

ANTARCTIC

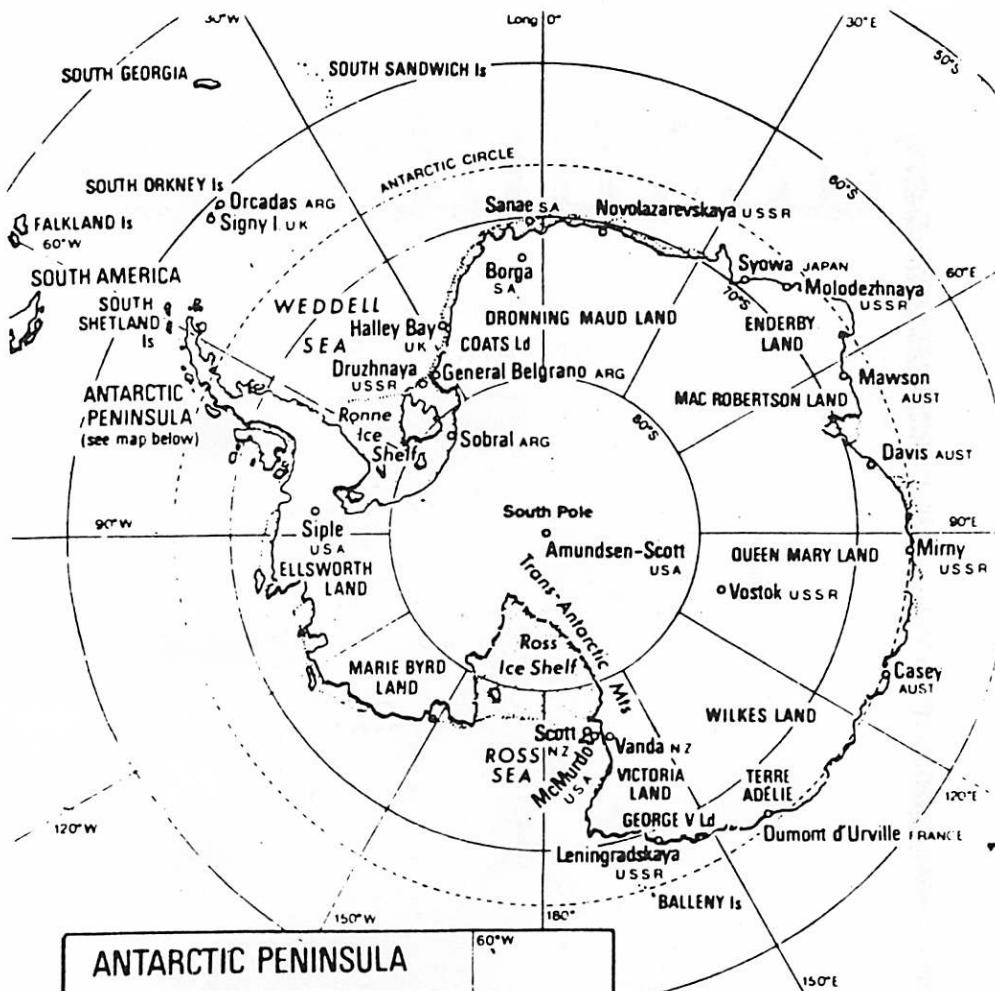
A NEWS BULLETIN
published quarterly by the
NEW ZEALAND ANTARCTIC SOCIETY (INC)



The Mikhail Somov, flagship of the Soviet Antarctic fleet was trapped in the ice off Marie Byrd Land for 133 days from March to July 1985.

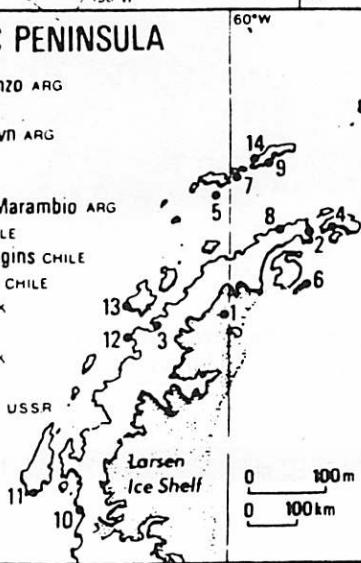
Vol. 10, No's 9 & 10

March/June 1985



ANTARCTIC PENINSULA

- 1 Teniente Matienzo ARG
- 2 Esperanza ARG
- 3 Almirante Brown ARG
- 4 Petrel ARG
- 5 Deception ARG
- 6 Vicecomodoro Marambio ARG
- 7 Arturo Prat CHILE
- 8 Bernardo O'Higgins CHILE
- 9 Presidente Frei CHILE
- 10 Stonington I. UK
- 11 Adelaide I. UK
- 12 Argentine Is. UK
- 13 Palmer USA
- 14 Bellingshausen USSR



ANTARCTICA

0 500 1000 Miles

0 500 1000 Kilometres

ABBREVIATIONS

ARG ARGENTINA
AUST AUSTRALIA

S.A. SOUTH AFRICA
UK UNITED KINGDOM
USA UNITED STATES OF AMERICA
USSR UNION OF SOVIET SOCIALIST REPUBLICS

0 100m
0 100 km

ANTARCTIC

(successor to 'Antarctic News Bulletin')

Vol. 10, No's 9 & 10

March/June 1985

117th & 118th Issues

Editor. P.O. Box 2110, Wellington
Address all contributions, inquiries to the Editor

CONTENTS

WHALING COMMISSION	319
MINERALS' NEGOTIATIONS	321

POLAR ACTIVITIES

NEW ZEALAND	324
AUSTRALIA	333
CHINA	339
INDIA	341
NORWAY	343
UNITED KINGDOM	346
URUGUAY	356

MIKHAIL SOMOV	357
---------------	-----

PROJECT BLIZZARD	360
FOOTSTEPS OF SCOTT	365
VINSON MASSIF	372
WHALE SURVEY	373

over

© New Zealand Antarctic Society (Inc) 1978.

No part of this publication may be reproduced in any way without the prior permission of the publishers.

This issue of "Antarctic" is larger than usual because of difficulties experienced in resuming normal production which fell behind when the editor retired and the Bulletin was transferred from Christchurch to Wellington. The decision to combine the two issues was made by the Council of the New Zealand Antarctic Society and the two issues were made by the acting editor. The result is that readers can now expect a September issue, early in October and the December issue on time.

Because this issue has covered six months, instead of three, there have been some problems over the selection of material. With the next miners' meeting pending, some priority has been given to the directions of the negotiations. Events such as "Footsteps of Scott" and "Project Bizzard" which will continue this season have also been given some priority. "Dick" Richards' obituary is important. BAS and Amare reports are longer than usual, they cover a whole season.

Significant stories from the New Zealand Antarctic Research Programme appeared in the December issue. Because results of some of the other research have now come to hand a selection of "events" have been covered in this issue. Where justice could not be given to projects such as the rebuilding of Scott Base and some of the other New Zealand research it has been decided to include them with the coverage of the recently announced, 1985/86 programme in the September issue of "Antarctic".

An Apology to readers

CONSERVATION TROPHY 384

ANTARCTIC SOCIETY

BOOK REVIEWS

DICK RICHARDS 378

OBITUARY

OIL SURVEY 374
HEARD ISLAND 375
SOUTH GEOGRAPHIA 376

SUB-ANTARCTIC

IWC

Soviet Antarctic whaling to cease

The Soviet Union plans a temporary halt to their commercial whaling in Antarctic waters from the 1987/88 season according to a declaration made on behalf of the Soviet delegation at the plenary session of the thirty-seventh annual meeting of the International Whaling Commission held in the English town of Bournemouth from July 15 to 20.

The announcement came five months before a five year ban on commercial whaling comes into effect from the 1985/86 Antarctic pelagic whaling season and from the 1986 coastal seasons elsewhere. The ban was proposed by the Seychelles at the 1982 IWC meeting and supported by 25 votes to 7 with five abstentions. The Soviet Union, Japan, Norway and Peru lodged objections within the 90 days prescribed by the IWC rules and were therefore not bound by the decision which provided for the setting of zero catch limits for commercial whaling as from 1985/86. Peru subsequently withdrew its objection but the Soviet, Norwegian and Japanese intentions remained undeclared.

Until the Soviet cessation comes into force their whaling will be conducted in accordance with the latest scientific committee recommendations. These prescribed a catch of 4,224 minke whales in the Southern hemisphere in 1984 and set limits for each of the five component areas. In stating their intention the Soviet Union has expressed agreement with the conservation motives of the ban and are ceasing whaling in order to allow for the recovery of protected

stocks and for undisclosed technical reasons.

The 37th annual meeting of the IWC was attended by delegates from 38 of the 40 member governments; Senegal and Mauritius did not send representatives. The Solomons attended for the first time. Three delegations came from the non-member governments of Canada, Portugal and Sri Lanka and six intergovernmental or international organisations sent observers. These were CCAMLA, EEC, IUCN, the Inter-American Tropical Tuna Commission, the International Council for exploitation of the sea and the UNEP/Convention on migratory species. Fifty six non-government international organisations also sent observers. These included Friends of the Earth and Greenpeace.

New Zealand was represented at the meeting by the Whaling Commissioner Mr I.L.G. Stewart of Wellington who was vice-chairman of the technical committee and subsequently elected chairman of the commission; by Mr Julian Ladbrook of New Zealand House London who attended the technical and plenary sessions and by Mr Martin Cawthron, Oceanographic Institute, Wellington who attended the scientific committee meetings.

Mr Stewart became a New Zealand representative on the Whaling Commission in 1979 and has been vice-chairman of the technical committee since 1982. He will be chairman of the Commission for three years.

Most of the minke whales in the southern hemisphere are caught by Japanese and Soviet factory expeditions operating in the Antarctic. The Japanese announced that they will continue catching sperm whales in the North Pacific until 1987/88 but it is widely assumed that they will cease whaling for minkes in the southern regions.

Small quantities of minke whales are caught in the North Atlantic North Pacific and off the coasts of Norway, Iceland and Greenland. The Southern hemisphere stocks were not reclassified at the recent meeting but those of the North Atlantic were. This followed recommendations of the scientific and technical committees to the plenary session which voted 25:1 with 10 abstentions in favour of reclassification.

KEY ISSUES

The key issues confronting the IWC, which began as usual with a meeting of the scientific committee followed by the technical committee and plenary sessions, included continued commercial whaling by Norway, the criteria for scientific whaling and the problems associated with the setting of quotas for aboriginal/subsistence whaling.

Norwegian activity, is centred around the North Atlantic Minke whale which has now been reclassified as protection stock. Under the rules of IWC Norway can continue whaling because of her objection to the commercial ban but in practice it may become more difficult now that her target stocks have been declared an endangered species.

Whaling for scientific research purposes is permitted by IWC subject to



Mr I.L.G. Stewart, newly appointed chairman of IWC.

reporting to the scientific committee. Problems have appeared with the numbers and types of whales requested particularly by Iceland and South Korea. Towards the close of the meeting the plenary session took note of the concerns expressed that scientific whaling could take on commercial aspects and set up a study group to report to the next IWC meeting with recommendations as to the appropriate criteria.

Similarly, given the desire expressed by some countries to have their coastal whaling regarded as aboriginal/subsistence whaling it was decided in the next twelve months to define more closely what is meant by aboriginal subsistence whaling.

The commission will meet next in Malmo, Sweden in June of 1986.

Footnote: It is forbidden to use a factory ship or whale catcher attached thereto for the purpose of taking or treating baleen whales except minke whales, in any waters south of 40° South Latitude, except during the period from December 13 to April 7 following, both days inclusive. Schedule of the IWC January 1985

Progress with minerals' negotiations

The latest round of the minerals negotiations, held in Rio de Janeiro from February 26 to March 12 were chaired by New Zealand's Mr Chris Beeby, assistant secretary, Ministry of Foreign Affairs. In this article Mr Beeby traces briefly the steps which led to the adoption of Recommendation XI-I. This recommendation constitutes the basis for negotiations now underway, examines the nature and structure and some of the provisions of the proposed regime.

The countries that are parties to the Antarctic Treaty perceive that the major achievement of the Treaty has been its very significant effect on the stability and security in Antarctica. The Treaty, however, does not deal with resources of any kind and as its operation depends on restraint it would be under maximum pressure if minerals were discovered. The implications of the discovery and recovery of minerals on the preservation of the Treaty and the Antarctic environment led New Zealand in 1970 to consider the need for a comprehensive regime governing mineral activities.

The topic was broached at the 6th Consultative Meeting of Treaty nations in Tokyo in 1970 and in 1977 at the 9th Consultative Meeting in London Recommendation IX-1 was adopted. It endorsed principles for such a regime and urged consultative parties and other states to refrain from all exploration and exploitation of mineral resources until an agreed regime was reached.

Recommendation X-I adopted at Washington in 1979 represented further consensus and in 1981 at the 11th Consultative meeting in Buenos Aires Recommendation XI-I was adopted. It was agreed that formal

negotiations begin and that urgency be applied to resolve the minerals regime to ease the potential threat to the Treaty.

THOSE PRESENT

The meeting at Rio de Janeiro was attended by delegates from Argentina, Australia, Belgium, Brazil, Chile, France, the Federal Republic of Germany, India, Japan, New Zealand, Norway, Poland, South Africa, United Kingdom, United States of America and the U.S.S.R.

Observers came from Bulgaria, Cuba, Czechoslovakia, Denmark, Finland, German Democratic Republic, Hungary, Italy, Netherlands, People's Republic of China, Peru, Roumania, Spain, Sweden and Uruguay.

The next round of negotiations will be held in Paris from September 23 to October 7, 1985. New Zealand will be represented by Mr Colin Keating, head of legal division of Foreign Affairs, and Mr Frank Wong, also of Foreign Affairs. Mr Chris Beeby will chair the meeting.

Recommendation XI-I constitutes the basis for the negotiations now underway. The main areas of agreement were that:

- The minerals regime should be negotiated by the Consultative parties and they should continue to play an active and responsible role in dealing with the question.
- The Antarctic treaty must be maintained in its entirety.
- The protection of the unique Antarctic environment and of its dependent ecosystems should be a basic consideration.
- The Consultative Parties, in dealing with the question of mineral resources in Antarctica, should not prejudice the interests of all mankind in Antarctica.
- The delicate balance contained in Article IV of the Antarctic Treaty should not be affected by the regime and the principles embodied in that Article should be safeguarded.
- The regime should include means for assessing the possible impact of mineral resource activities on the Antarctic environment determining whether such activities will be acceptable and, if they are regulating them.
- The area of the regime should encompass the continent; and Antarctica and its adjacent offshore areas but without encroachment on the deep seabed.
- The regime should cover all mineral resource activities at every stage.
- The regime should be open in the sense that it should include provisions for adherence by states other than the Consultative Parties on the understanding that adhering states would be bound by the basic provisions of the Antarctic Treaty.
- The regime should include provision for co-operative arrangements with other relevant international organisations.
- The regime should protect the special responsibilities of the Consultative Parties in respect of the environment of the whole Antarctic area, taking into account responsibilities which may be exercised in that area by other international organisations.
- The regime should promote the conduct of research necessary to make the environmental and resource management decisions which will be required.

The recommendation also stated that any agreement that may be reached on a regime should be accept-

able and without prejudice to those states that claim sovereignty in Antarctica as well as to states that neither claim sovereignty nor recognise such claims.

The regime will be a legally binding international agreement, closely linked with the Antarctic Treaty and will be open for accession by all interested states. The agreement will not be a complete and comprehensive mining code but will be a framework within which details can be added as issues arise as well as providing principles and general guidelines.

NEW INSTITUTIONS

New institutions will be created by the regime. These would include a central Commission with authority to determine by consensus whether an area would be opened for mining activities and to establish the broad principles relating to such activities; a subordinate advisory committee responsible for scientific, technical and environmental advice. A secretariat and small regulatory committees with responsibility for detailed regulation of the mining activity including the adoption of a management scheme and the setting of conditions attaching to the activity. Representatives of the regulatory committee would include, among others, states claiming sovereignty in the proposed mining area and the state wishing to undertake mining activities.

The accommodation between claimants and non-claimants to sovereignty in Antarctica was the most intractable issue confronting the meetings. It was therefore agreed in 1984 that attention be focussed on the institutions of the regime as a starting point for discussions.

The regime will cover the same area as the Antarctic Treaty, namely the area south of 60 degrees without encroaching on the deep seabed and would govern every stage of mining activities. Prospecting, having minimum risk to the environment will not confer title or require prior authorisation. It would however, be subject to environmental standards set out in the regime and be consistent with any additional measures imposed by the Commission. Reviews of a prospecting activity would be possible.

Exploration and development, however, will be prohibited until proposals are authorised by the regime institutions. Individual applications for exploration and development will have to be scrutinised by the advisory committee and a detailed plan established by the relevant regulatory committee with final approval from the commission.

The basic consideration of the regime will be the protection of the Antarctic environment and ecosystems. Environmental principles covering every phase of activity will

be set out. They will apply both to operators and institutions, will test the proposed activity and will be mandatory.

No mineral activity will take place before information, technology and procedures (including contingency plans) are available and adequate with satisfactory monitoring of environment and ecosystems. Proposed activities will additionally be balanced against the accumulative impact of mining and other uses of Antarctica. Exploration and development will be forbidden until they were determined as being acceptable on environmental grounds.

The regime also provides for the setting aside of specific areas which will be designated by the commission as prohibited. It provides also for the suspension, modification or cancellation of authorised exploration and development if necessary, for the settlement of disputes and for dealing with liabilities. It will also take into account the interests in Antarctica of the international community at large.

News of the burial of Captain Ivan Man at Vostok station may recall to older members of the New Zealand Antarctic Society the Ob's first visit to Wellington on April 9, 1956. Society members helped to entertain the scientists and ship's company which included eight women, one a scientist, Professor Marie Klemova. Many months later Captain Man and the chief scientist, Professor V. G. Kort, sent the society an album of photographs showing the establishment of the first Soviet station, Mirny, and the ship's voyage. The album was presented to the Canterbury Museum in 1977.

