

Positively the last time ...

Swan told everyone it would be positively the last time he set foot on ice, and he would go on no more polar expeditions as long as he lived. But then, according to Charles Bremner, of "The Times", he began waxing lyrical about his plans to build a giant airship and circle the world, ending at the 1992 Olympics in Barcelona, to direct attention to the need to stop damage to the world's environment

Dr Malakhov, for whom the Arctic is a way of life, intervened and told him to relax. Then the Soviet doctor who nursed his comrades through their worst physical hardships, tending their frostbitten faces, fingers and feet and saving them from falling through the ice, quietly assessed what they had all achieved. He said the ice was far rougher than he had

encountered before, and the early thaw greatly added to their difficulty.

With the weather closing in again it was time to leave, but not before Swan and Dr Malakhov formally ended Icewalk by cutting the traces off the leader's plastic sledge. Everybody climbed aboard, the Twin Otters and they bounced across the rough ice into the air again and turned south for Resolute and home.

Australia awards seven more Antarctic medals

Two women and the first person to have been leader at each of the Australian Antarctic stations are among the seven Australians awarded the Antarctic Medal in recognition of their outstanding service with Australian Antarctic expeditions. The awards were announced by Australia's Governor-General at mid-winter.

Denise Allen of Diamond Creek in Victoria spent three winters, two of which were consecutive at Mawson, as an observer for the Bureau of Meteorology. During this time she was also involved in many duties including a water sampling programme for Monash University in the Vestfold Hills Lakes, marking routes to the ice Plateau for station programmes and establishing fuel dumps as well as assisting other scientific projects. In 1988 she served as part of the medical team and acted as a general nurse and as first aid officer and as anaesthetic assistant during an emergency operation.

Dr Dianna Lynn Williams of East Lindfield, New South Wales was medical officer at Macquarie Island in 1981, Mawson in 1984 and Heard Island for the summer of 1985/86. Her research work, culminating in her Doctorate of Medicine, was performed under difficulty without the usual laboratory support and has been recognised internationally as making an outstanding contribution to immunology, endocrinology and health in polar regions.

Mr Willem Phillip Barnaart of Kingston, ACT is the first person to have been leader at the four Australian stations — Mawson, Davis, Macquarie Island and Casey. He led the traverse for the re-establishment of the Prince Charles Mountains Route, making it shorter and safer and facilitating the re-opening of the area for a summer base and accompanying science programmes. The establishment of a new field hut in the Colebeck Archipelago was also initiated by Mr Barnaart.

Others receiving the medal included Daniel O'Reilly of East Doncaster in Victoria, who was the Australian Construction Service Leader at Casey in 1983, at Mawson in 1985 and at Davis in the summer of 1987/88. David Rockley McCormack of Hawkes Nest, NSW wintered as plant inspector six times from 1972 to 1988 when he maintained all the mechanical facilities at Mawson and prepared all vehicles and associated equipment for the spring and autumn traverses to the Prince Charles Mountains.

Russell Albert Rachinger of Ararat, Victoria was station leader at Casey for 1987 during which he revised fire safety procedures, recommended operation procedures for travel on the sea-ice in the area and organised the identification, packaging and return to Australia of over 40 tonnes of waste materials and surplus stores as well as helping in field operations. Graham George Robertson of Kingston, Tasmania, was a biologist at Mawson in 1988 during which he pioneered a research programme on breeding and feeding of emperor penguins. As this occurs from July until November he spent most of the winter in the field.

The Antarctic Medal was presented first in 1987 when it replaced the polar medal which was British in origin. It ranks immediately below the Australian Bravery Medal in the Order of Precedence of Honours and Awards.

Books

New Antarctic Chronology due

Chronological list of Antarctic expeditions and related historical events. (ISBN 0 521 30903 4). 730 pages including 63 of plates, maps and graphs. It may be ordered from The Trade Department, Cambridge University Press, The Pitt Building, Trumpington Street, Cambridge, United Kingdom, CB2 1RP at a retail price of approximately £58.00.

The "Antarctic Chronology" will be published by the Cambridge University Press, as one of the Studies in Polar Research series, in the northern autumn of 1989. The work, which has been compiled by Robert Headland, archivist at the Scott Polar Research Institute, Cambridge, is a comprehensive revision of Dr Brian Robert's version published by Polar Record in 1958 (9[59]: 97-134, [60]: 191-239), with the addition of a concise introduction, an index, maps and references.

The revised list contains 3342 entries from 700 BC to 1988 compared with the 664 entries from 650 AD to 1958 in the earlier edition. Most of the entries are for expeditions or voyages and give dates, nationalities, leaders (or captains, etc), vessels, a brief description, and, where appropriate, a reference. For other events such as inventions, a date, details of persons, countries, and a brief description are provided. Occasional entries are in different form depending on their significance and the amount of information available about them.

Discovery

Covering the far south in general and the Antarctic in particular the early voyages which discovered the Cape of Good Hope and Cabo de Hornos are included, together with those which are important to the discovery and early history of the far southern temperate islands Tristan da Cunha, the Falkland Islands and some of the oceanic islands around New Zealand.

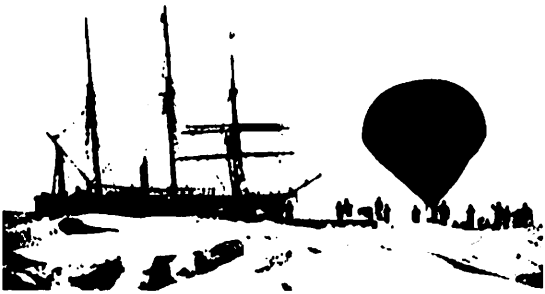
For most of the subsequent period, after about 1890, the Antarctic continent and adjacent islands, as well as: Ile Amsterdam, Auckland Islands, Balleny Islands, Bouvetoya, Campbell Island, Iles Crozet, Gough Island, Heard Island, Iles Kerguelen, Macquarie Island, McDonald Islands, Peter I Oy, Prince Edward Islands, Illes Saint-Paul, Scott Island, Shag Rocks, South Georgia, South Orkney Islands, South Sandwich Islands and South Shetland Islands are covered. The region represented by the Antarctic Treaty is included in the document which also covers virtually the same area with which the Scientific Committee on Antarctic Research is concerned.

1890—1914

The early entries consist mainly of explorations and voyages penetrating the far south. The majority of the nineteenth-century expeditions were undertaken by sealers, who discovered many and visited nearly all the peri-Antarctic islands, and there are also records of several scientific expeditions. From about 1890 until 1914 the expeditions of the heroic age of Antarctic exploration together with whaling voyages feature and from then until about 1939 many scientific expeditions from various nations predominate. The regular annual expeditions of several nations form the bulk of the entries for the period after 1945 and these are continued to 1988. Information from this period includes the opening and closing of stations, major traverses, details of scientific programmes and a large variety of other occurrences.

Related historical events which have been included cover inventions and discoveries important in Antarctic exploration such as aircraft, photography, preservation of foodstuffs, the development of the Primus stove and the discovery of the cause of scurvy; political events, treaties and wars affecting the region; the foundation of scientific institutes

The German South-Polar Expedition aboard the *Gauss* 1901–1903



A photograph of scientists at work beside the Gauss

From that heroic period of Antarctic exploration at the beginning of the 20th century the expeditions led by Scott, Shackleton and Amundsen are the most familiar. There were however other important ones, less dramatic perhaps in terms of adventure, but achieving much in science and exploration.

One of these was the German expedition, led by Dr Erich von Drygalski, a physicist who had already spent four years in Greenland. He headed a strong scientific team on an expedition characterised by the thoroughness of its preparations. The German Government financed the building of a special ship, the *Gauss*. Drygalski's departure in 1902 was Germany's response to the new European fever for Antarctic exploration.