CEMIDA, a movement whose avowed aim is to uphold democracy in Argentina has been founded by reserve officers in the Army. It includes generals, colonels, and captains. The acting president is General Jorge Leal. In 1965 General Leal, then a colonel, led Operation 90, the first Argentine expedition to reach the South Pole by land from General Belgrano Station on the Weddell Sea coast. The 10 men travelled 1450km by snocat in 45 days.



Polar activities

Government boosts NZARP funding

The New Zealand Government has given priority to the funding of the Antarctic Research Programme with a grant of \$150,000 to compensate for additional costs incurred through devaluation the Prime Minister, Mr David Lange, announced recently. Most other government departments have had to absorb these costs. As a result the research programme will be maintained in 1985/86 at a level comparable with that of last season.

Approximately 197 scientists, field personnel and support staff will be involved with the 52 laboratory and field events planned around Ross Island, McMurdo Sound and the central Transantarctic Mountains. The detailed planning, logistics and implementation of the programme however, involves up to 300 personnel during the summer season.

Scientific studies this year will be concentrated on aspects of biological research and a range of earth, atmospheric and physical sciences. New projects include a study of the quaternary glacial stratigraphy in the Marshall Valley; sea floor photography in the McMurdo Sound area and some work on influenza viruses in Antarctic seals and birds*.

The programme will cost an estimated \$4 million of which the Department of Scientific and Industrial Research will provide about \$2.3 million. The other agencies working in Antarctica, including the universities, will provide approximately \$1.5 million.

* Full coverage of the New Zealand programme will be given in the September issue of *Antarctic*.

Last season's activities concluded officially at 3 p.m. on Wednesday February 13 1985 when the summer leader Mr Jim Cowie of Christchurch handed over to Mr Leo Slattery, postmaster and winter leader. Mr Cowie, who was initially appointed deputy leader for the summer took over from Mr Peter Cresswell when he returned to Christchurch on January 3, unwell. This winter is Mr Slattery's third at Scott Base.

Deputy Officer in charge is Peter Nelson (mechanic, Whangarei). Other members of the team are Dennis Shaw (base engineer, Nelson), Owen Taylor (electrician, Pukerau), Keith Graham (Post Office technician, Auckland), Tony Grant (technician, Christchurch), Brian Lawson (technician, Auckland), Peter Walton (carpenter, Dunedin), George Moir (chef, Wellington) Kevin Conoglen (dog-handler, New Plymouth), and Peter Turner (technician, Wellington).

The two major events of the season were the Ciros Project (Cenozoic investigations in the Western Ross Sea area) and the joint New Zealand, United States and West German expeditions into North Victoria Land.

Break Gream, Leo Statney, O.J.C., and postmaster at Scott Base in the 1982 winter, takes over the same dual position of February 13 and starts his third Antarctic winter. On left is Jim Cowie, deputy O.J.C., and postmaster at Scott Base in the 1982 winter, takes Peter Cresswell, had to return home for medical reasons. Antartica Division photo



The core consists of six alternating, "interglacial" water facies, separated by glaciogenic sediments and glacial debris.

Base sea ice was thinner than usual and could not be relied on to remain stable for the six week drilling period. However, CIROS 2, near the south end of the Ferrar Glacier was successfully drilled to a depth of 166 m below the sea bed. Despite difficult drilling conditions 67% of the core was recovered. Only hours after reaching base ment a freak storm destroyed most of the camp buildings and damaged associated equipment; the ice itself was undamaged, and all rod and coring was retrieved. However, the planned down-hole logging to obtain additional sedimentary data on the sediments layers had to be abandoned.

CIROS is a long term drilling project which seeks to obtain a record of the Cenozoic (and possibly Cretaceous) history of the south-west corner of the Ross Sea by coring the tary strata offshore. There is no record exposed on land which pre-dates the time between the Jurassic basalt of 180 million years ago and the rocks of the McMurdian Volcanic Group erupted over the last 15 million years. The period includes the growth of the Antarctic ice Sheet and the rise of the Transantarctic Mountains. Peter Barrett, director of the Antarctic Research Centre at Victoria University, New Zealand, U.S.A., U.K., and Japan, I the first of two holes planned for this season, 15 km off Butter Point and 70 km from Scott Base.

Basaltic sand is common in both types, indicating the presence of extensive ice in the McMurdo Sound moving across the offshore volcanoes and into the valleys of the Victoria Land Coast. The drill site is at present experiencing an "interglacial" phase. Well preserved diatoms have been found. The diatoms are identical to some in other Southern ocean cores and indicate ages from 2 to 4.5 million years. However the core contains a volcanic ash at 125 m, which has been dated radiometrically (K-Ar), and has given an older age. Further work will be needed to account for this but once the difference is resolved the core will be a valuable reference for tying together events in the Dry Valley Region in the late Cenozoic.

Equipment from Ciros 2 site, returned to New Zealand for repair, will be flown south again this coming season in readiness for drilling operations to begin again in the summer of 1986/87.

NORTH VICTORIA LAND

New Zealand's main research project in North Victoria Land, where New Zealand scientists have worked since 1958, was a study of the geological evolution of the area. The existing interpretation of North Victoria Land, (a key area in determining the tectonic relationship between New Zealand, Australia and Antarctica) was brought into question by the discovery in the Millen Lanterman Ranges of Ordovician fossils significantly younger than all previous finds.

Early mapping by New Zealand some American parties tended to accentuate the presence of three major north-northwest trending belts with differing rocks, structures and geological histories. German geologists working in the area from

1979 suggested that the differences had been over rated and that the relationships were, in fact, close. Subsequent geochemical work in New Zealand showed that the Cambrian volcanoes of the Central Bowers Belt were probably a primitive intra-oceanic arc, a conclusion incompatible with the current position and strongly suggesting that the present arrangement was due to major movement of perhaps tens to hundreds of kilometres on faults between the belts.

Bad weather and other work precluded a detailed examination of the new Ordovician fossil localities at the time of discovery. This, combined with evidence of major thrusting on both the east and west sides of the central belt encouraged the organisation of a joint New Zealand, United States and West German expedition to re-examine the fossil localities at Handler and Reilly Ridges and the structural geology of the boundaries of the belts.

The party was flown into the Crosscut Peak area in two groups on November 5 and 6 and subsequently travelled to Handler Ridge. Both parties worked together for the first two weeks and then one group comprising Dr Tom Wright (U.S.), Colin Brodie (Otago), Tony Teeling (Mount Cook), and Warren Herrick (Oamaru), travelled north concentrating on the structures of the Millen Range and Crosscut Peak thrust. The other group comprising Drs John Bradshaw (Christchurch), John Begg (Wellington) Werner Buggisch (West Germany) and Jack McConchie (Wellington) sledged 150 km to the north-west to Reilly Ridge where they were joined by Dr Franz Tessensohn who stayed for the remainder of the expedition. The parties were reunited

on December 10 and lifted out by a single Hercules on December 12. Preliminary results of work undertaken are said to be proving interesting but were not available at the time of publication.

OTHER LINKS WITH GANOVEX IV

Two Victoria University students Jean Olson and Richard Kellett participated in the geophysical programme of GANOVEX IV in North Victoria Land.

The students were principally involved with the testing and installation of equipment, helicopter gravity surveys and ground profiling, radio echosounding, magnetotelluric profiling and processing of aero magnetic data.

Trevor Chinn and Ian Whitehouse (Ministry of Works and Development – Christchurch) were joined by Hans Hofle (GANOVEX IV) in a joint glaciological and glacial geological reconnaissance of the Terra Nova Bay Area.

Working around the shores and in the northern foothills of the Bay the party sought to establish a glacial chronology to supplement the unclear dry valley sequences. This involved the study of glacial moraines and past sea levels. The relationships between the present ice margins and the Holocene (maximum) margins were examined together with the structures of any that were unusual. The party found that the small glaciers were well covered in snow with little bare ice exposed indicating a positive mass balance suggesting that they are in advance and are presently as large as they have been since the Pleistocene.

Penguin bones were collected from the small alluvial fans deposited

from the small alluvial fans deposited across the beach ridges. The bones, along with those collected from under the pebbles of the abandoned rookery sites around Inexpressible Island will be dated using radio carbon techniques. The results should provide minimum ages for the rate of uplift of the raised beaches of the bay and contribute to the clarification of the glacial sequences and tectonic history of the area.

A further stage of an ongoing study of the Ross Sea coastal environment was completed. The study began in 1982/83 and was continued in 1984/85 when a reconnaissance of the Victoria Land coast was undertaken. Last season's objective was to obtain detailed information from a number of sites and assess the potential for dating the deposits. The resulting data will be used to create or test models of predicted relative sea level during ice sheet reconstruction and the deglaciation of McMurdo Sound.

In the field from October 21 to November 14 Dr Mark Mabin of Auckland University and Glen Lauder of Canterbury University visited sites at Spike Cape, Dunlop Island, Granite Harbour, Cape Ross and Depot Island recording the numbers and heights of the raised beaches. Observations of glacial geology were made where till sheets were preserved. Extensive snow cover, however, prevented analysis of marine and glacial deposits.

UPLIFT HISTORY

Documenting the uplift history of the Transantarctic Mountains in the McMurdo Region in both early Paleozoic and Cenozoic times was the objective of a field party from Victoria University comprising Annette George, Russell Korsch, Des Paterson and Paul Fitzgerald. Their field work was observed by Riedner Gomero, a

Peruvian geologist specialising in marine sediments. The party studied the pre-Devonian structures and the metamorphic history of the basement in the Victoria and Wright Valleys and the Late Mesozoic and Cenozoic uplift history of the Royal Society Range.

Korsch and George concentrated on specific ridges in the lower Victoria and Wright Valleys where they carried out detailed structural mapping, collected data on the depth of burial and amount of uplift prior to Beacon sedimentation. A representative set of metamorphic rocks was also collected. These will be subject to laboratory studies and when combined with analysis of the field data it is hoped that an integrated tectonic history of the McMurdo portion of the Transantarctic Mountains prior to the start of the deposition of the Beacon Super-group in the Devonian age will emerge.

Fitzgerald and Paterson also completed work begun the previous season to determine the younger uplift history of the Transantarctic Mountains. This required the sampling of granitoid rocks at regular intervals over significant ranges of elevations for fission track age determinations on apatite. This year field work was concentrated in the Blue Glacier area. Laboratory work will be carried out at the University of Melbourne.

COAL MEASURES

More progress with the detailed mapping of the Beacon Supergroup Coal Measures was made by a party of four led by Geoffrey (Toby) Rose of the Australian Coal Measures Study Group of New South Wales, who is also secretary of the NSW Department of Mineral Resources. He and fellow Australian Dr Graham Bradley (ACMSG) were NZARP guest scientists. They were accompanied by two New Zealand coal geologists

Dr Mike Isaacs, New Zealand Geological Survey, (Otara) and John Gumbley, an Antarctic Division field assistant from State Coal.

The teams objectives were to collect data for a 1:50,000 map of the Willett and Clare Range areas as part of an ongoing geological mapping of the dry valleys and to collect samples of coal for subsequent analysis using petrological and palynological techniques to assess their overall character. Chemical studies will also be undertaken.

From early December until mid-January the team worked in the Mt. Bastion, Robison Peak and Sponsors Peak areas interpreting aerial data, measuring stratigraphic sequences and sampling and mapping the coal seams.

SEDIMENT STUDIES

The sedimentation studies which began in Granite Harbour, in the summer of 1982/83 were completed last season. Granite Harbour appears to be a closed sedimentation system and the objectives of this combined Victoria University/Oceanographic Institute Study were to identify the main sources of sedimentation and transport processes in the Harbour. From this it is hoped that scientists will be able to determine how fast sediment accumulates in polar coastal environments.

Other sedimentary studies centred on the Onyx River which flows for up to 90 days a year over 28 km from Lake Brownworth to Lake Vanda in the Wright (dry) Valley. Because the passage of the Onyx is not obstructed by vegetation or complicated by man's influence or by groundwater losses it is particularly suitable for the study of sediment transport and channel evolution, which concern scientists working on the behaviour of large braided rivers.

Working from a camp on the south bank of the river at Valhalla Fan, 8 km upstream from Lake Vanda between December 27 and January 17 a team comprising Paul Mosley and Eric Valentine of the MWD Hydrology Centre (Christchurch), established 38 cross sections over a 500 metre reach of six neighbouring branches of the river. At each section regular measurements were made of water depth, velocity and transport rates of coarse sediment moving along the bed. The individual channels were surveyed for changes and topographic surveys were made of the entire reach.

The field observations are being used to develop quantitative relationships between hydraulic conditions and sediment transport rates and have been combined with the flow records for the period 1972-83 to establish the total quantity of coarse sediment carried by the river each year. Total estimated quantities range from less than one tonne in 1977-78, a year of very low flow when water didn't reach Lake Vanda, to over 3,000 tonnes in 1981-82 and 1982-83 when the volumes of water reaching Lake Vanda were 3.8 and 4.6 million cubic metres respectively.

MARINE LIFE STUDIES

Studies of Antarctic marine life last season concentrated on the physiological adaptation of fish and the photoreception of isopods, other crustaceans and fish.

Operating mostly from a fish hut on the sea ice 1.5km on front of Scott Base scientists from Auckland and London universities continued to study the physiological adaptations of Antarctic fish. Drs John Macdonald (Auckland) and Sue Pocket (London) investigated basic neurophysiology.

Using a nerve-muscle preparation isolated from *Pagothenia borchgrevinki* they studied the release of chemical neurotransmitter (messenger) by nerve endings. For the nervous system to operate in the Antarctic fish the fundamental processes such as transmitter release and receptor reaction must be tuned to work at low temperatures. This study, to be continued in the coming season, will provide further details of the mechanisms of temperature adaptation.

Drs John Montgomery (Auckland) and Alistair McVean (London) made recordings from single nerve cells in the brains of *Pagothenia borchgrevinki* during natural stimulation of reflex eye movements to evaluate previous basic neurophysiological findings of brain function. The study is significant because these fish function with a brain temperature of -2 degrees centigrade. The investigation aims to show how and how well the nervous system functions at such low temperatures.

Drs Rufus Wells (Auckland) and Lynda Warren (London) studied the respiratory physiology of a range of Antarctic fish. They were able to confirm earlier reports that Antarctic fish have an elevated metabolism and that it is not caused by stress. They also found that one of the less common species *Rhigophilia dearborni* (eal pouts) has a high rate of oxygen uptake through the skin. Most of the other species of Antarctic fish are like "normal" fish and obtain their oxygen through their gill epithelium.

Since 1977 Dr V. Benno Meyer-Rochow, University of Waikato, has been studying the eyes, vision and photoreceptive structure and function of Antarctic fish, isopods and other crustaceans and evaluating their sensitivity to light and temperature. This last season work was extended to

muscle and temperature analysis and changes in the colour of various fish.

FRESHWATER STUDIES

Factors controlling organic carbon production in the ecosystems of streams in the McMurdo Sound area were investigated by Dr Clive Howard Williams and Dr Warwick Vincent of the Division of Marine and Freshwater Sciences, DSIR and by NZARP guest scientist Dr John C. Priscu from Montana State University. Geoff Spearpoint of Antarctic Division was the field assistant.

It was the second part of a three year investigation which began in the 1983/84 season when during a study of 25 of the streams of South Victoria Land they found a level of algal biomass comparable to that in some of the greatest of the world's stream communities. However the biomass contained a limited range of algal species. Unexpectedly the clearest nutrient-poor waters contained the greater volume of biomass indicating that turbidity was more important than nutrient supply in restricting the variety.

Concentrating in 1984/85 on the Adams Stream in the Miers Valley and the Fryxell Stream in the Taylor Valley the team measured the carbon dioxide exchange of the algal mats with an infrared gas analyser. They found that the photosynthetic rate per unit of biomass was low but that the respiratory component was very high. This was thought to be due to the high density of bacteria co-existing with the algae and in the 1985/86 season they will follow up this discovery by measuring the interaction between the two components.

In collaboration with Dr John Priscu the team also studied nitrogen cycling and photosynthetic metabolism in Lakes Fryxell and Vanda.

Preliminary results indicate that while the growth of algae in Lake Fryxell is restricted by an abundant supply of nitrogen this is not the limiting factor in Lake Vanda. Nutrient cycles and photosynthetic processes are to be further studied this coming season.

CELLULAR STUDIES

The search for answers to fundamental questions regarding intracellular freezing and the nature of cell membranes continued through the study of the survival mechanisms of Antarctic terrestrial and freshwater invertebrates by a team from the Physiology Department of Otago University. Led by Grant Butt, the team (last season) included Robert Scott and Peter Ashworth.

Work began in 1983/84 when knowing the ability of the larger invertebrates (springtails, mites, rotifers and tardigrades) to withstand sub-zero temperatures and in some cases dehydration, the mechanisms enabling protozoa to survive were uncertain. Accepting that the formation of intracellular ice is fatal to organisms and that the protozoa have only thin membranes separating their cytoplasm from the freshwater environment — the question remained: How did they survive the freeze-thaw cycle?

During the first season's work at Cape Bird about 20 different species of protozoa were collected from pools and streams but only one — a small Chlamydomonas-like species survived the freezing of the medium in which they were found. It was noted that as ice fronts advanced they tended to push the organisms ahead and it was assumed that in larger bodies of water the organisms would be pushed down into unfrozen regions. However when a small seepage was

analysed the team found that colonisation by protozoa was opportunistic; the occurrence of the organisms in any pool was more a matter of chance rehydration after wind-blown resting stages. Most protozoa appeared able to survive dehydration if allowed to dry relatively slowly on a rough surface. Because some of the organisms appear new to science further analysis of results is currently hampered by taxonomic difficulties.

Last season many further samples of protozoa were collected from Lakes Fryxell and Vanda and they are currently being studied. Although their taxonomic status remains uncertain they are sufficiently distinct to allow experiments and one area of work is the extent to which the cellular membranes of the cold-hardy species are modified. The water permeability of the membrane is currently being determined and the composition of the protozoa will be further studied using ion-selective electrodes.

PENGUIN BEHAVIOUR

The foraging patterns of penguins at Cape Bird were studied over three months by a team led by Dr Lloyd Davis (Ecology Division, DSIR, Wellington) and comprising Christine Butts (Kaiapoi), Frances McCaffrey (Havelock North), Murray Potter (Hastings) and Catherine Pettigrew (Christchurch). They maintained 24 hour observations of approximately 80 birds recording patterns of behaviour and durations of foraging trips. From the observation it is hoped to establish evidence of rhythmicity (the presence of a biological clock) in penguin behaviour.