Drygalski had taken special care to look after his men. Through the long winter morale was high, with the *Gauss* resembling an isolated village – warm, convivial, relaxed – whilst outside the storms raged.

Their studies in meteorology, magnetics, oceanography and biology were of great importance and resulted in 20 massive volumes of results that occupied Drygalski for over twenty years. Despite their discovery of Gaussberg and the claim for Germany of the area from 89° to 94°E, named Konig Wilhem Land, the Kaiser was disappointed. Drygalski's request for a further season was refused and this first German foray into the Antarctic was over.

The lengthy and detailed narrative of the expedition was published in 1904. This is now a very scarce book and, because little was published about the expedition in English, its achievements have been largely overlooked.

Now, for the first time, there is a complete translation of the text liberally illustrated with many of the photographs and drawings produced by the expedition. At last the story of this successful early voyage into the Antarctic, the second to winter in the ice, is now accessible to all interested in Antarctic history.

PRODUCTION DETAILS

The extent is 384 pages set double column and containing illustrations and drawings selected from the original 1904 edition and the scientific reports. The size is 276 × 219 mm (10⅞″ × 8⅝″) printed on woodfree paper and bound in a brown cloth, blocked in black and gold on front and spine, with a design from the original edition.

ORDER FORM

Please send me ..... copy/copies of Drygalski, *The German South-Polar Expedition*

☐ Post publication orders @ £49.95 or $95 including postage

I enclose remittance for ..... (cheques payable to *Erskine Press* or *Bluntisham Books*)
or debit my Credit Card Account by the above amount.

ACCESS ☐ AMERICAN EXPRESS ☐ MASTERCARD ☐ VISA ☐

Card Number..... Expiry Date .....

Signature .....

Name (in capital letters).....

Address (in capital letters).....

.....

BLUNTISHAM BOOKS · EAST STREET · BLUNTISHAM · HUNTINGDON PE17 3LS · ENGLAND

ERSKINE PRESS · ALBURGH · HARLESTON · NORFOLK IP20 0BZ · ENGLAND

and initiation of publications concerned with Antarctica.

Each entry is numbered and indexed accordingly, the 27,000 entries, prepared with the aid of computer, specify the full names of persons and vessels (with dates in parenthesis), placenames, names of institutes and publications, names of Antarctic stations, together with references to inventions, legislation and other historical events. The index occupies about a fifth of the text.

References to published material are given for entries where appropriate and practicable; the criteria for their selection being reliability. Much of the information is derived from a variety of unpublished sources, correspondence with Antarctic research organisations and specialists, gravestones on peri-Antarctic islands and many others. All entries for countries currently undertaking Antarctic expeditions have been checked by people in the organisation involved who have also provided many additional details.

The introduction includes concise descriptions of the principles adopted for names of persons, states, vessels and places; arrangement of the entries, geographic summaries of the 20 peri-Antarctic islands; observations on legal aspects of the Antarctic, sovereign claims, national legislation, the Antarctic Treaty, the Scientific Committee on Antarctic Research, other international agreements, stages of exploration and exploitation of Antarctic regions; and a review of national Antarctic operations with data about wintering stations. The publication includes maps showing the development of knowledge of the far south, and the locations of many places mentioned in the text. A selection of plates, many from the archives of the Scott Polar Research Institute, is included in the document which is the result of five years work.

Continued from page 442.

Arenas and sailed with their equipment to the site on the Polar Duke. The team comprised personnel from NSF, the US Navy, the National Oceanic and Atmospheric Administration (NOAA), the US Coast Guard and private contractors. Their 52 tons of equipment included a 36 foot skimmer boat, two 24 foot aluminium workboats, an inflatable boom, three floatable bladders, a special vehicle for loading and unloading boats, tools, pumps and other supplies.