In association with Dr Brian Green (CSIRO) birds were injected with radio-active water and salts. Blood

samples were taken at two subsequent intervals to determine the amount of energy (metabolic rate) involved in their various activities.

As part of a project with Dr John Cockrem (Ecology Division, Wellington) Dr Davis also measured melatonin levels in the blood of penguins. Melatonin is a hormone which is associated with rhythm of behaviour. A pilot study in radio-telemetry involving the attachment of transmitters to the feathers of penguins using an epoxy resin proved successful and it was found that they could be tracked at sea using these methods.

This coming season Dr Davis (now of the University of Otago) will lead a joint Ecology-Division/Otago University expedition continuing the radio tracking of penguins, sampling for melatonin and observing behaviour. The team will also be analysing diet.

CENSUS

The aerial photographic survey and bird count of the Adelie penguin colonies in the Ross Sea Region was continued. It is part of the International Survey of Antarctic Seabirds (ISAS) and last season it was in two parts.

Rowley Taylor, Peter Wilson and Bruce Thomas of Ecology Division DSIR, Nelson made a ground count of Adelie penguins at Cape Royds in late November. A week later they took oblique aerial photographs through the opened paratroop doors of an RNZAF C130 Hercules of 15 colonies on Ross and Beaufort Islands, and along the North Victoria Land coast as far as Lyell Island and Yule Bay. The colonies included Cape Royds, Cape Bird (3), Beaufort and Inexpressible Islands, Terra Nova and Wood Bays, Capes Jones, Wheat-

stone, Cotter and Hallett, Downshire Cliffs, Sentry Rocks and Unger Islands. Good quality coverage was obtained at all but the Sentry Rocks colony.

At Cape Royds the ground census revealed 2825 occupied nests the highest total ever recorded there and although last season's aerial photographs have not yet been counted the agreement between the aerial and the ground counts the previous season was very close.

On December 11 Taylor and Wilson made an 11 hour return flight from Dunedin to the Balleny Islands in an RNZAF P3 Orion. For two hours they searched the entire coastline of the islands for penguin colonies. All previous sites were visited and oblique photographs taken. Five colonies were found on Buckle, Chinstrap and the Sabrena Islands with a total population of just over 8,110 breeding pairs.

Over the last four seasons all but three of the 32 known adelie penguin colonies in the Ross Sea area have been photographed at least once and some such as Cape Royds, Cape Bird and Beaufort Island, Capes Cottrell and Hallett have been surveyed each year. Colonies which have not been photographed will be included in an aerial survey planned for early in December of the coming season.

ICEBERGS

The study of iceberg distribution, their size, origin, shape and numbers was continued by Dr Harry Keys. It began as a pilot study the previous season during which icebergs were examined and methods tested for measuring the size and shapes with the purpose of developing a new classification system in the detail possible

using fast-ice platforms. The system recognises three categories tabular, irregular and rounded and requires examination from at least two directions with attention given to features such as snow stratification and wave notches.

This season the operation was threefold; it comprised a helicopter flight from Scott Base, along the Victoria Land Coast to the Norden-skjold Ice Tongue during which photographs were taken from a height of 2450 metres and a depot laid 30 km south of the Tongue; travel with a dog team and skidoo from Scott Base to Butter Point, Cape Roberts, the Norden-skjold and returning via Butter Point to the Erebus Ice Tongue and Scott Base to make ground observations and a subsequent aerial photography from an RNZAF Hercules C130 Hercules, also flying at 2450 metres but 25 km from the coast.

The comparative data showed 448 icebergs wider than approximately 10 metres between the Norden-skjold Ice Tongue and Blue Glacier and a further seven in the Erebus Bay off Ross Island.

Most of the icebergs were detected by aerial photographs from helicopter flights and by ground observation. Seventy-five percent were thought to be grounded usually in depths of between 100 and 300 metres. Studies of sediment samples collected from 40% of icebergs will provide information about the origin. From this and other observations net movement patterns can be established. Consecutive satellite imagery will enable distinctive bergs to be tracked and will be used in this project.

Anare

Marine science cruise and geological mapping

Geological studies in the Framnes Mountains of MacRobertson Land and detailed mapping of the Stillwell Hills in Enderby Land were among earth science projects in the 38th research programme of Australian National Antarctic Research Expeditions (ANARE) which ended in March. A major marine biology project was a 45-day cruise in the Prydz Bay region to study the distribution of krill and its behaviour.

To deliver summer and winter parties and materials to the three continent stations, Casey, Davis, and Mawson, and the sub-Antarctic station on Macquarie Island ANARE used two chartered ships, the Nella Dan and the newly-built West German Icebird (4378 tonnes) owned by Schulz and Clemmensen, Hamburg. They made eight voyages between October and March.

This winter there are 106 men and women at the four ANARE bases. Of these 20 are on Macquarie Island, 33 at Casey, 25 at Davis, and 28 at Mawson. This number is one less than last year's.

ANARE relief and resupply operations for the 1984-85 season began in the second week of October when the Nella Dan left Hobart for Macquarie Island with the summer and winter teams. Between early November and the third week of March when she returned to Hobart the ship made three Antarctic voyages.

Because of a tight construction schedule the Icebird, a specially-designed and ice-strengthened polar resupply ship, was unable to call at an Australian port on her way to Antarctica before testing. She made

her maiden voyage from Cape Town direct to the ice edge to resupply Mawson, Davis, and Casey.

CARGO COSTS

To meet the Antarctic Division's charter requirements the owners of the Icebird arranged for 83 members of the summer and winter ANARE teams to be flown to South Africa. Three helicopters, some additional helicopter fuel, and a small quantity of equipment were shipped from Australia to Cape Town by freighter, the cargo costs being shared between the Antarctic Division and the shipowners.

After initial delays the Icebird sailed for the ice edge on November 4. She experienced relatively mild weather and completed her missions to Mawson and Davis by the middle of the month. A diversion was made to the Soviet station, Mirny, but then the ship was beset in the pack ice for seven days. She was off Casey on December 6 and the voyage ended at Melbourne on December 14.

With its ability to carry more than 5000 cubic metres of cargo, double the capacity of earlier cargo ships chartered by the Antarctic Division,

the Icebird performed most of the resupply tasks last season. As a result the Nella Dan had more time for marine research.

Icebird also provided support for shipboard and ship-borne projects during her voyages. Six chartered helicopters, three Hughes 500Cs and three Bell 206Bs were carried on the two ships. The Icebird used helicopters on her first, third, and fourth voyages south. In addition to ice reconnaissance and ship to shore operations the helicopters supported glaciology and biology programmes at Casey and Davis, and geology programmes in the Mawson area.

MONOLITH VISIT

On her third voyage to Davis and Mawson along the summer edge of the pack ice off the coast of MacRobertson Land the Icebird entered barely charted waters. The ship's master, Captain Ewald Brune, used Soviet charts for much of the journey.

But when the Icebird approached the Scullin Monolith ($67^{\circ} 47' S$ / $66^{\circ} 42' E$) which is 150km east of Mawson, and the Murray Monolith ($67^{\circ} 47' S$ / $66^{\circ} 54' E$) even the Soviet charts ran out. Captain Brune took the ship slowly to within one nautical mile of the Scullin Monolith, plotting depths and photographing the course to aid ships in future seasons.

As part of the International Survey of Antarctic Seabirds (ISAS) ANARE scientists had to visit the Scullin Monolith to continue studies of the estimated 500,000 Antarctic petrels and other birds which breed on the great granite hill. An ANARE party from the Nella Dan made an eight-hour visit to the Monolith on December 10, 1983.

Because the ship's echo-sounder showed rock pinnacles under the water

near the Monolith Captain Brune moved her 2.6nm to deeper water. She remained there for more than 12 hours while the ANARE party was ferried ashore to count and band Antarctic petrels, and collect lichens and rock samples.

SHOALS CHART

When the studies were completed the Icebird headed for Mawson. She made a careful and considered approach to the station in Horseshoe Bay because about 8.6nm directly off it on the only charted course hazardous shoals of rocks are scattered. At least four are named after ships that have struck them; the latest was the chartered supply ship Nanok S in 1983.

Soundings were checked on the way into Mawson. The Icebird's own launch ran ahead along the charted course with its echo-sounder providing the first alarm of trouble below water. Bearings were taken from the mountains behind Mawson and the local islands in front of it, and by late evening the ship was safely tied up in Horseshoe Bay.

A hydrographer, Lieutenant-Commander Robert Ward, was aboard the Icebird leading a reconnaissance for a Royal Australian Navy survey of the entrances to Australia's Antarctic stations. The first priority of the survey will be to chart the shoals outside Mawson.

STORMY WEATHER

Seventy-two passengers aboard the Icebird after her calls at Mawson, Davis, and Casey, had an uncomfortable voyage back to Hobart. The passage out of the ice was smooth but soon after dawn on February 14 the ship struck an intense depression when about 971nm south-east of Perth.

Hurricane force winds — Force 12 on the Beaufort Scale — and waves more than 10m high severely tested the ship. The winds of up to 70 knots and cross seas caused the ship to roll through up to 35 degrees. This movement was accompanied by persistent jolting as the 320-tonne steel accommodation module in a cradle bolted to the deck shifted about 5cm from side to side.

Captain Brune ordered that the Icebird heave to with its bow into wind. Then he changed course to keep the ship moving close to windward until about 4 p.m. local time when the worst of the storm passed. But when the ship was back on course for Hobart the module was still moving.

While the severe weather continued passengers left the module in favour of the bridge on the Icebird's main superstructure. They returned to it in the evening after the ship altered course again to ease the jolting.

Soon after the Icebird arrived in Hobart last month the module's fastenings were strengthened. It rests on rubber mounts in a cradle bolted to the deck and is also bolted down itself. Captain Brune says that the design provided for movement and the ship's classification permits it.

Expedition leader for the last of the season's eight voyages which was made by the Icebird was Mr James Beasel, who was nominated as director of the Antarctic Division on December 21 last year, having been acting director since February. The Icebird sailed from Hobart on February 22 for Mawson, Casey, and Macquarie Island, and returned in the third week of March.

In the 1983-84 season Australia had to withdraw from SIBEX I, the first phase of the Second International BIOMASS Experiment, a 10-nation co-operative research programme devoted

to understanding the Antarctic marine ecosystem, and particularly krill. Because of financial constraints and logistic problems the Nella Dan was forced into an extended resupply role and was available for only six days of marine research.

KRILL CRUISE

Australia's contribution to the second phase of SIBEX II last summer was the largest research programme in the Southern Ocean by Antarctic Division scientists. The 45-day expedition on board the Nella Dan covered more than 4600 nautical miles in seven north-south transects of Prydz Bay which lies between Mawson and Davis.

Twenty-one marine scientists and technicians led by Dr Harvey Marchant, head of the Antarctic Division's marine biology programme, took part in the expedition which sailed from Hobart on December 22 and returned on February 4. Good weather enabled the scientists to work at nearly all of 65 planned research stations where echo-sounders were used to measure the distribution and concentration of krill swarms, and collect oceanic and biological samples.

Research in Prydz Bay was concentrated on the distribution of krill and its behaviour, age, sex, and reproductive rates. Data was also collected on krill's environment, its predators, and on its food source, phytoplankton.

SWARMING STUDIES

More than 10,000 samples of krill were collected during the cruise and the Nella Dan brought back also more than 40 live adult krill and hundreds of newly-hatched juveniles. These will be studied in the Antarctic Division's laboratories by Dr Tom

Ikeda, senior research scientist in charge of the krill biology programme, *and his colleagues.*

On board studies of hatching rates showed that krill spawning is highly productive, relative to other species. Preliminary estimates indicated that some 80 percent of the eggs hatched.

Some Antarctic krill swarms can measure hundreds of metres across. Studies of the gregarious behaviour of krill compared to various fish species indicated that young krill tend to form groups in which they all face the same way and swim on the same angle. Video tapes showing krill lining up to match currents in tanks on the Nella Dan will be studied at the University of Tasmania as part of the work on swarming behaviour.

Research into swarming behaviour can be significant because predator fish and krill are often caught together. The numbers of immature fish in these catches can be quite high. Because of this any future large-scale harvesting of krill may harm fish population in the Southern Ocean through excessive hauls of immature fish.

EATING HABITS

Other studies included the eating habits of krill as previously it had been unclear what size of food the crustacean could eat. The scientists' findings proved that krill use food sources very successfully, eating phytoplankton from one micron in size through to the largest. (A micron is one-thousandth of a millimetre.)

Dr Marchant chanced on something new about the krill's eating habits. In one of the krill hauls he noticed that the faeces were white instead of dirty brownish green. On analysis he found that the mature female krill in the haul had been eating one kind of diatom which is between three and four

millimetres long. The food was chomped down to a uniform size of 50 microns "rather like someone eating spaghetti and biting off lengths".

Algal studies by the research team concentrated on the smaller phytoplankton which are very important in marine ecosystems. Much of the earlier work in Antarctic waters has focused on the large robust organisms or the visible phytoplankton in the sea ice. No blue-green algae were found south of the Antarctic Convergence where northward-flowing water descends below warmer water from the temperate zone to form a circumpolar boundary. The blue-green algae are found in high concentrations in tropical or temperate waters. Now it appears that if they exist at all in the Southern Ocean they are in very low concentrations.

NOISE EXPERIMENT

One of Australia's foremost experts on krill, Dr George Ettershank, of Monash University, who established a firm estimate of the total lifespan of the crustacean — seven years — by using a technique called "age pigment" analysis, followed a new line of research while aboard the Nella Dan. He conducted experiments to find out what kind of noises krill make.

Other marine research carried out aboard the Nella Dan on the SIBEX II cruise and her other voyages to the Casey, Mawson, and Davis ice edges, included observations of seabirds, seals, and whales, phytoplankton studies in the pack ice zone, deployment and recovery of current meters, measurement of currents in Prydz Bay, and deployment of sea ice buoys. C.T.D. (Conductivity, Temperature, Depth) equipment was used to map ocean depth, temperature, oxygen content, salinity, and light levels.

A major geological and biological study of the Bunger Hills, the second largest ice-free area in the Australian sector of Antarctica will be made next season by ANARE scientists. Early this month a team from the Nella Dan was flown by helicopter to make a three-day reconnaissance of the area which is 300km east of Casey and roughly halfway between the station and the Soviet station, Mirny.

Early in March, 1977, four scientists aboard the Nella Dan were flown some 70km south of the main ice edge to the Bunger Hills where they spent about five hours. Working from two helicopters in the surrounding hills and valleys the party collected samples of lichens and mosses from 14 sites, and studied organisms in algal mats from three freshwater lakes. The scientists and the two helicopter pilots also visited the Soviet/Polish station, opened in October, 1956, and named Oasis, then handed over to Poland in January, 1959 and renamed Dobrowolski.

In another ice-free area, the Vestfold Hills, which surround Davis, the earth sciences programme last summer included geomorphological studies and surveying of the shallow hills and valleys strewn with saline lakes and fiords. Early in February a field trip from Davis by two scientists to the Marine Plain about 5km from the station resulted in the discovery of a large bone fossil believed to be from a marine mammal.

FOSSIL FOUND

Dr Patrick Quilty, the Antarctic Division's chief scientist, who went south on the Icebird's third trip, was walking around a lake margin on the Marine Plain following a line of fossil shells when he found what appeared to be a frost-shattered rock.

Closer examination indicated that the fragments were bone.

Because of the size of the fossil which was in marine sediment Dr Quilty decided that it could not belong to a bird. When he returned to Hobart he said that the fossil was good, solid bony material from a fair-sized animal which had to be a marine mammal.

Future expeditions to the Vestfold Hills area will try to uncover more fossils. Dr Quilty's find will be removed from the rock matrix that surrounds it, and thin slices of the fossil will be subjected to microscopic examination to determine its structure and the type of animal it came from.

Twenty bags filled with hundreds of little slivers of fossilised bone brought back by Dr Quilty will also be examined. They are expected to provide additional clues to the original of the large fossil.

PEAKS CLIMBED

Geomorphological observations in the Framnes Mountains ($67^{\circ} 50\text{min}$ S/ $62^{\circ} 35\text{min}$ E), a group of three major ranges — Casey, Masson, and David — and adjacent peaks in MacRobertson Land were made by field parties from Mawson during the summer. Journeys were made by vehicles, starting early in December, and ascents were made of six peaks in two of the three ranges. Lichen samples were collected by each party for Antarctic Division biologists.

Earliest in the field was a party of four which reached the Casey Range by oversnow vehicle on a lichen sampling trip. Two trips were made on one day by two parties, one using an oversnow vehicle and the other a dog team, to the melt lake under Mt Henderson (970m) 14km from Mawson at $63^{\circ} 02\text{min}$ S/ $67^{\circ} 42\text{min}$ E.

There has been a field hut on the south-east side of the mountain since 1978.

A party of six which used the over-snow vehicle climbed the Goldsworthy Ridge which extends north from Mt Henderson in the north-east part of the Framnes Mountains. It also collected lichens.

Another party of four added to the lichen collection when it made a three-day visit to the David Masson

Ranges and climbed five peaks, one known only by the number 1050. In the David Range ascents were made of Mt Coates (1280m), Mt Hordern (1510m) about 6.5km to the south, and Dunlop Peak (1330m), one of the Smith Peaks, which is 1.6km south of Mt Hordern.

In the Central Masson Range the party climbed Mt Burnett (1050m) and Trost Peak (680m) which is 2.4km to the north-east of the higher peak.

Rebuilding programme reviewed

Australia's \$58 million 10-year rebuilding for its three Antarctic stations, Casey, Davis, and Mawson, now 30 to 40 percent completed, is being revised. The purpose of a review made last season is to try to find new designs and construction methods that will require less maintenance and less building activity in Antarctica.

A reduction in new work at Davis and Mawson has been ordered by Mr James Bleasel, director of the Antarctic Division, who announced the programme review late in January. He expressed concern that there are too many support staff — many of them builders and maintenance crews — in the present ANARE programme, and only about 25 percent of the expeditions are engaged in research and data collection.

Rebuilding activity will now be concentrated on Casey Station. It has to be rebuilt now as the old station is deteriorating to such an extent that it is expected to be unsafe within four years. The speed-up of work will mean that the essential elements of the new station should be ready for occupation in the 1987-88 season.

As a result of a Parliamentary Public Works Committee inquiry into the deterioration of the three stations

rebuilding activity began in 1981. Present designs for the programme which is managed by the Department of Housing and Construction employed large steel-framed modular panelled buildings which are constructed on site.

In the 1984-85 Budget allocation to the Antarctic Division the sum of \$300,000 was included for a review of the station building programme. A review team of Department of Housing and Construction officers not involved in the present rebuilding and a senior representative of the Antarctic Division inspected the stations last season.

When the review team reports by June this year it will give the results of its examination of the possibility of finishing the present programme using some type of modular structure which could be prebuilt in Australia and erected quickly in Antarctica without the need for a large force of building workers at the three bases. The report will also consider the feasibility of using simply maintained services to reduce the number of maintenance staff needed at the new stations. This would allow more scientists to be accommodated in Antarctica.

The third ascent was of the peak numbered 1050.

MAPPING HILLS

As part of the extension of research in ice-free areas detailed geological mapping of the Stillwell Hills and coastal islands in Enderby Land was undertaken last season. The Stillwell Hills ($67^{\circ} 26\text{min}$ S/ $59^{\circ} 28\text{min}$ E) which lie west of Mawson, are a group of rocky hills along the south-west side of William Scoresby Bay.

Along the east and west margin of the bay are the coastal islands, among them Bertha, Islay, Couling, and Sheehan. They are part of the William Scoresby Archipelago which runs

northward from the coast just east of the bay.

A programme of rubbish removal from the three continental stations, the first since Mawson was established in 1954, was carried out last summer. The cost in shipping time of bringing back the material to Australia was about \$A100,000, but the programme will continue for two more seasons.

Most of the rubbish cargo brought back to Hobart on each of the Icebird's last three trips consisted of timber offcuts and other construction materials. Other rubbish accumulated round the base for more than 25 years included used fuel drums, old oil, plastics, metal, and glass. After quarantine everything will be incinerated or buried.

Chinare

Chinese Base on Fildes Peninsula

China's first Antarctic research expedition (CHINARE) which established a summer station, Chang Cheng (Great Wall) on King George Island in the South Shetlands, returned to Shanghai early in April. The expedition, which lasted five months and cost about \$A5.39 million, spent three months in Antarctica. It worked on King George Island and in the ice-free area of the Bellingshausen Sea.

Great Wall station is on the east side of the Fildes Peninsula at $62^{\circ} 13\text{min}$ S/ $58^{\circ} 55\text{min}$ W, about one nautical mile from the Soviet Bellingshausen Station. It has two large accommodation buildings, a wharf, an airstrip, and an oil storage depot.

Representatives of six other nations which have stations on King George Island — Argentina, Chile, Brazil, Soviet Union, Poland, and Uruguay, attended the formal opening of the station, which took place in a heavy snowstorm on February 20. Members

of the expedition later spoke, by radio telephone, to their families who were attending a tea party in Peking. The Great Wall Station post office dispatched its first mail on February 27.

Dr Wu Heng, director of the Chinese National Committee for Antarctic Research, who cut a ribbon to mark the opening of the station, headed a delegation which had flown from China to attend the ceremony. He declared China's commitment to the peaceful international exploration of Antarctica and welcomed scientists of

other nations to join in the station's research work, adding that the invitation also applied to "our compatriots in Taiwan".

China's expedition sailed from Shanghai on November 20 aboard the 12,469-tonne oceanographic research ship Xiang Yang Hong No. 10, owned by the National Bureau of Oceanography, and the Chinese Navy's salvage ship J121 which served as the logistic support ship. After calling at Ushuaia, the Argentine port of Tierra del Fuego, the expedition reached King George Island on December 26.

SITE SOUGHT

Several days were spent in the reconnaissance of possible sites for the station. On December 31 China's flag was flown for the first time on "Antarctic land". Seven hours later the decision to build the station on the Fildes Peninsula and call it Great Wall was announced.

While construction was in progress a separate scientific party — the Southern Ocean Research Expedition — worked aboard the Xiang Yang Hong No. 10 studying marine living resources, particularly krill and their environment. These investigations were under the direction of Jin Qingming, deputy-director of the Second Institute of Oceanography.

LOGISTIC SUPPORT

With its French Aero Spatiale Super Hornet helicopter the J121, which anchored in Maxwell Bay, provided logistic support for the construction team and the summer scientific party. Mr Guo Kun director of the office of the National Committee for Antarctic Research was in charge of the station and directed a scientific programme of mapping, meteorology,

geology, geomorphology, and biology.

As a result of work done by the People's Republic of China since the 1980-81 season with the Australian, New Zealand, Argentinean, Chilean, and Japanese programmes, the first expedition included a number of scientists with previous Antarctic experience. Two — Guo Kue and Chen Shanming — worked at Argentine stations in the 1982 summer, and five took part in Australian National Antarctic Research Expeditions (ANARE) programmes between 1980 and 1982.

Mr Guo Kun's two deputies, Dong Zhaoqian and Zhang Qingsong, were both at Casey in the summer of 1980. Zhang Qingsong wintered at Davis in 1981, and Dong Zhaoqian worked aboard the Nella Dan on the Australian section of the First International BIOMASS Experiment (FIBEX) in the summer of 1981. Lu Peiding and Bian Lingen wintered at Davis in 1982, and Yan Qide worked in the summer of 1982 on an Australian marine geoscience cruise aboard the Nella Dan.

PROGRAMME COMPLETED

China's research programme last season was completed towards the end of March. The two ships sailed to the Chilean port of Punta Arenas Tierra del Fuego, where they spent several days, and then proceeded through the Straits of Magellan on their way to Shanghai.

Since 1980 the People's Republic of China has sent observers to the meetings of the Scientific Committee on Antarctic Research (SCAR). It applied for membership at last year's meeting in Bremerhaven, West Germany, and members agreed to make a decision at this year's executive meeting after the PRC had com-

pleted its planned marine research programme and established a summer station.

SCAR's executive meeting in April is expected to admit the PRC to membership. China, which acceded to the

Antarctic Treaty in 1983, plans to send a second expedition south next summer. This is in pursuance of its declared intention to seek consultative membership of the Antarctic Treaty by 1985.

Gangotri IV

India plans South Pole traverse

India plans to send a traverse party to the South Pole early next summer from its permanent station Dakshin Gangotri ($70^{\circ} 05' 37''$ S/ 12° E) on the Princess Astrid Coast of Queen Maud Land. Dr S.Z. Qasim, Secretary of the Department of Ocean Development, who heads the Indian research programme, announced the proposed attempt by the present winter team to make the return journey of up to 2500 nautical miles when in Australia in May.

Dakshin Gangotri, established as a permanent station in the 1983-84 season, and fully operational last season, will be expanded in future seasons, according to Dr Qasim. An area of 200 square kilometres has been earmarked for extending the station, which is in the Schirmacher Hills region about 18.5km from the Soviet station, Novolazarevskaya. Three more buildings will be constructed, but Dr Qasim says a base on the ice shelf will still be needed to transfer materials to Dakshin Gangotri.

When the fourth expedition, reported to have cost \$A4 million, sailed for Goa by way of Port Louis, Mauritius, in the first week of March, a winter team of 15 scientists and support staff led by Mr P. Kumaresan, remained. It relieved last winter's team of 12, which was led by Lieutenant-Colonel S. S. Sharma, of the Defence and Development Research Organisation.

India's first ice-strengthened ship Sagar Sampathi was expected to carry

the fourth expedition south but the Department of Ocean Development chartered the Finnish ice-strengthened Finn Polaris (6826 tonnes) for the second time. It was commanded by Captain K. Lasse. There were 44 scientists and support staff in the expedition which was led by a geologist Dr B. B. Bhattacharya. His scientific team included geologists, biologists, electronics and radio engineers, and meteorologists.

Helicopter support during the summer was provided again by a self-contained air support group led by Commander G. Verm and Wing Commander R. K. S. Dhillon. It operated two Indian Navy Alouette III helicopters and two Indian Air Force Mi-8 helicopters. These were used for aerial photography, logistic support for field operations, and hydrographic surveys.

Early in December the Finn Polaris sailed from Goa for Queen Maud Land. After a three-day call at Port Louis the ship arrived at the ice edge

in the last week of December. The summer team departed in the first week of March, stopped for two days at Port Louis, and returned to Goa towards the end of the month.

MINERAL SURVEY

Geologists in the first expedition (1981-82) found evidence of uranium and those in the 1983-84 summer team conducted geophysical and magnetic surveys which showed occurrences of copper, lead, and zinc. The emphasis last season was primarily on geophysical surveys to ascertain the physical properties of the ice shelf and the ocean floor below it so as to determine the mineral potential of the area.

Previous geophysical surveys were limited to the operation of magnetometers. Last season radio-echo sounding was carried out to estimate the ice thickness at a number of locations. Electro-magnetic surveys were conducted to determine ice thickness and investigate the geophysical structure over Antarctica.

Seismic prospecting was done to map the basement configuration, locate possible high velocity sediments under the ice cover, and find out the crystal structure. Heat flow measurements were also made at a number of critical sites.

HILLS MAPPED

During the third expedition geologists mapped the whole of the Schirmacher Hills range on a scale of 1:25,000, and renamed them Dakshin Gangotri Hills. Certain areas were of interest for mineral potential, and last summer detailed investigations were carried out in them.

Geologists covered seven lines of research in their investigations. These were:

- nature of mineralisation (ore

- types on the surface and sub-surface;
- extent of mineralised zone;
- controlling factors of mineralisation (structural, lithological etc.);
- bedrock geochemistry and nature of wall rock alteration;
- structural evolution of the shear zones;
- physio-chemical environment of mineralisation;
- crystal evolution of the region in the light of plate tectonics.

Projects started during the first three expeditions were continued at sea and on the ice. Some studies in oceanography were continued during the voyage of the Finn Polaris to Antarctica and along the coast of Queen Maud Land. In addition studies of krill and micro-biological investigations were also continued. Monitoring of meteorological parameters was done on the voyage from Goa, at the site of the ship's location by the ice edge, and at Dakshin Gangotri.

ENVIRONMENTAL STUDIES

Environmental studies included aero-biological sampling and investigations of man-made changes in the Antarctic environment. Two studies of human adaptability to a polar environment were made. They covered the effects of continuous daylight/darkness over long periods on the human metabolism, and the effects of living in isolation in a small group.

Dakshin Gangotri was set up as a permanent research station in 29 days by the Army construction team of 28 engineers, fitters, carpenters, and electricians in the 1983-84 expedition, which was led by Dr H. K. Gupta. The station was handed over to Lieutenant-Colonel Sharma on February 24.

In addition to prefabricated accommodation modules the con-

struction team installed a heating system, and erected a biological laboratory and a meteorological observatory. Radio engineers installed a satellite communications system, and a helipad was laid out on the ice. A site for an airfield was selected about 5km from the station, and the bearing strength of the ice was determined.

Mr Kumaresh, who is the leader this winter, is an engineer. With him

are S. P. Sarpotdar (engineer), Dr X. N. Verlencer (biologist), Bhukan Lal (scientist), Naresh Kumar (general physician), Ranjit Kumar (doctor), M. G. Appachu (vehicle mechanic), C. Sangewar (geologist), B. P. Thimmaiah (carpenter), S. N. Mishra (electrician), K. C. Somanna (engineer), Kamal Dev, D. P. Parashar, Chand Singh (communicators), Kedar Singh (cook).

Norwegian expedition to Queen Maud Land

Norway's largest Antarctic expedition for 25 years spent two months in the southern Weddell Sea and Queen Maud Land last summer. Seventy-seven men and women, including 28 scientists and engineers took part in the expedition, which was led by Dr Olav Orheim, of the Norwegian Polar Institute.

A marine science programme was carried out from the Norwegian Coast Guard's Andenes which had been out fitted with eight laboratories covering a space of 1000 square metres, and 10 scientific winches. The 106m-long ice-strengthened vessel, commissioned in 1982, was operated by a crew of 42 officers and men. Her two Bell 206B helicopters were used for ice reconnaissance and science support.

Late in December last year the Andenes sailed from the Argentine port of Ushuaia on Tierra del Fuego for the Weddell Sea. Field parties were deployed by helicopter in Queen Maud Land around 5° E and 15° W in early January. Two summer camps were established: Camp Norway 5 (about 72° S/5° E) and Camp Norway 6 (about 74° 30min S/10° W).

Scientists from the Norwegian Polar Institute, the Continental Shelf Institute, and the Universities of Bergen and Washington (U.S.A.)

carried out a marine research programme in the southern Weddell Sea and on the continental shelf and slope. These covered geophysics, geology, glaciology, and oceanography.

Four geophysicists from the University of Bergen studied the depositional and subsidence history of the southern Weddell Sea margin. Their project included collection of about 2000km of 48-channel seismic data, heat flow studies, and continuous gravimetric and magnetometric profiling.

CURRENT FLOW

Marine geologists from the Continental Shelf Institute and the Polar Institute concentrated on the glacial history of the Weddell Sea continental shelf, sea floor morphology, and sedimentary processes outside an ice shelf. The two oceanographers studied the circulation on the Weddell Shelf, and

the flow and transformation of bottom water. They deployed nine current meter rigs which will be recovered by a later expedition.

ICEBERG STUDY

Two glaciologists, Dr Orheim and Dr Monica Kristensen, of the Polar Institute, studied iceberg response to ocean waves, and underwater shapes of icebergs and ice shelf fronts. They also made radio echo sounding studies of the grounding area of the Jutul Glacier and Riiser-Larsen Ice Shelf, and limited sea ice studies.

Work at Camp Norway 5 covered ornithology, botany, ecology, glaciology, geological mapping, and topography. Two ornithologists from the University of Trondheim and one from the Polar Institute studied breeding colonies of the Antarctic petrel located 1700m above sea level and 200km from the sea. They made out a population census and investigation of the petrels' breeding biology.

TERRESTRIAL ECOLOGY

In the area of the Gjelsvik and Muhlig-Hofmann Mountains scientists from the University of Oslo studied the terrestrial ecology of the area, including floristic phytogeography and dispersal ecology, the energy budget and the micro-climate. Another project covered the ecology and low temperature tolerance of terrestrial invertebrates.

A search for meteorites in blue ice fields was made by geologists from the University of Oslo and the Polar Institute. Their geologic mapping programme included radiometric datings of the Gjelsvik Mountains - Buddenbrook Ridge area. The Polar Institute topographic programme covered geodetic determination of

points for the construction of satellite maps with concurrent collection of Landsat 5 imagery.

Studies of bottom freezing/melting at the grounding line, and of hydrocarbons and organic pollution in the air were made by a University of Bergen geologist. He also worked on the sulphur-sodium ratio of snow, and the sulphur dioxide content in the air inside the snow pack.

PETROGRAPHIC STUDIES

One of the four geologists who worked from Camp Norway 6 was from Statoil, the Norwegian State-owned oil exploration, recovery, and distribution company established at Stavanger in 1972. His work included biostratigraphic and petrographic studies of the sedimentation and tectonism of upper Palaeozoic sequences in western Queen Maud Land.

Two geologists from the University of Bergen carried out geochemical, radiometric, and palaeomagnetic investigations of the basalt lavas in Vestfjella (Kraul Mountains) and Heimefrontfjella (Homefront Range). In the same area a Swedish geologist from the University of Stockholm conducted glacial geological and geomorphological studies.

During its cruise along the coast of Queen Maud Land the Andenes called at the British Antarctic Survey Station, Halley, and was in touch with the West German research ship *Polarstern* on which there was a Norwegian biologist who took part in the RFG expedition to the Weddell Sea. Field parties were retrieved late in February and then the Andenes set course for isolated Bouvet Island in the South Atlantic.

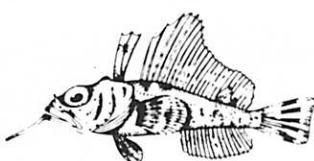
In 1978-79 the Norwegian Antarctic expedition set up a manned weather station on Bouvet Island for the summer. Two automatic weather

stations with battery capacities for one and two years were also established, and scientists carried out meteorological, biological, geological, geophysical, and surveying programmes.

BOUVET ISLAND

Since then the weather station has been maintained by ships of other nations engaged in sub-Antarctic and Antarctic research. Last summer members of the 1984-85 expedition spent several days on Bouvet Island. The weather station was serviced, a back-up station was established, and the old station was recovered. Biologi-

cal surveys were made on the island, and aerial photography of the upper part of the island, and geodetic and triangulation surveying were carried out with the support of the helicopters from the Andenes.



Africana's call for assistance

A South African Sea Fisheries research ship caught in a storm in the Indian Ocean early in March called for assistance when it suffered a steering failure. The Africana, a 2451-tonne ice-strengthened stern trawler, was 320 nautical miles north of the Australian station, Mawson, off the coast of Enderby Land, on March 10 when she encountered mountainous seas and winds blowing at Force 11 to 12 on the Beaufort Scale.

First to answer the distress call was the West German-owned Icebird, which was on the fourth voyage of its first season under charter to Australian National Antarctic Research Expeditions (ANARE). At the time the Icebird was about 44 hours' steaming away, and on her way to Casey Station, but she turned around and headed for the Africana.

Eighteen hours after answering the distress call the Icebird turned back on course for Casey. The Africana reported that assistance was nearer at

hand from a Soviet trawler, and the crew had been able to centre the ship's rudder. The Soviet trawler reached the Africana on the evening of March 10 and escorted her on the way to Marion Island (46° 52min 34sec S/ 37° 51min 32sec E) in the Southern Indian Ocean where South Africa has a permanent meteorological station.

For the last two years the Africana has been engaged on fisheries research and has made 22 cruises off the South African coast from Cape Town and as far south as Marion Island. This month she made her first trip to Antarctica.

With ships from Australia, France, and Japan the Africana took part in research in the Indian Ocean sector of the Southern Ocean. The research cruise was part of South Africa's contribution to the second phase of the Second International BIOMASS Experiment (SIBEX II), a 10-nation co-operative research project on the distribution and abundance of krill.