While equipment was being unloaded they worked with the Chilean divers to complete underwater surveys, and examine the condition of the ship and extent of the spill. Extensive skimming operations were also completed, 900 gallons of fuel and water being collected on the first day. One hundred and fifty legs of inflatable skiller boom were towed into place downwind of the ship by the two workboats and the Chilean boom augmented by a further boom and sorbent boom. Argentinian salvage and diving officers marked tank boundaries and vents in preparation for removal of the fuel and, with the Americans, stopped leaks in the hull which was further surveyed.

By mid March both crews left the site; the Americans having skimmed an estimated 1,000 gallons of fuel from the surface and both teamsremoved 16,000 gallons from the ship. By early March 67,000 gallons remained in the vessel. Between 125,000 and 150,000 US gallons, primarily diesel and aviation fuel, is thought to have spilled from the ship and much of it had evaporated, dissolved, dispersed or been photo-oxidised during the first week.

The breakup of the ship and continued leakage remain dangers to the area.

Initially station staff had observed substantial amounts of fuel in the water of local intertidal areas and on the beaches of islands near the ship. Much was dispersed by wind and tide but some remained trapped in beach sediments and sands.

High death rates among limpets and in algal mats were observed and, for reasons of which scientists remain uncertain, the south polar skua population failed completely. Either toxicity of the prey fed to the chicks or changes in parent behaviour may have contributed. More than the usual number of cormorant chicks died probably because of contaminated food. One dead shag was found and although only a few oiled penguins

were observed many may have been killed at sea and chicks exposed to skuas on shore as breeding success was much lower than usual.

Two months later salvage and containment teams, organised by the National Science Foundation, visited the site to gather data and evaluate the impact on the marine and terrestrial ecology. The 17 member team, who left Punta Arenas on 6 March, represented nine institutions from three countries. They spent four weeks assessing the immediate impact of the spill and began a long term research programme on its effects. (This article will be continued in the next issue of "Antarctic".)

... maps

Beacon Heights map published

Geology of the Beacon Heights area, southern Victoria Land, Antarctica; 1:50,000
C. T. McElroy and G. Rose, New Zealand Geological Survey, Miscellaneous Series Map 15. NZ$20.00

John Bradshaw is a reader in Geology at the University of Canterbury, Christchurch, New Zealand.

The publication of the Beacon Heights map is an important event in several respects. It marks the return of the New Zealand Geological Survey to Antarctic map publication, and is a significant development in terms of scale and geological detail. It is particularly important as the first step in a plan to produce a 1:50,000 map series for the south Victoria Land dry valley area. Hitherto geological maps have fallen mainly into two groups; specific projects, and regional scale reconnaissance maps. Particularly good maps at 1:500,000 have been produced in recent years by West German and Italian programmes in northern Victoria Land and by Australia in the Prince Charles Mountains. The US Geological Survey has produced several 1:250,000 maps and a small number of maps at larger scales. A further series at 1:250,000 for northern Victoria Land is in the pipe-line. I believe the south Victoria Land maps take these refinements one step further.

The area covered lies south west of Lake Vanda and embraces a broadly triangular ice-free area between Finger Mountain in the north, Mount Feather in the southwest and New Mountain in the southeast. The area is a classical one for Antarctic stratigraphy as it was from here that H. T. Ferrar, geologist with Scott's National Antarctic Expedition, 1901-04, named the Beacon Sandstone Formation, the forerunner of the present Beacon Supergroup.

The mountains here still contain the type sections of a number of Beacon Supergroup formations and members. The Beacon rocks of the Transantarctic mountains are of more than Antarctic significance, and discoveries by the scientists attached to the expeditions of Scott and Shackleton contributed to the development of ideas about Gondwana, global climate change and continental drift. By virtue of its scale, the Beacon sedimentary basin is still of great interest.