BAS news

First marine geophysics programme

There were delays at the beginning of the 1984-85 summer season because of dense pack ice and bad weather off the west coast of the Antarctic Peninsula. Later on, some field work, especially on the Trinity Peninsula and in George VI Sound, was severely hampered by gales and by soft snow surfaces caused by unusually high temperatures. Nevertheless, most programmes* progressed very satisfactorily.

Two large depots, south-west of the Weddell Sea and south of Alexander Island, were established in preparation for next year's air operations, but bad weather prevented the setting up of a third, on James Ross Island. This task was greatly helped by the use, for the first time by BAS, of chartered helicopters, one of which was unfortunately wrecked on the Ronne Ice Shelf in mid-January.

Another development in 1984-85 was a marine geophysics programme carried out for the first time by BAS and Birmingham University geophysicists from the Natural Environment Research Council's ship RRS Discovery, in the Scotia Sea, northern Weddell Sea and Bransfield Strait. Such programmes have previously been carried out by Birmingham University geophysicists on BAS ships.

RRS JOHN BISCOE

Pack ice continued to prevent access to the west coast of the Antarctic Peninsula and the condition of the snow runway at Damoy air facility, Wiencke Island, was doubtful. Men picked up from Punta Arenas by the RRS John Biscoe in mid-November were flown to Rothera Station from the Chilean Teniente Marsh Station. They were landed at Marsh on November 21 and the ship then proceeded to Bird Island off the north-western end of South Georgia.

Persistent gales prevented the ship from anchoring so she continued eastwards to land geomorphologists at St. Andrews Bay and called at Grytviken. The wind then abated slightly and the relief of the Bird

Island Station was carried out a few days later.

After second visits to Grytviken and Bird Island the ship set course for the South Orkney Islands. There were further delays because of gales but fuel and stores were delivered to Signy Station and the next task was to collect more fuel from the Falkland Islands before returning to the Antarctic Peninsula.

Faraday Station was relieved in mid-December and the ship then proceeded to Montevideo, via Marsh Station, to collect more men and stores. Sailing south again via the Falkland Islands, she called briefly at Faraday and arrived at Rothera, Adelaide Island, on January 10.

After relieving all stations except

Halley equipment for the long-term Offshore Biological Programme (OBP) was tested and the RRS John Biscoe resumed work in mid-January on the Programme (OBP). The first project, which was the British contribution to SIBEX (the Second International BIOMASS Experiment), was a zone survey between the South Orkney Islands and South Shetland Islands, around the South Shetlands and throughout the Bransfield Strait. A total of 53 standard stations on 13 transects were completed by early February. The main concentration of krill was found to be around the Elephant Island Group, extending to King George Island, with smaller concentrations in the Bransfield Strait. The work had included acoustic runs, hauls using a rectangular mid-water trawl and bird (predator) observations.

OBP work for BAS was then resumed. The first phase was a detailed study of the influence of physical oceanography on the abundance and distribution of krill off the south and east coasts of King George Island. This was followed by brief visits to Marsh and Palmer stations to move BAS personnel and then, from the end of February to mid-March, studies were made on the variability and microstructure of krill swarms west and north-west of the Elephant Island Group, using a BAS-built plankton recorder, profiling current meters and a video/stereo-still camera system. Although the weather was generally bad and seas rough during this final phase, much valuable work was done. Net sampling efficiency tests were carried out in the sheltered waters of Port Foster, Deception Island and Potter Cover, King George Island and, after two men had been landed at Marsh station, were resumed as the vessel proceeded north-east to South Georgia. The Weddell Sea - Scotia

Sea confluence in about long. 51°W and the polar front and frontal zone in the Scotia Sea were surveyed.

Three American biologists were on the John Biscoe during the OBP cruise. Another spent some time on Bird Island and two more worked on the diving physiology of king penguins at St. Andrews Bay, South Georgia. The latter two were picked up by the John Biscoe at the end of March. The ship then made a brief visit to Grytviken before heading for home via Rio de Janeiro. She arrived at Grimsby on April 23.

RRS BRANSFIELD

From Southampton, which she left at the beginning of November, the RRS Bransfield sailed south via St. Helena and Cape Town and proceeded direct to Halley Station. After passing through 650 nautical miles of pack ice she entered a shore lead on December 13 and arrived at Halley the next day.

Unloading was again possible at a convenient inlet in the ice shelf about 16km north-east of the station and was completed in two days. The two chartered Bell Jet Ranger helicopters on board were then test flown and the ship departed south-westwards to lay a field depot as near as possible to the western end of the Ronne Ice Shelf front. At about 50°W progress was hampered by dense pack ice in the shore lead and bad visibility, but satellite reports indicated clearer water 30 nautical miles ahead.

The Bransfield proceeded slowly in company with the Soviet cargo ship Kapitan Myshevskiy which was attempting to reach Druzhnaya II Station, but progress beyond $50^{\circ}30\text{min}\text{ W}$ seemed to be impossible. A suitable depot site was found on

the Ronne Ice Shelf, a safe route to it over the ice shelf was marked out and an emergency depot established. On January 5 the helicopters began ferrying the main supplies ashore, but after a short while one crashed — fortunately without injury to the pilot and had to be abandoned.

A few days later the ship was able to move alongside the ice front at $75^{\circ} 33' \text{S}$ / $57^{\circ} 47' \text{W}$ and, with the concerted effort of all on board, the depot was completed (1010 drums of fuel were taken ashore). The Bransfield then returned to Halley but the collapse of a large snow cornice along the ice cliff had made the original unloading site unusable, so the ship tied up at an alternative site about 20 km west of the station.

On January 18 the Bransfield finally sailed from Halley and arrived at Signy a few days later. Prefabricated hut sections were delivered by the helicopter to three field work sites on the island. The ship then visited Bird Island and Royal Bay, South Georgia. At the latter, the field hut was inspected (it was found to be in good order although field equipment had been removed) and the botanists' reindeer exclosures were also checked.

AIR DELIVERY

At the beginning of February the ship collected more cargo and fuel from the Falkland Islands and then, at Montevideo, exchanged home-bound summer visitors for others heading south. She also collected air freight which included aircraft spares and a helicopter to replace the one which had been wrecked on the Ronne Ice Shelf.

The new helicopter was test flown in the Falklands on February 25. The

ship then sailed for the southern part of the west coast of the Antarctic Peninsula, calling briefly at Faraday and Rothera (both having been relieved by the John Biscoe) before continuing through pack ice to the Ronne Entrance south of Alexander Island. She arrived at the edge of the fast ice off Spaatz Island on March 5. Helicopter reconnaissance showed that the best site for the proposed fuel depot to be at 300 m on Spaatz Island and 150 drums were ferried ashore before the weather deteriorated. Flying was impossible in four out of the next ten days but the depot of 573 drums of fuel was then completed.

GLACIOLOGY

While the ship was in the area, glaciologists measured the temperature and salinity of the water column, to supplement the work that they had been doing on George VI Ice Shelf. At the same time, the Bransfield carried out bathymetric profiling across the Ronne Entrance and charted the coastline, sea floor and George VI ice front, using satellite navigation and radar. A conspicuous channel 900-1215 m deep and 8 km wide was found off Spaatz Island, continuing the line of George VI Sound. Geologists were able to visit hitherto inaccessible rocks on the south-western tip of Alexander Island.

After spending ten days in the area the ship returned through the pack ice to Rothera. The remaining cargo was unloaded, the station refuelled and field depots replenished by March 21. In the next few days a final visit was made to Faraday station, specimens were picked up from Palmer station, the Damoy hut secured for the winter, and BAS

aircraft skis picked up from Marsh station.

PACK ICE

The Bransfield then attempted to lay a depot on James Ross Island in preparation for the resumption of field work there in 1985-86. Dense pack ice and bad weather were encountered south of Antarctic Sound, and the ship drifted in the ice for a few days before the helicopters managed to fly a small quantity of food and fuel to Cape Lachman, the north-eastern tip of the island. Further attempts were thwarted by falling snow and strong winds and the ship left the area on April 1. Brief visits were made to the Falkland Islands to take on fuel, to Signy and Bird Island to pick up the remaining field workers and to Grytviken for water, and the ship then headed for home via Rio de Janeiro. She arrived at Grimsby on May 14.

AIR SUPPORT

The three BAS Twin Otter aircraft supported field parties throughout the summer. They carried out glaciological radio-echo sounding over a wide area of the continent. As usual they were based at Rothera on Adelaide Island, using a snow runway on the exposed piedmont 5 km inland at a height of 280m.

All three aircraft began the season by ferrying aviation fuel and general cargo to the Fossil Bluff hut in George VI Sound, which is used as a staging post for summer operations further south. In November, all three also collected men and cargo delivered to Damoy by the RRS John Biscoe but, as conditions there were so unfavourable, the hut was closed and later

arrivals were routed via Marsh Station. BAS was most grateful to the Chileans who allowed its ships and aircraft to use the Marsh facilities. This ensured that field work could begin without delay.

Field groups were flown to Alexander Island, George VI Sound, the Black Coast, the Ellsworth Mountains, the Rutford Ice Stream, Gipps Ice Rise (Larsen Ice Shelf) and Siple Station. Four BAS men joined four Americans for a second season's USARP-BAS collaboration, this time in the Jones Mountains-Thurston Island area.

Three BAS flights were made from Siple Station, closed this year, to the Jones Mountains in December, in an unsuccessful attempt to locate a fuel depot which had been supplied by the Americans last year. A replacement bladder of fuel was flown in by a United States Hercules aircraft at the beginning of January. The party was in the Jones Mountains throughout December, but because of bad weather were able to work for less than half of the time.

In December, one BAS aircraft flew to Marsh via Trinity Peninsula where BAS geologists were working. They landed at Hope Bay at the beginning of November and for most of the time since then had been hampered by bad weather and soft snow.

One aircraft continued to support the USARP-BAS field work in the Thurston Island - Abbot Ice shelf area in January, and good progress was made in generally excellent weather. A second aircraft supported BAS groups in other areas and visited the new Ronne Ice Shelf depot. The third aircraft flew from Rothera to Halley and back via Fossil Bluff, transporting staff, and undertaking radio echo sounding flights over

Palmer Land and the Ronne Ice Shelf.

All aircraft were grounded for a while by bad weather. One was unfortunately damaged in a storm at Rothera airstrip and remained grounded while awaiting a specialist engineer and spare parts, but was repaired, test-flown and returned to normal service in early March.

Radio-echo flights continued into February from the Ronne Ice Shelf depot and included traverses along the ice front to Berkner Island and over the English Coast of George VI Sound. After this, the aircraft was based at Fossil Bluff and flew over Palmer Land, but was damaged again in mid-February while taking off at the Bluff from an uneven surface caused by excessive summer melting. Temporary repairs to the nose-oleo and fuselage, by a Canadian engineer sent south for the purpose, enabled the aircraft to be flown out at the end of the summer.

FIELD PARTIES

The remaining operational aircraft ferried field parties back to Rothera by early March. Five Canadians who had been investigating the possibility of constructing a hard landing-strip at Rothera were flown to Marsh to return home from there. (The present snow airstrip is 5 km from the station at a height of 280 m.) Fuel was taken to the northern end of George VI Sound, a party collected from the Rutford Ice Stream and some aerial photography undertaken at Rothera. Sea ice reconnaissance was then carried out west of Alexander Island and the Eklund Islands for the Bransfield which was to attempt to set up a fuel depot in the Ronne Entrance area shortly afterwards.

On March 5 and 6 flights were made to Brabant Island where a member of the Joint Services Expedition had been injured on a remote peak. The aircraft located the party but was unable to land or drop supplies because of low cloud and turbulence.

A week later, BAS field equipment was retrieved from several localities and Fossil Bluff was closed for the winter. All three aircraft left Rothera on March 16 and arrived back in the UK on March 27. (The skis of the temporarily repaired aircraft had been removed at Marsh station en route to reduce drag. Normally, they remain in place as they are too large to be carried in the aircraft.)

MARINE GEOPHYSICS

A University of Birmingham group funded by BAS and led by a BAS geophysicist undertook a 4-month cruise on the NERC ship RRS Discovery. This continued the marine research begun by Discovery Investigations in 1925, and the long-term Birmingham University-BAS geophysical research into the evolution of the Scotia island arc, begun in 1959. The Discovery is not ice-strengthened and therefore had to keep north of the pack ice.

The first of this year's projects, which began in early January, was a study of young ridge crest-trench collisions along the Pacific margin of the Antarctic Peninsula. A transect of the shelf and margin was surveyed off Anvers Island to obtain underway bathymetric, magnetic, seismic, shallow sidescan and gravity profiles. HMS Endurance collaborated in two expanding-spread seismic lines, firing depth charges that were recorded on

RRS Discovery with a new BAS-funded digital multi-channel recording system. Heat-flow measurements were undertaken by personnel from the University of Texas at Austin and from Woods Hole Oceanographic Institution. Profiles across the youngest (4 million year) collision zone off northern Brabant Island were supplemented by dredge hauls on the upper continental slope.

The second project was mainly devoted to a seismic and piston-coring transect from the centre to the northern edge of the Weddell gyre, with the object of understanding how Weddell Sea bottom water influences sedimentation. Excellent records were obtained and a total of about 90 m of cores were recovered from 14 stations. Analysis of these will assist site selection for a 1986-87 Ocean Drilling Project in the Weddell Sea. Other possible drilling sites were surveyed on the South Orkney Islands micro-continental block.

The final phase concentrated on a reconnaissance of the very young ridge crest-trench collision at the southern end of the South Sandwich Islands arc and trench. The new seamounts were mapped and sampled. An interesting result from shallow water was the detailed mapping of iceberg scour tracks recorded with shallow sidescan sonar.

SHIPS AND AIRCRAFT

HMS Endurance and her helicopters gave excellent assistance to BAS in the 1984-85 summer. After collaborating with the Discovery in seismic work for the marine geophysics programme in mid-January, the ship picked up the Trinity Peninsula field party from the Chilean O'Higgins station. In early February

she undertook aerial photography of James Ross Island, which will be very useful for future geological field work, and, in spite of bad weather, made an aerial reconnaissance of the South Sandwich Islands. Later in the month, two men were taken on board from Bird Island; two others were flown from Bird Island to Cape Alexandra, the north-western tip of South Georgia to carry out a Wandering Albatross census, and four Aberdeen University scientists were picked up from St Andrews Bay. In mid-March, the ship picked up four men from Rothera, and enabled two of them to make geological landings at the northern end of the Antarctic Peninsula.

OTHER ACTIVITIES

Endurance also assisted the Joint Services Expedition to Brabant Island, picking up the 1984 winterers, and landing a summer party at the end of December, and picking them up in mid-March.

In between these various tasks several BAS stations were visited and given valuable help. While at Signy in January, the ship's helicopters moved stores to a depot on Coronation Island, carried out aerial photography of Signy Island and transported biologists to an ice-covered lake where they were diving for specimens. In February, the naval helicopters enabled two new field huts to be set up.

His Excellency, the Civil Commissioner of the Falkland Islands Dependencies and High Commissioner of the British Antarctic Territory, Sir Rex Hunt, and Lady Hunt spent some time on Endurance and visited Bird Island and Signy.

The West German research ship

Polarstern called at Signy in mid-January en route for Neumayer station, and two weeks later visited Halley. The Walther Herwig visited Signy in mid-February. Helicopters from the Norwegian National Antarctic Expedition's ship Andenes went to Halley in mid-February. The expedition, which had been working on icebergs, sea ice and glaciers along the coast of Dronning Maud Land, included Dr Monica Kristensen, the leader of the 90° South Expedition planned for 1985-86 (see *Antarctic*, September 1984).

VISITORS

A Polish geophysics expedition on board the research ship Jantar called at a number of stations and refuge huts on the west coast of the Antarctic Peninsula in January. They spent a week in the vicinity of Rothera. USCGC Glacier was also in the area, carrying out seismic work.

Helicopters from the Glacier and the Chilean vessel Piloto Pardo visited Rothera in January. (Piloto Pardo was resupplying the Chilean summer station Teniente Carvajal — formerly the BAS Adelaide station.) Other Chileans called at Rothera in early February.

The Chileans had flown supplies of aviation fuel to Fossil Bluff in October, and two of their aircraft landed at Rothera after reopening Teniente Carvajal. They also made a number of flights in November and December to Rothera and to Fossil Bluff, the latter when en route to Siple and the South Pole. A Canadian Twin Otter refuelled at Rothera in early November, and was grounded there for a week by bad weather before being able to continue on to McMurdo via Siple and Byrd stations.

Two west German Dornier aircraft

arrived at Rothera in mid-November, en route between Marsh and their Filchner summer camp via Fossil Bluff; they returned at the beginning of February. BAS was appalled to hear that one of the Dornier's was shot down over Western Sahara by Polisario rebels when it was on the way home. The crew died.

A private DC3 Tri-Turbo aircraft paid a brief visit to Rothera from Punta Arenas at the end of November. The crew were two ex-BAS men.

The tourist ship Lindblad Explorer visited Faraday and Signy in December, Faraday three times in January and Signy (and Coronation Island) at the beginning of February when she also visited South Georgia.

A New Zealand yacht, Totorore, visited Bird Island at the end of September. A few days later, fifteen men from the Royal Fleet Auxiliary Sir Lancelot were forced to spend a night on the island when bad weather delayed helicopter flights back to the ship. The Sir Lancelot carried the private New Zealand expedition which worked on South Georgia from November to January. The five members, led by Dr Ian Turnbull of the N.Z. Geological Survey, undertook geological and biological projects. All were expert climbers.

A private international climbing expedition on board a French yacht, Basile, was in the Antarctic Peninsula area from mid-February until the end of March. The eight members were from France, Italy and Switzerland. The yacht spent three days at Faraday at the end of February — when three other yachts, Kotick, Ksar and Sundowner, were also there. Kotick took six BAS men on a visit to a nearby island and the mainland

and a few days later, with Basile, went south to Rothera. They returned to Faraday in mid-March. Basile then took several BAS men on day-trips and one was able to climb Mt. Mill, on the mainland, with two members of Basile's crew. The yachts departed northwards in mid-March, intending to call at Wiencke Island and Marsh station.

FROM THE STATIONS

All stations continued their routine scientific programmes. Short journeys, chiefly for recreation or training, were undertaken in several areas at the beginning of the summer in brief periods of good weather. Visits were made from Faraday to the mainland, and from Halley to the ice front and the heavily crevassed hinge-zone of the Brunt Ice Shelf. One attempt to reach the inland ice from Halley was thwarted by ice cliffs. Further journeys were undertaken from Halley, in February and March, to the hinge-zone and the Stancomb-Wills Glacier. A snowmobile left in a crevasse at the hinge-zone in December, was located and recovered in February in spite of bad weather. Later in the month, a party succeeded in crossing the hinge-zone to launch radio-sonde balloons from the plateau. Unfortunately, radio interference prevented the sonde signals from being picked up at Halley.

Earlier in the summer at Halley, a West German aviation fuel depot was moved from the old station to the new station and a new snow air-strip marked out.

At Rothera and in George VI Sound considerable melt problems were caused by high summer temperatures. At Rothera, January was the warmest month on record (the mean

daily temperature was +1.9°C and the maximum recorded was +7.9°C) and there was heavy rain and sleet. Conditions improved at the end of the summer, and some field-training trips were undertaken to the north of Rothera. At base, general improvements included the installation in February of a 10,000-gallon rubber fuel tank.

From Faraday, journeys were made in February to several nearby islands, and also to the mainland to complete work on a refuge hut and check a depot. At the beginning of the month all hands had been required to assist in the erection of a new VLF hut and aerial mast and the relaying of power cable weighing over a ton. The helicopters on Bransfield assisted in moving equipment.

At Signy, journeys were made to Coronation Island in March to replenish a depot at Olivine Point and enable film sequences to be taken for the BBC. At the beginning of the month the whole base complement was co-opted to undertake a fur-seal census over the island. The seal population has been increasing rapidly — much to the detriment of the vegetation, especially the moss banks.

On March 22, the John Biscoe reported that the glass-fibre living hut on Deception Island, one corner of which had been damaged in the 1969 eruption, had apparently been removed. No trace of it remained, although other damaged buildings were still there.

There are 61 winterers this year: 18 at Halley, 14 at Rothera, 13 at Faraday, 13 at Signy and 3 at Bird Island.

Greenpeace plans Antarctic base

Greenpeace, the international conservation organisation, plans to establish a permanent base in Antarctica this coming summer. Four men — a scientist, a doctor, a mechanic, and a radio operator — will spend a year on the continent at a prefabricated base which is expected to be erected in January next year.

An expedition is expected to sail from Hamburg to Antarctica by way of the United States, New Zealand, and Australia. It will use a 1000-tonne converted ocean-going tug named Gondwana which is likely to reach Antarctica late in December. The tug will probably carry a crew of 45.

No details of where the Gondwana will go in Antarctica or where the base will be established have been given by Greenpeace. But the tug will sail from Hamburg to New York, Auckland, where it is expected in mid-November, and then to Sydney, its last port of call. Depending on the time spent in each port and ice conditions, the tug is unlikely to reach Antarctica any earlier than mid-December.

According to a statement released in London the purpose of establishing the base in Antarctica is to draw attention to "the continued and increasing human activity which threatens to result in commercial exploitation of Antarctica's riches and destruction of its fragile environment." The Greenpeace scientist at the base will study human impact on the Antarctic environment.

There have been conflicting reports from Britain and the United States about the expedition. An American report says that Greenpeace has bought the Gondwana, and that when the expedition arrives it will declare Antarctica a world park for all the people of the Earth. A London statement says that the tug was given to Greenpeace by an anonymous donor.

A New Zealander, Roger Wilson, who is co-ordinator of the expedition, says that it is expected to cost about \$NZ1.8 million. Greenpeace hopes money from the public and companies throughout the world will halve the cost.

U.S. bases' winter population

United States bases in Antarctica will have a winter population of 116 this year. Only three stations are occupied by winter teams; Siple Station was closed for the 1984 winter and will be reopened for the 1985-86 season. There are 110 men and six women at the three stations; in 1984 there were 104 men and four women in the three teams.

Eighty-five men and women are wintering at McMurdo Station on Ross Island. Seven, including two women,

are scientists, and 12 men and one woman work for the National Science Foundation's support contractors, ITT Antarctic Services. Sixty-five are naval officers and men.

One of the women, Kathleen M. Driscoll, of the University of Alaska, is engaged in infrasonic wave research at Windless Bight. She wintered at the station in 1983. Two married couples are in the winter team. They are Sandra Ackley and Robert Robbins, who is the senior Antarctic

West German Dornier shot down

One of two Dornier 228 aircraft which provided support for a joint West German-New Zealand-United States geophysical and geological research programme in Northern Victoria Land last season was shot down on February 24 near the coastal town of Dakhla in the Western Sahara while returning home. The pilots, Herbert Hampel (48), Richard Moebius (47) and the engineer, Josef (Sepp) Schmid (29) were all killed.

Both aircraft, which had been in Antarctica since October last year were on their way back to West Germany by way of the Amundsen-Scott South Pole Station, Rothera, the British Antarctic Survey station on Adelaide Island, South America, West Africa, and the Canary Islands. The second Dornier landed safely at Lanzarote in the Canary Islands. On its way south to support the Northern Victoria Land programme the downed Dornier became the first West German aircraft to land at the South Pole.

In Paris a spokesman for the Polisario guerilla movement which is fighting Morocco for the independence of the Western Sahara confirmed that it had shot down the Dornier 228 on February 24. This was the second foreign aircraft shot down near Dakhla by the Polisario guerillas. The first was a Belgian aircraft on January 24. In both cases the guerillas claimed that the aircraft resembled those used for reconnaissance by the Moroccan Army.

During their support of the research programme in Northern Victoria Land the Dornier 228 crews used the McMurdo Station runway and visited Scott Base. In addition to the airborne geophysical survey over a cross-section of the Transantarctic Mountains and the Ross Sea for the West German Bureau of Geosciences and Natural Resources (BGR) the Dornier pilots worked with New Zealand geologists and geophysicists.

Services representative at the station, Robin and David Key, of the University of Texas, are responsible for the operation and maintenance of the geodetic satellite observatory.

Of 19 members of the winter team at the Amundsen-Scott South Pole Station 1327km south of Ross Island seven are scientists and 12 are support staff. There are two women — the medical officer, Dr Nancy Sachs, and Laura Kay, who is concerned with the cosmic ray programme run by the Bartol Foundation, University of Delaware.

Palmer Station on Anvers Island off the Antarctic Peninsula has the smallest winter team — six scientists, five support staff, and one United States Navy orderly. One scientist is a woman.

Ross Island has a winter population of 101 men and women this year. In addition to 85 Americans there are 11 New Zealanders at Scott Base and four Englishmen and one Canadian at Cape Evans. The team of five is at Cape Evans to prepare for the journey to the Pole by two of its members who will leave their hut in October.

Uruguay puts first station in South Shetlands

Uruguay, which acceded to the Antarctic Treaty in 1980, established its first research station in the South Shetlands last summer. Named Artigas, the station is in Collins Harbour ($62^{\circ} 11\text{min}\ S/58^{\circ} 51\text{min}\ W$) on the south coast of King George Island, and immediately east of the Fildes Peninsula.

New Zealand has a particular interest in Artigas Station. The buildings include three wannigans, each $7\frac{1}{2}\text{m}$ by 4m which were built in Levin. These were shipped last year to the Chilean port of Punta Arenas, Tierra del Fuego, and then flown to the Chilean Rodolfo Marsh Station on King George Island by a Uruguayan Air Force aircraft.

Arrangements for the purchase and shipment of the wannigans were made through the Antarctic Division, Department of Scientific and Industrial Research. This followed the visit to Scott Base in the 1983-84 season of a Uruguayan Antarctic Institute representative, Lieutenant-Colonel Omar Porciuncula y Lamar, to study the logistics of the New Zealand programme.

Late in January last year Uruguay sent a scientific and logistics mission to King George Island to study the feasibility of establishing a research station. A party of nine, including a biologist, geologist, and meteorologist, and representatives of the Uruguayan Army, Navy, and Air Force flew to Rodolfo Marsh Station in a Uruguayan Air Force Fairchild F227.

Uruguay, which established an Antarctic institute in 1968, and a commission for Antarctic studies in 1970, made a request to join the Scientific Committee on Antarctic

Research in 1983. It was told that full membership could be considered only after the establishment of a scientific research programme. However, it was invited to send an observer to SCAR's 18th meeting in Bremerhaven, West Germany, in September-October last year.

Proposals for the establishment of a summer station and an Antarctic research station were welcomed by SCAR, but concern was expressed about the surfeit of stations on King George Island — the Uruguayan station was the sixth on the island. Uruguay was encouraged to consider establishing a permanent station at some other location where its research programmes might enhance the geographic distribution of stations and thus be of some scientific significance.

New British High Commissioner

Britain has a new man at Port Stanley. Sir Rex Hunt, who was Commissioner for the Falklands at the time of the short war with Argentina, has been replaced by Mr Gordon Jawkes, who is also High Commissioner for the British Antarctic Territory. Patrick Keatley, of "The Guardian", describes this as a huge wedge of territory on the Antarctic Continent, starting at 60° South, and going right down to the U.S. Air Force base at the Pole. So far there have been no corrections issued by the U.S. Navy or the National Science Foundation.

Mikhail Somov caught in pack ice

Caught in heavy pack ice off the Hobbs Coast of Marie Byrd Land in the middle of March the Mikhail Somov, flagship of the Soviet Antarctic fleet, has been unable to break out. In 1977 she was held for 57 days off the Oates Coast.

By the end of June (1985) she had been held in the ice of the Amundsen Sea for 105 days.

A Soviet icebreaker, the Vladivostok, sailed from Wellington on July 5 to assist the Mikhail Somov, which has enough fuel and supplies to last until August. There are 53 men still aboard the trapped ship. If the Vladivostok is unable to reach her a skeleton crew will be left on board and the icebreaker will stay in the area until summer if necessary.

When Captain Anatoli Sukhorukov first reported on March 18 that his ship was in difficulties because of bad ice conditions about 19.96 nautical miles from the Soviet permanent station, Russkaya ($74^{\circ} 46' \text{ min S}$ $136^{\circ} 51' \text{ min W}$) at Cape Burks, Dr Dimitri Maksutov, leader of the 30th Soviet Antarctic Expedition (SAE-30), and the summer teams, had to prepare for the possibility that the Mikhail Somov might remain in the ice for the winter.

MEN TAKEN OFF

Arrangements were made for 43 men to be taken off by the Mikhail Somov's two Mi-8 helicopters. They were flown to the meteorological research ship Akademik Shirshov, diverted from the Indian Ocean, and brought to Wellington on April 29.

When the Mikhail Somov was caught in the ice she was at 75 deg S/135 deg W. In April she was reported to be drifting to the south-east at the rate of six to eight kilometres a day. Early in June a radio message said: Ship has no way, screw jammed ... visibility limited

by twilight, temperature minus 20 deg (Celsius).

By the end of June the ship was at 75 deg S/153 W. Before the Vladivostok left Wellington Dr Boris Krutsikh, director of the Soviet Arctic and Antarctic Research Institute, estimated on the basis of the latest satellite ice reports that the Mikhail Somov should reach open water in October or November.

A 7714-tonne diesel-electric ice-strengthened vessel, the Mikhail Somov began her 10th voyage in support of SAE-30 from Leningrad in November last year. She carried staff and supplies for Molodezhnaya and Mirny Stations, and new winter teams for Russkaya and Leningradskaya Stations. After supplying the first two stations she made her first visit to Lyttelton where she refuelled, took on supplies, and sailed south again on February 26.

SUPPORT

Originally, the Mikhail Somov was to have returned to New Zealand early in April for more supplies and then call again at Molodezhnaya and Mirny

on her way back to Leningrad. Her planned 40-day cruise included ice studies and oceanographic research in the Ross Sea area, the resupply of Russkaya and Leningradskaya, and then a call at Wellington.

Ruskaya built on a rocky outcrop of Cape Burks is in an area where ice conditions are extremely difficult. Cargo operations have to be carried out from fast ice or floes of broken fast ice by Mi-8 helicopter. They are usually completed by March 10 before intensive ice formation begins.

THE OB

In 1973 the Ob could come no closer than 173nm to the icebound Hobbs Coast, and the establishment of Russkaya for occupation in the 1974 winter had to be abandoned. Between February 17 and March 2 three buildings, food, and some equipment, were flown by helicopter to the site but work was stopped because of icing of the Ob.

Finally, the station was opened on March 10, 1980. Prefabricated buildings, supplies, and fuel were ferried to the site from the 9,280-tonne ice-class cargo ship Gzhiga which approached to within 13nm of the planned station in late February. Unloading took 12 days and was interrupted frequently by snowstorms and gales.

This year the Mikhail Somov was able to complete the exchange of winter teams before she was iced in. There were 27 men in the 1985 party led by Lev Ivanovich Eskin, of the Arctic and Antarctic Research Institute. It included eight scientists and 12 builders who will erect new accommodation and other facilities.

Unloading of cargo was almost completed when an unexpected storm with winds of up to 97 knots broke out, and the ship was caught in heavy

ice. By the end of March she was held fast in solid ice, and it was decided to take off most of the expedition.

But some time in April the Akademik Shirshov was diverted to assist the Mikhail Somov. She stayed outside the pack ice, while the 43 men were ferried by helicopter in an operation which needed several trips. Then she headed north for Wellington, arriving there on April 29. After taking on supplies and equipment for the Mikhail Somov she sailed again in the afternoon of May 3 for West Antarctica.

In company with the Mikhail Somov when she was caught in the ice was the 4814-tonne ice-strengthened cargo ship Pavel Korchagin, which is used normally on the west sector of the Soviet Northern Sea Route. She made her first voyage south with SAE-28. Last year she left Leningrad at the end of October, and her programme provided for calls to Bellingshausen Station on King George Island, South Shetlands, Prydz Bay, Molodezhnaya and Mirny. Her cargo included large quantities of construction material for a new Soviet station. She was in Wellington from February 17 to 20 and was to have called at Molodezhnaya on her return home.

VIA WELLINGTON

Forty-three men were ferried first to the Pavel Korchagin and then to the Akademik Shirshov. Towards the end of May the Pavel Korchagin left her station about 16.1nm from the Mikhail Somov and returned to Wellington on June 5 to refuel. She sailed south again on June 12, carrying one of the Mikhail Somov's helicopters and its crew. The Akademik Shirshov also returned to Wellington on the same day and sailed on June 7 to re-

sume her research mission.

In the first three weeks of March the Akademik Shirshov, a 5460-tonne meteorological research ship, was engaged in upper atmosphere rocket launchings in the Central Pacific. She arrived at Wellington on March 27 to take on fuel and supplies, and sailed on March 29 to continue research in the Indian Ocean.

One of the five icebreakers used to maintain the Northern Sea Route cargo service to the eastern sector of the Arctic, the 13,290-tonne Vladivostok, operated by the Far Eastern Shipping Company, was called into service to go to the aid of the Mikhail Somov. Dr Artur Chilingarov was appointed to lead the rescue expedition, and a special group of representatives of the State Committee for Hydrometeorology and Environmental Control, and the Ministries of Merchant Marine and Civil Aviation, was set up to guide the expedition.

When the icebreaker, which has been in service for 16 years, sailed from her home port, Vladivostok, on June 10 under the command of Captain Gennadi Antokhin, she carried everything necessary to give maximum help to the Mikhail Somov. Her cargo included helicopter fuel, makeshift housing and equipment for an emergency, polar clothing and footwear, food, timber, tools, extra towlines, spare parts for towing winches, and additional tents.

Designed to stay at sea for a year without returning to base, the Vladivostok carries an Mi-8 helicopter and satellite equipment to obtain ice information. On her 1780nm voyage from Wellington to reach the Mikhail Somov the ice-breaker will first have to cut through sea ice up to one metre thick for more than 377nm. Then she is likely to encounter fast ice three to four metres thick.

U.S. Change of Command

After three seasons as Commander, United States Naval Support Force, Antarctica, Captain Brian H. Shoemaker will officially relinquish his command to Captain David R. Srite at Port Hueneme, California, on August 16. His successor is a former commanding officer of the United States Navy's VX-6 Squadron.

Captain Shoemaker, who has been assigned to duty with the Unified Space Command, Colorado Springs, Colorado, was CNSFA in the 1982-83, 1983-84, and 1984-85 seasons. His Antarctic experience began much earlier. He served as a helicopter pilot with VX-6 Squadron in the 1966-67 season, and wintered at

McMurdo Station in 1967.

In June last year Captain Shoemaker was a passenger on the United States Air Force Starlifter which made two mid-winter flights to drop mail and supplies to the winter parties on Ross Island and at the South Pole. This was not the first time he had made a winter flight.

Two flights south, officially described as winter flights, were made by the ski-equipped Hercules City of Christchurch in 1967. On the second flight back from McMurdo Station on September 3 the aircraft brought back two injured men. One was Captain Shoemaker who had strained ligaments in his leg.

Other activities

Project Blizzard surveys Mawson's hut

Project Blizzard, the private Australian expedition which began the first stage of restoration of Mawson's hut at Cape Denison, late last year, returned to Sydney from Commonwealth Bay aboard the Dick Smith Explorer early in March. The 12 members of the expedition, who left Hobart for Antarctica on December 2, spent six weeks at Cape Denison. They assessed the condition of the hut, built for Mawson's 1911-14 Australasian Antarctic Expedition, its associated buildings and artefacts, and surveyed the site. A second expedition will return in the 1985-86 summer to complete the restoration work.

In addition to its detailed assessment and documentation of the hut, the site and the other buildings, the expedition carried out a series of scientific projects. These included a detailed meteorological programme to supplement Mawson's original data; a magnetic study on the original magnetic survey site; studies of hormonal adaptation to cold climate; and biological surveys, particularly of penguins.

Project Blizzard also retraced part of the famous eastern journey across the ice cap from Cape Denison by Mawson, the only survivor after his companions, Mertz and Ninnis, died. A traverse of 80km was made in January by three members of the expedition, who hauled sledges with 75kg of supplies.

On its third voyage to the Antarctic Continent the 22m steel-hulled auxiliary schooner carrying the expedition left Sydney on November 10, arrived at Melbourne on November 17 and sailed for Hobart on November 23, arriving there on November 28. The Dick Smith Explorer sailed for Commonwealth Bay on December 2, the anniversary of Mawson's departure in 1911 aboard the Aurora.