The map is accompanied by an explanatory booklet of 48 pages that aims to provide "benchmark" descriptions of Beacon strata. In such a short space it is impossible to describe the units to everyone's satisfaction and tantalizing questions spring to mind at the end of each section. None the less I think the benchmark status is fairly achieved. The booklet also contains short sections on structure, igneous rocks and economic geology. The inclusion of just over six pages of references will ensure that the map is frequently consulted even by those not planning to visit this particular area.

Choice of colours

The map printing appears to be well executed but I was less impressed by the choice of colours. The colours for Devonian to Early Permian rocks follow the internation-

ally recommended colour scheme but the Late Permain and Triassic are in blue tones normally associated with the Jurassic. Because the Carboniferous is thin and the Ferrar Dolerite is rendered in a pink colour, the colours for most of the solid outcrop fall in the same part of the spectrum, dull pastel shades ranging from orange brown through red-brown but the basement is very difficult to detect as are the main unconformities. The map is one to be pored over in good light and not for wall display. Looking ahead to other sheets in the series, I foresee difficulties in rendering a range of Late Precambrian and Early Paleozoic basement units where reds, browns, mauves and greys are internationally recommended. Similarly there could be problems in representing the Jurassic Kirkpatrick basalts and volcanic sediments in harmony with the genetically related Ferrar Dolerite.

It has been suggested in some quarters, quite wrongly in my view, that map series of this type are simply compilations or "stamp collecting". I believe that the discipline of constructing these maps will lead to new insights into the nature of the Beacon sedimentary basin and that future sheets will require a complete revision of our concepts of the geology and history of the sub-Beacon basement of southern Victoria Land. The mapping is just the beginning and I hope that funding will be available for the necessary follow-up in the laboratory.

I believe this map deserves a place on the shelves of all earth scientists working in the Ross Sea sector and on the shelves of many of those working elsewhere.

Society news

On 18 July 1989 members of the New Zealand Antarctic Society, interested friends and associates launched a fourth branch in Auckland. It is the first time since the early 1960's that The Society has had branches in the four main centres of New Zealand in addition to its overseas branch.

Max Tunnicliffe was elected Chairman, the Secretary is Mike Wing, the Treasurer, Vicky Young and the committee Don Ensor, Alan Hemmings and Simon Towle.

The original Auckland branch held its first meeting on 22 February 1955. It had a ready made constituency in a group of 16 called the Auckland Committee for the Discussion of Antarctic Matters (ACDAM) which had formed in December 1954. Their objective was "to get New Zealanders into Antarctica" and they drew up plans for the country's first expedition to the Ross Dependency.

Jim Rose, father-in-law to Sir Edmund Hillary, at whose home ACDAM was launched had been a member of the deputation which met with the Minister of External Affairs in January 1955. Soon after ACDAM decided to lobby jointly with the New Zealand Antarctic Society and they formed the Auckland branch. Evan Turbott, a coast watcher in the Auckland Islands during the war and then Auckland Museum ornithologist and later Director, was Chairman and Andrew Packard, a zoologist was Secretary. Members were to include Sir Edmund Hillary, Auckland Museum director Gilbert Archey and journalist Frank Simpson.

In May 1956, the branch held its first annual meeting at which Turbott "recounted the effort the branch committee had put into preparing plans for an expedition south to be implemented, if not by the Government, then by the Society or even the branch itself."

Press reports of March 1955 suggested that the Government might only fund the Trans-Antarctic Expedition and the Ross Sea Appeal Committee was subsequently formed in Wellington with Turbott as branch representative. Packard was branch chairman when selected for the 1957-58 summer expedition.

As the branch had been formed for the purpose of promoting a New Zealand Expedition to the Ice the committee had difficulty sustaining interest at the conclusion

of the Trans-Antarctic Expedition. From the early 1960s the branch was no longer represented at the meetings of the National Council of the New Zealand Antarctic Society.

The Dunedin Branch of the Society closed down in 1963 and from then until it was revived as the Otago Branch in 1986, only Canterbury and Wellington continued to function with the overseas branch. Efforts to revive the Auckland branch were unsuccessful until Mike Wing organised and publicised a meeting on 2 November 1988 to assess interest in re-establishing the branch.