Leaders of the 20 men and two women in the expedition were a Sydney architect and mountaineer, William Blunt (leader) and a doctor engaged in medical research, Dr Ross Vining (deputy leader). They were joint leaders of the 1983 private expedition to Australia's sub-Antarctic Heard Island aboard the ketch Anaconda II.

Other members of the expedition were: Jonathan Chester, diver, photographer, member of traverse party; Dr Paul Mara, medical officer. Dr Ken Wilson, deputy medical officer, member of traverse party; Steve Tremont, naturalist; Patrick Honey, carpenter, member of traverse party; Helmut Rohde, architect; Julie Johnston, diver; Estelle Lazer, archaeologist.

N.Z. MATE

Skipper of the Dick Smith Explorer on her third voyage to Antarctica was Don Richards, a director of the Oceanic Research Foundation. He was radio operator on the ORF expedition to Commonwealth Bay led by its president Dr David Lewis in the 1981-82 season. Another ORF

director, Colin Putt, was mate and engineer this time. He was a member of the private South Indian Ocean Expedition to Heard Island 20 years ago, and was one of three New Zealanders in the team which made the first ascent of the island's active volcano, Big Ben in January 1965.

On the voyage south the Dick Smith Explorer experienced exceptionally fair weather and no major storms were encountered. But light conditions and head winds necessitated many hours of motor sailing, and on the 12th day south of Hobart a bearing supporting the propeller shaft burnt out. Colin Putt was able to make an alternative drive bracket, and no more problems were encountered.

ICEBERGS

Numerous icebergs were hazards during the last 270 nautical miles and a 24-hour look-out was maintained on the bow to ensure that the ship did not strike any submerged ice. For the final 16km to Cape Denison, the rocky headland in Commonwealth Bay the ship battled against a very steep short 5m sea and 55-knot katabatic winds which coated the deck with frozen spray. Working the icy ropes and preparing to anchor in the shallow Boat Harbour was a tough task. But the winds finally abated and the Dick Smith Explorer anchored in unexpectedly calm weather at 2 p.m. on December 24.

Project Blizzard established its base camp at the hut erected in 1978 by the Australian Antarctic Division which spent six weeks at Cape Denison to evaluate the structural soundness of Mawson's hut 200m to the north, and to study the feasibility of its restoration.

Although Cape Denison is widely

regarded as the windiest place in the world the mild, sunny weather held long enough for the expedition to unload all its supplies and equipment and erect temporary living accommodation on shore. Christmas Day was far from a holiday for the members of the expedition. Taking advantage of the continuous daylight they worked through to 11 p.m. for a belated but still sumptuous Christmas dinner.

During the lull in the weather the team unloaded four tonnes of food, and a similar quantity of scientific gear, survival equipment and instruments for documentation of the site. Two inflatable surf rescue boats carried the equipment to shore. Then it was sledged to the edge of the snow and finally manhandled over the last 100m of rocky ground to the base camp. Tents were erected for accommodation, and also a prefabricated modular fibreglass dome lent by the Australian Antarctic Division, which was used as living quarters by five people.

Calm weather continued on Boxing Day, allowing work to begin on several scientific programmes. Wind recording instruments were located just to the south of Mawson's hut, and another was placed on the outer Mackellar Islets about 8km offshore. Ross Vining, Helmut Rohde and Patrick Honey travelled to the islands by inflatable rubber boat to erect the instruments. They sighted tens of thousands of Adelie penguins on the islands.

Cape Denison is also home to many colonies of Adelie penguins, and one colony was only 10m from the base camp. Steve Tremont made a biological survey of the entire area, and up to January 24 sightings had been made of 90 Weddell seals, including several bearing tags, four elephant seals, and numerous skuas. Divers Jonathan

Chester and Julie Johnston began an underwater survey of Boat Harbour. The water temperature was minus one degree Celsius but with special wet-suits they were able to stay under water for an hour.

KATABATIC WINDS

Because of 60-knot katabatic winds the Dick Smith Explorer was unable to depart for the French station, Dumont d'Urville, for two days. But in a brief lull the ship left Boat Harbour and completed the 100km voyage in 13 hours. Fuel and liquid petroleum which had been generously transported to the Antarctic by Expeditions Polaires Francaises on a resupply voyage early in 1984 was taken on board and transported back to Cape Denison in the New Year.

While the ship was away architects William Blunt and Helmut Rohde and the historical archaeologist, Estelle Lazer, began the detailed tasks of surveying and documenting the historic site. A tunnel was dug into the hut which contained much more snow and ice than it did when the ORF expedition was there in the 1981-82 summer. Measurements of the humidity were taken to assist in determining the effect the removal of the ice and snow will have on the interior of the hut and the items still in it. Estelle Lazer's task was to document the artefacts both inside and out.

TRAVERSE PARTY

In the first week of January the members of the traverse party, Jonathan Chester, Patrick Honey, and Dr Ken Wilson, began their journey over part of Mawson's route. Earlier they had dug a snow cache near Aladdin's Cave. This was a cave excavated in the ice where Mawson

and two members of his expedition spent two days sheltering on a winter sledging journey when about 9km from the hut at Cape Denison. The cave later became the starting point for all the sledging parties that left the hut.

When the Project Blizzard party left its base camp on the 80km traverse south the first calling point was the snow cave cache. Then the three men set off across the ice-cap for Madigan Nunatak, Mt Murchison, and Aurora Peak. The 535m peak 6.4km south of Mt Murchison at $67^{\circ} 23\text{min}$ S/ $144^{\circ} 12\text{min}$ E marked the southernmost point of the traverse. Returning by way of Mt Hunt ($67^{\circ} 07\text{min}$ S/ $144^{\circ} 18\text{min}$ E) the traverse party reached the base camp on January 23.

ICE-CAP CHANGES

Several apparent changes in the polar ice-cap, including the possible disappearance of Madigan's Nunatak beneath the ice, were noted by the party which did two weeks' sledging in temperatures averaging minus 5°C. The lowest recording was minus 16°.

Satellite navigation systems were used. They were powered by solar panels and a wind generator. The party encountered sastrugi which damaged the fibreglass man-hauling sledges, but all other equipment and clothing stood up to the conditions.

Cape Denison lived up to its stormy reputation in the third week of January when winds of up to 130 knots were recorded. Before that the strongest winds recorded had been about 80 knots in gusts.

Hurricane force winds delayed the expedition's departure from Cape Denison. Because of gales that reached more than 54 knots at times the party was unable to complete loading operations for four days. But

the Dick Smith Explorer slipped the shelter of Boat Harbour during a brief lull when the winds dropped to 27 knots.

On departure the expedition made a brief landing at Cape Hunter, the only other rocky headland in Commonwealth Bay, which is about 13km west of Cape Denison. Valuable geological specimens were collected and ornithological studies undertaken.

Soon after departure from Commonwealth Bay the DSE encountered a Force 9 gale and was hove to for a day riding out the storm. But by February 20, the ship was free of Antarctic ice, having passed north of the Antarctic Convergence, and the threat of icebergs no longer impeded night navigation. Skipper Don Richards reported that all sails were set to hasten the vessel northward on every available fair wind.

LAST PROJECT

Project Blizzard's last project before departure from Commonwealth Bay was the completion of an archaeological survey of the historic site of Mawson's hut and the other buildings. The way is now clear for the hut restoration phase of the project to begin in the 1985-86 summer. Research studies by the expedition's photographers, architects, scientists, and an archaeologist, have provided the necessary information for a comprehensive and thorough appraisal of the site and its future needs.

Mawson's hut was found to be in a stable condition and no repairs were necessary.

Snow completely filled the workshop and most of the living hut, and all the inside surfaces of the other huts not choked with snow and ice were covered with a thick veneer of delicate hoar frost crystals. Snow samples and micro-climate records were collected

to assist in determining the most suitable course for conservation of many of the more valuable artefacts which had suffered from damp and rust despite the dry Antarctic climate.

PLAQUES

Two historic plaques which had suffered serious frost damage were brought back to Australia for restoration under controlled conditions, and will be returned to Commonwealth Bay when the work is completed. The larger of these was the wooden plaque on the cross set up in 1913 in memory of Mawson's sledging companions, Mertz and Ninnis. It was removed in 1977, brought back to Australia for preservation, and a brass replica was fixed in its place.

Later the plaque was returned to Cape Denison in a protective brass case. This resulted in the frost damage. A similar fate had befallen a smaller plaque commemorating the hoisting of the Australian flag at Cape Denison on January 5, 1931, when Mawson returned to his old base during the BANZARE Expedition (1929-31) and claimed formal possession of King George V Land for Australia.

PROCLAMATION

A proclamation was left in a container on a hill overlooking the base, and a plaque was placed on the flagpole. In 1974 an ANARE team found the proclamation still in place but by 1977 the container was found to be rusted through. It contained drift and ice and only frozen plastic was wrapped around the original document, which was stained by rust.

After a copy had been made of the proclamation and left with other papers in a small tin, the original was

brought back to Australia and treated to ensure preservation. It was copied and placed in the National Library's Manuscript Section and a facsimile returned to Cape Denison in a new container.

Good progress was made with the scientific programme during the expedition's stay at Cape Denison. Detailed wind profiles of Mawson's hut site were measured, and the information, together with a detailed topographic survey, will facilitate analysis of Cape Denison's meteorological environment. An extensive photographic survey of Mawson's huts

and the historic site was also completed.

Project Blizzard was given official approval for the first expedition by the Australian Government through the Minister of Science (Mr Barry Jones) and received logistic support and advice from the Antarctic Division in Hobart. It will make a detailed report on Mawson's hut to the Government, and the second expedition in 1985-86 will complete the restoration work in accordance with the first expedition's findings and the recommendations of the government department responsible for the hut.

Antarctica can be a dangerous place for classically-trained archaeologists used to excavations for relics of ancient civilisations. Estelle Lazer, archaeologist with the Project Blizzard Expedition which surveyed the site of Mawson's hut at Cape Denison last summer found this out when she scraped back some ice and found a box of what appeared to be thin frankfurters. A closer examination next day revealed that the frankfurters were actually 60 sticks of decomposing but still volatile gelignite. The box had been dumped after Mawson's men had blasted foundations for their hut 72 years earlier. Treading carefully on a potentially dangerous site, the party recovered bottles of acid, bullets, and flares with exposed detonator caps.

* * *

When the Chapel of the Snows was built on Ross Island in 1956 the American Bible Society provided a Protestant Bible for use at services. In 1965 the battered and well-worn Bible was returned to the society's archives and replaced by a new Bible presented on behalf of Dr Billy Graham. This Bible was lost when

fire destroyed the chapel in the early hours of August 23, 1978. Since then the chapel has been rebuilt, and it still has a Protestant Bible. It was presented by two New Zealanders, Mr and Mrs J.M. Caffin, of Christchurch, to mark their long and happy association with many Americans and New Zealanders who have worshipped in the chapel over the years.

* * *

Captain Ivan Man, a pioneer of Soviet Antarctic exploration, who commanded the veteran supply ship Ob from 1955 to 1959, and the research vessel Professor Vize in 1967-69, went back to Antarctica in 1983 for the last time. He died of old age at home but asked in his will that he be buried in the Antarctic. On January 17, 1983, he was buried at Vostok Station, known as the coldest place on Earth, beside Alexei Karpenko, who died trying to fight the fire which destroyed the Vostok power plant on the night of April 12, 1982. "They came here for the last time to remain forever", were the words spoken over their graves.

British Pole Expedition at Cape Evans

Four Englishmen and one Canadian have been in winter quarters on Ross Island since early February preparing for a private British expedition to the South Pole next summer. In October two of the Englishmen, Robert Swan and Roger Mear, who are co-leaders of the expedition, will leave their base at Cape Evans on a 1420km journey to the Pole, following the route taken by Scott in 1911-12, including the ascent of the Beardmore Glacier.

Swan is a 28-year-old tree surgeon and self-styled explorer, and Mear, who is 34, is a professional mountaineering instructor. Both have worked with the British Antarctic Survey at Rothera Station on Adelaide Island, off the west coast of the Antarctic Peninsula. They hope to complete their journey in 75 days and reach the Pole by January.

No advance depots will be set up along the route, and there will be no air support. Each man will start the journey on skis, and hauling a sledge loaded with 136kg of food, fuel and equipment. They will use a tent weighing less than 9kg and designed to withstand winds of up to 115 knots.

Originally Swan and Mear expected to be flown back to McMurdo Station by a United States ski-equipped Hercules aircraft. But as the United States authorities have indicated that they are unable to provide transport or sell fuel from stocks at the Amundsen-Scott South Pole Station to private expeditions, the Footsteps of Scott Expedition has arranged to be picked up by a chartered modified ski-equipped Tri Turbo DC-3. The aircraft will be piloted by Captain Giles Kershaw, the English pilot who provided Antarctic and Arctic air support for the British Transglobe Expedition.

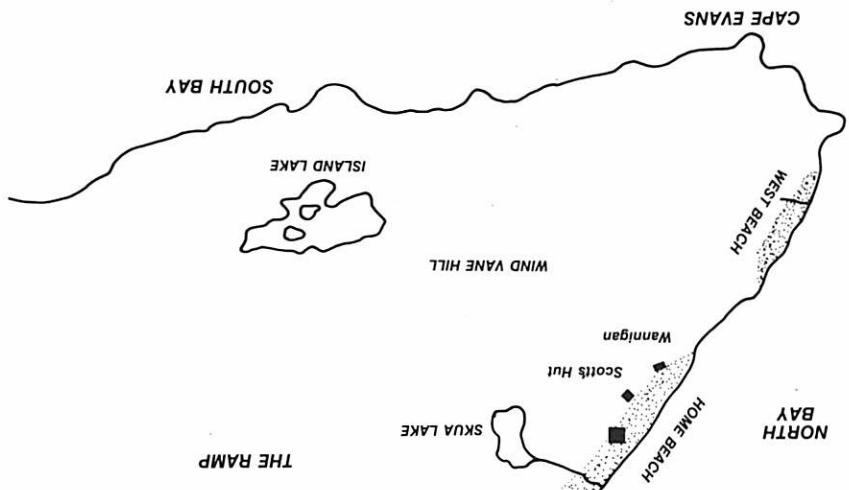
Captain Kershaw, who spent seven summers with the British Antarctic Survey, is widely known as probably the most experienced Antarctic pilot anywhere today. He has flown the three-engined DC-3 in the Arctic for Polair, of Santa Barbara, California, and has flown two mountaineering parties from Punta Arenas to the Antarctic in the 1983-84 and 1984-85 season.

AIR SUPPORT

With Chilean Air Force support the United States Seven Summits Expedition climbed Antarctica's highest peak, the Vinson Massif, in the Sentinel Range of the Ellsworth Mountains. Later the expedition was flown to the United States Siple Station, and then returned to Punta Arenas by way of Rothera. A second expedition last summer chartered the turbo-prop DC-3 for a similar ascent but had to give up the project when the aircraft was damaged in high winds on Adelaide Island and had mechanical trouble.

As Mear has said that the Tri Turbo DC-3 will not return the two men to McMurdo Station from the Pole, it is expected that the aircraft will be flown to Punta Arenas. Last season the Chilean Air Force flew two Twin

This map shows the expedition's Jack Hayward Base at Cape Evans. It is about 400m from Scott's hut. The Wanningan near the southern end of the beach is used in summer when needed by the New Zealand Antarctic Research Programme.



Home for the five men until next year is Jack Hayward Base, named in honour of Mr Jack Hayward, of the project called Polar Star an Air Force Hercules flew a cargo of food, fuel, and survival and communications equipment from Punta Arenas to a station more than NZ\$60,000. It is a 4.8m by 7.3m prefabricated hut with styrofoam insulation, and is about 400m from Scott's hut. Modern luxuries include electric light, chemical toilets, a stove which burns Welsh coal, and a radio.

Since February 22 when the expedition left Cape Evans for New Zealand the five men have followed in the footsteps of Scott's expedition by making steps of Scott's expedition by making nearly 75 years ago. Meir, Wood, and Dr Stroud did a modern version of the "worst journey in the world", to Cape Crozier, but left on March 18, not in 1912, and the ascents of Mt Erebus (3749m) like Scott's Cherry-Garrard. They made the mid-winter like Wilson, Bowers, and John Trolson, cameraman, who will produce a film of the expedition. He is a master mariner with 14 years' sea experience, five of them in the British Antarctic Survey ships Bransfield and John Biscoe.

Dependencies Survey (now BAS), the Canadian, Gareth Wood, who is the base manager and radio operator, and Dr Stroud, medical officer, who has served with the Falkland Islands Dependencies Survey (now BAS), the Mear at Cape Evans are Dr Michael Mear, his companions of Swan and Wimberly 88.01min W).

scaled the extinct volcanoes Terra Nova (2130m) and Terror (3262m) before going on to Cape Crozier.

Eleven New Zealanders at Scott Base were having a routine fire drill on March 29 when they had a surprise visit from the three men who had crossed Windless Bight on the way back to their base at Cape Evans. Temperatures during the journey had dropped as low as minus 30° Celsius, and by the time they reached Scott Base Dr Stroud was suffering from mild frostbite and Wood had blistered feet.

KNOCK ON DOOR

After a short stay the party walked back to Jack Hayward Base. Less than a fortnight later Scott Base had two unexpected visitors from Cape Evans. About 5.30 p.m. on May 10 there was a polite knock at the back door. Outside were Mear and Dr Stroud with the expedition's two special 15-gear ice bicycles which they had attempted to ride over the ice and snow. They arrived just in time for dinner.

Helped by a full moon Mear and Dr Stroud walked for nearly 7½ hours to reach Scott Base, stopping to chat to a few Americans at nearby McMurdo Station. One of Scott's Australian geologists, Griffith Taylor, who was the first man to ride a bicycle in Antarctica, took it 12.8km from Cape Evans to the Erebus Glacier Tongue one fine Sunday morning in 1911, but the Englishmen had to carry and wheel their machines for most of the journey because there was too much snow to ride through.