At its most recent meeting the Council of the New Zealand Society elected Bill Wicks, prime mover of the revived Dunedin Branch as President. He succeeds Robin Ormerod of Wellington Branch who has been president since March 1987. The new treasurer is Claire McDonald and secretary Paul Dingwall also both of Wellington.

Delegates representing the branches were Mike Wing and Vicky Young of Auckland, Arnold and Jan Heine of Wellington, Paul Christensen and John Weeber of Canterbury and Bill Wicks and Doug Pagel of Otago Branch.

Other national officers include Richard McElrea as Honorary Solicitor and Stewart Thomson as Honorary Auditor. Margaret Bradshaw continues as Back and Missing Issues officer for the bulletin and along with Harry Burson is also working for the Antarctic Heritage Trust.

The story of the early Auckland Branch is adapted from "Looking South" by Neville Peat, published by the New Zealand Antarctic Society in 1983.

The New Zealand Antarctic Society Inc.,

The New Zealand Antarctic Society was formed in 1933. It comprises New Zealanders and overseas friends, many of whom have seen Antarctica for themselves and all of whom are vitally interested in some phase of Antarctic exploration, development or research.

The annual subscription is NZ$35.00. This entitles members to:

- *Antarctic, published quarterly in the autumn, winter, spring and summer. It is unique in Antarctic literature as it is the only periodical which provides regular and up to date news of the activities of all nations at work in the Antarctic and sub-Antarctic. It has a worldwide circulation. (Airmail postage is extra for overseas members.)*
- *Newsletters for New Zealand members and an annual newsletter for overseas members. Regular meetings are held by the Auckland, Wellington, Canterbury and Otago branches.*

Subscriptions are:

- **N.Z. $35.00 in New Zealand**
- **N.Z. $43.00 in Australia and South Pacific***
- **N.Z. $48.00 in North America and Asia***
- **N.Z. $52.00 in South America, Africa, Europe and the Middle East***

*** Includes airmail postage overseas.**

You are invited to join:

North Island residents should write to the:
Branch Secretary
Auckland Branch,
New Zealand Antarctic Society,
34 Haycock Avenue,
Mt. Roskill, AUCKLAND

or:
Branch Secretary,
Wellington Branch,
New Zealand Antarctic Society,
P.O. Box 2110,
WELLINGTON

South Island residents should write to the:
Branch Secretary,
Canterbury Branch,
New Zealand Antarctic Society,
P.O. Box 404,
CHRISTCHURCH

or:
Branch Secretary
Otago Branch,
New Zealand Antarctic Society,
P.O. Box 7083,
Mornington,
DUNEDIN

Overseas residents should write to the:
New Zealand Secretary,
New Zealand Antarctic Society,
P.O. Box 1223,
CHRISTCHURCH

Bulletin only membership is available to libraries and other institutions at NZ$30.00 for organisations in New Zealand; NZ$37.00 to those in Australia and the South Pacific; NZ$41.00 in North America and Asia and NZ$44.00 in South America, Europe, Africa and the Middle East. (These prices include airmail postage.)

Student membership: NZ$26.00 plus postage for overseas members.

Advertising rates

Full colour (outside back page only)	$400
Whole page (b & w only)	$200
Half page (b & w only)	$100
Quarter page (b & w only)	$35

The rates are negotiable for regular placement.
Deadlines: The first of December, March, June and September.
Enquiries to the Treasurer, New Zealand Antarctic Society, P.O. Box 1223, Christchurch, New Zealand.

Fliers and other advertising material can be inserted at cost of $150 per issue plus any additional postage incurred through any such insertions. Enquiries should be made to the editor whose address, telephone and fax numbers appear in the front of this issue.

Set by Lucas Graphics and printed by R.W. Stiles & Co. Ltd, both of Nelson, New Zealand