When Mear and Stroud arrived at Scott Base the temperature was down to minus 37.5°C. They indulged in the luxury of a shower and had three night's rest at the base. Their inten-

tion was to head back for Cape Evans on May 12 but they stayed until the morning of May 13 because of high winds. Their visit was a pleasant surprise for the New Zealanders because it had not been mentioned during the weekly radio check with the Cape Evans team.

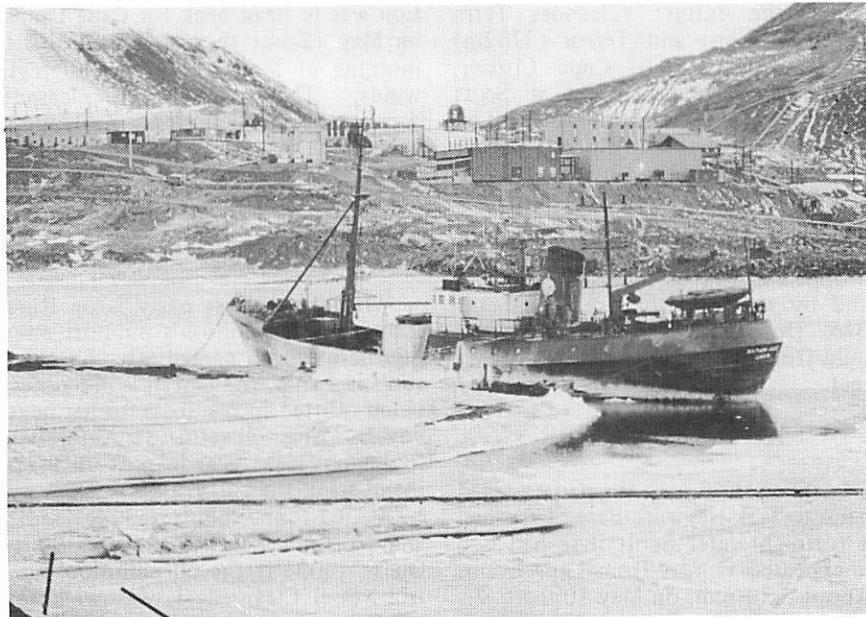
MAJOR REFIT

While the winter party is on Ross Island the expedition's support ship Southern Quest, named after Shackleton's last ship, the Quest, is in Sydney being refitted in readiness for her next voyage. She will return to Antarctica in January next year to pick up three members of the party.

A 361-tonne converted Icelandic and North Sea trawler, the Southern Quest, formerly the oil pollution control vessel Cleanseas I, was well-prepared last year for her long voyage to New Zealand and then into Antarctic waters. The 26-year-old trawler underwent a major refit in South Shields. Her hull was ice-strengthened, deflectors were added to protect the propeller, crew accommodation was extended, and the former fish holds were provided with six watertight hatches. Finally more sophisticated radar and satellite navigation equipment were installed.

MORE STABLE

To improve the ship's stability the port and starboard companionways were enclosed. This work, and the discovery of hairline fractures in the propeller, necessitating the casting of a replacement, delayed the ship's departure until November. Earlier, when she was berthed in the Thames at Tower Bridge, the expedition was honoured by the visit of Princess Anne, which carried on the tradition



Southern Quest, the expedition's support ship, in Winter Quarters Bay after arriving at McMurdo Station from Cape Evans.

established by her great-great-grandparents. She was escorted around the ship by Lord Shackleton and Sir Vivian Fuchs.

More than six years of planning and preparation ended on November 3 when the Southern Quest, under the command of Captain Graeme Phippen, who has seven years' experience with the British Antarctic Survey, and with a crew of 14, most of them volunteers, sailed from West India Dock, London. There to say goodbye were relatives and friends, and the winter party, which was to join the ship in New Zealand.

In 1910 the Terra Nova called at Cardiff before heading south to take on coal. The Southern Quest also made Cardiff its departure point from the United Kingdom. Fifteen tonnes of Welsh anthracite for cooking and heating at Jack Hayward Base com-

pleted the expedition's inventory of more than 60 tonnes of equipment and stores, and the Southern Quest sailed on November 9 to the accompaniment of a flypast by the Royal Air Force.

CAPE TOWN CALL

A call was made at Las Palmas, Canary Islands, for refuelling, and the ship reached Cape Town on December 10, averaging 9 knots for the voyage of 5210 nautical miles from London. Two thousand people, a naval band, and the Mayor of the city were on the quayside to greet the ship and her crew. Scott was disappointed with South Africa's response to his expedition when the Terra Nova called at Cape Town in 1910. But now there is a monument to the Pole party and its leader erected at Cape Town in 1960.

Blessed by fine weather on the Indian Ocean leg of her voyage the Southern Quest reached Lyttelton on the morning of January 16, having left Cape Town on December 17. A small crowd of well-wishers, including a Maori welcome party, greeted the ship's arrival at a port which has witnessed the arrival and departure of the ships of four polar expeditions since 1901.

SURVIVOR

One member of the welcoming party was 96-year-old William Burton, of Christchurch, last surviving member of Scott's 1910-13 expedition. He made three voyages in the Terra Nova from Lyttelton to McMurdo Sound, first as a stoker, and then as assistant engineer.

Another link with Scott's last expedition was the presence on the wharf of Lieutenant Michael Hough, who was on special leave from the 5th Royal Inniskilling Dragoon Guards to act as expedition co-ordinator in New Zealand before the ship arrived. Captain Oates served in the 6th (Inniskilling) Dragoons, which was amalgamated in 1922 with the 5th Dragoon Guards to form the 5th Royal Inniskilling Dragoon Guards. Lieutenant Hough's commanding officer, Lieutenant-Colonel Patrick Cordingley, who is the co-author of a biography of Oates, and assisted the expedition, asked for the inclusion of a member of the regiment because of the historical associations.

N.Z. SUPPORT

Like other private Antarctic expeditions the Footsteps of Scott Expedition still needed more money, equipment, and supplies when the Southern Quest reached Lyttelton. But in less

than a fortnight there was a most generous response from people and companies in the port and Christchurch. Sponsorship and gifts added close on \$NZ25,000 to the expedition's funds and resources.

When the ship sailed at 2.16 p.m. from Lyttelton on January 27 her cargo included workboats, portable two-way radios for ship to shore work at Cape Evans, and a dinghy. A parting gift from the Lyttelton Harbour Board, which had carried on the tradition of assistance to polar expeditions, was a special bottle of port labelled "Port of Lyttelton".

In 1910 the Terra Nova called at Port Chalmers to take on coal, and the Southern Quest also made the port her last departure point from New Zealand. Two hundred wellwishers said goodbye to the ship at Lyttelton, the Skellerup-Woolston Brass Band played "Now is the Hour", and an English flavour to the occasion was provided by a group of Morris dancers, most of them British-born, who performed on the wharf.

FURTHER LINKS

Port Chalmers, which has known the expeditions of Scott, Shackleton, Byrd, Ellsworth, and Wilkins, gave the 22 men and women aboard the Southern Quest the warmest welcome of all. The ship arrived on the morning of January 28 and Robert Swan was presented with a list of gifts from the people of Port Chalmers and Dunedin in response to a last-minute appeal for warm clothing and provisions which had been launched by the Mayor of Port Chalmers (Sir John Thorn).

When the ship sailed for Ross Island at 9.05 a.m. on January 30 her cargo included a quarter of a tonne of New Zealand meat, butter, cheese,

bacon, eggs, and yoghurt. From Port Chalmers came woollen socks and jerseys, frozen fish and peas, raisins and nuts, fresh vegetables, and fruit. Lady Thorn had knitted a jersey for Robert Swan to be worn on the journey to the South Pole and returned to the borough for inclusion in a maritime museum, and another gift was a scale model of the *Terra Nova* made by Mr Chris Spiers, a member of the Port Chalmers Borough Council.

NOW IS THE HOUR

More than 150 people said goodbye to the crew by singing "Now is the Hour" when the *Southern Quest* departed, and Sir John Thorn led three cheers for the expedition. Her sailing time had been delayed first by the late arrival of radar equipment and then by work on equipment.

Captain Phippen's crew, which had increased from the original 14 who left London last year, was still predominately English, but Canada, Ireland, South Africa, Australia, and New Zealand were all represented, and there were two women, Rebecca Ward, official photographer for the voyage, and Deborah Overton, a TV set designer, who served as a deck-hand. The New Zealanders were Ken Marshall, a ship's officer, Shaun Rowse, a carpenter, both of Christchurch, and Royden Johnson, a camera assistant, who also represented Australia where he now works.

Favoured by good weather all the way south, the *Southern Quest* sighted the first iceberg at 63.5° S. Ice conditions were reported to be the best for 25 years, and the ship had a clear run into McMurdo Sound, arriving off Cape Evans on February 8. The temperature was minus 10°C and there were winds up to 35 knots.

On their first day members of the expedition worked late unloading cargo. The ship was moored out, using ice ropes, and cargo was ferried ashore between the ropes on a pontoon which had been partly built in Lyttelton and completed in Port Chalmers. More than a tonne of cargo was taken to the beach at Cape Evans on each trip, and unloading of the hut, stores, and equipment — 60 tonnes in all — was completed in five days. Even a Force 7-8 blizzard on February 9 did not stop the cargo handling which was assisted by the ship's two Zodiac inflatable dinghies.

Memories of Scott's two expeditions which had to use coal afloat and ashore were recalled by members of the expedition who had the dirty back-breaking task of transferring 15 tonnes of Welsh coal from the *Southern Quest*'s hold to the pontoon. The coal had to be bagged for loading, and the job was even harder when bags kept breaking.

CARGO UNLOADED

When everything was ashore and the hut had been erected Captain Phippen left Cape Evans on February 19 to visit McMurdo Station and Scott Base. Members of the crew met the winter parties at both bases, and the ship left on February 21 for Cape Evans.

Before leaving Cape Evans for the last time Captain Phippen took the ship across McMurdo Sound into the ice. The ice made only a few extra dents in the blow, and the crew had a grand view of the Wilson Piedmont Glacier. Then the ship returned to Cape Evans and checked that all was well with the winter party.

Finally photographs were taken, goodbyes exchanged, and the crew gave three cheers for the five men they

were leaving behind for 11 months. As the Southern Quest headed north she blew her whistle and the crew let off flares.

Once again the weather was with the ship on her voyage back to New Zealand. She sailed late on the night of February 22 and called at Campbell Island, where New Zealand maintains a weather station, on the afternoon of March 3. The crew enjoyed the hospitality of the 12 men wintering on the island.

Early in the morning of March 8 the ship was back in Port Chalmers. She sailed at noon on March 11, and ended the first stage of her support mission on March 12 when she arrived at Lyttelton.

After catching up with news from families and friends the crew of the Southern Quest remained in port for

just over a month. They enjoyed some relaxation but much of their time was spent maintaining a high public profile to help raise money for the expedition. Crew members gave slide shows and talks, sold souvenirs, and learned how to be entrepreneurs.

On April 15 the Southern Quest left Lyttelton for Sydney by way of Auckland. In Sydney the ship will have her first major refit since leaving England, and members of the expedition will continue the quest for sponsors to cover expenses, and work on their own behalf, having been granted two-year work permits by the Australian Government.

Lyttelton will see the Southern Quest again in late December or early January. She will be on her way to Cape Evans to pick up members of the winter party.

A small hand-held telescope carried aboard H.M.S. Discovery, one of the two ships of the British Arctic Expedition (1875-76) which reached 83deg 06min N in an attempt on the North Pole, has been sent into space on a mission by the United States space shuttle Discovery from Cape Canaveral, Florida. The telescope, owned by the Scott Polar Research Institute, has also been to Antarctica aboard the Discovery on Scott's 1901-04 expedition. A member of the space shuttle's crew, Steven Hawley, arranged to borrow the telescope when visiting England in 1983.

* * *

Efforts to make history in Antarctica by doing something that has never been done before occasionally rebound on the doer. A 34-year-old American, Tom Curran, of Wonder Lake, near Chicago, claimed to have made the first civilian parachute jump in Antarctic last summer.

He made it on October 20 from Observation Hill (230m) which overlooks McMurdo Station. But he was far too late. The first such jump was made in the 1960-61 summer by a "New York Herald-Tribune" correspondent, Wadsworth Likely. He jumped over McMurdo Sound with a para-rescue team from the U.S. Navy's VX-6 Squadron. Curran, who worked for the support contractors, ITT Antarctic Services, had been in Antarctica for five days when he jumped without permission because "Observation Hill was there, and the day was fine." His stay was short. A few days later he was back home with a non-existent record.



Vinson Massif climb abandoned

What have been described as "fantastic political complications" plus 140-knot winds on the Antarctic Peninsula caused a United States mountaineering expedition to abandon its attempt in late November and early December last year to climb Antarctica's highest peak, the Vinson Massif (4897m) in the Sentinel Range of the Ellsworth Mountains.

The Vinson Massif was first climbed by an American expedition in 1966, again in 1980 by two West German scientists and a Soviet exchange scientist with a United States research expedition in the Ellsworth Mountains, and in 1983 by an expedition which included three Americans, one Englishman, and one Japanese.

FOUR CLIMBERS

There were four climbers in last summer's expedition. The leader was Peter Bruchhausen, who has worked in Antarctica with the Ross Ice Shelf Project. With him were Pat Morrow, Martyn Williams, and Michael Dunn. To reach the Vinson Massif area they chartered a one-off modified Tri-turbo DC-3 aircraft with three engines instead of two from Polair in Santa Barbara, California.

This ski-equipped aircraft was used also by the Seven Summits Expedition which climbed the Vinson Massif in 1983. It was flown then by Polair's chief pilot, Captain Giles Kershaw, and support was provided by the Chilean Air Force.

Because the Tri-turbo DC-3 is in the experimental stage it has a restricted licence for use only in the service of a government agency. It can be used for a private expedition which is doing

work for the country which supports it.

In 1983 Chile supported the Seven Summits Expedition which was based in Punta Arenas. Fuel for the flight to the Vinson Massif area was dropped by a Chilean Hercules Aircraft, and the Tri-turbo DC-3 carried an official Chilean Air Force observer.

AIRCRAFT DAMAGED

Last season the latest expedition flew from Punta Arenas and called at Rothera, the British Antarctic Survey station on Adelaide Island. The aircraft is reported to have been damaged by winds of up to 140 knots on the Antarctic Peninsula, probably while using the snow runway on the exposed piedmont 5km from Rothera. A second attempt to reach the Vinson Massif area was made two weeks later and was abandoned because of mechanical failure in one of the aircraft's engines.

To raise funds for a second attempt to climb the peak in November-December this year a special North Pole flight has been organised. One-third or more of each fare for the 11-day North Pole adventure will go to the 1985 Vinson Massif expedition fund.

"HIGH ADVENTURE"

To fly from Edmonton across the Canadian Arctic to the North Pole and back will cost each member of the travel group \$US9400. On April 1 the group will go by commercial airline to Resolute, the Canadian research station on Cornwallis Island, then to a base camp on Lake Hazen, and fly to the North Pole in a Twin Otter aircraft.

Among the adventure attractions are a visit to a polar game farm, and a stop at the archaeological camp site of the American explorers Greely and Peary where members of the group will try their skill at igloo building

and dog sledging. Sir Edmund Hillary, his son Peter, Neil Armstrong, first man to walk on the Moon, and Pat Morrow, will be with the group to "share tales of high adventure", according to the organisers.

Southern minke whale survey

Twelve scientists from Argentina, Australia, Chile, Japan, New Zealand, the Soviet Union, Britain, and the United States, took part in the International Whaling Commission's 1985 cruise to assess the population of minke and other whales in the waters around Antarctica last season. Their survey ended on March 1 when three Japanese whale chasers, Shonan Maru I, Kyo Maru 27, and Shonan Maru II, returned to Fremantle.

THREE SHIPS

With the Soviet whale research ship Vdumchiviy 34 the three ships sailed from Fremantle on December 21 to carry out a research programme in the IWC Area IV between 70°E and 130°E. When the survey ended the Vdumchiviy 34 remained in Antarctica to continue independent research.

Last season's programme was the seventh in the IWC project which is part of the International Decade of Cetacean Research. The main purpose of the research since the 1978-79 season has been to obtain accurate scientific data on minke whale numbers in the Antarctic region and gather detailed information on all other species of cetaceans sighted.

A United States biologist, Gerald Joyce, of the National Marine Mammals Laboratory, National Marine Fisheries Service, led the cruise to Survey Area IV. He was also leader of the team for the 1983-84 cruise in

Area VI (120°W to 70°W). The senior scientist was Durant Hembree, of Perth, who took part in six earlier cruises. New Zealand's representative was Paul Ensor, of Christchurch, who took part in the 1980-81, 1982-83, and 1983-84 cruises.

Working along the edge of the pack ice and offshore along the coast from Princess Elizabeth Land to Wilkes Land in East Antarctica the four ships covered an area which was surveyed first in 1978-79. The track began near Prydz Bay and reached nearly to the Dumont d'Urville Station area.

In 71 days at sea the scientists aboard each ship recorded 6671 whales and 1597 dolphins. Whale sightings included 4158 minke, 605 sperm, 658 beaked, and 1209 pilot whales. The research team also carried out a series of experiments to test sighting theories used to assess whale populations. Some of the minke whales observed during the cruise may have been sighted two or three times, according to Gerald Joyce.

All results from the cruise will be considered by the IWC scientific committee. They will be used to establish population estimates for consideration by the annual meeting of the IWC in June.



Sub-Antarctic

Australian sub-Antarctic oil survey

As part of the Australian Government's new programme of marine geological and geophysical research to ascertain the petroleum potential of the country's continental margins the chartered Norwegian geoscience research vessel Rig Seismic began a 60-day cruise early in March to the Heard-Kerguelen Plateau. The cruise will cover two million square kilometres of ocean east and south of Australia's sub-Antarctic Heard Island and half-way to South Africa.

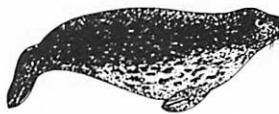
Eighteen scientists aboard the Rig Seismic, which has been chartered by the Bureau of Mineral Resources, will conduct seismic, magnetic, and gravity tests of the ocean floor. The purpose of their study is to provide an estimate of the petroleum potential of the area covered after they have determined the structure, thickness, lithology, and formation of the surface beneath the sea. For its missions the Rig Seismic has been fitted with more than \$A1.5 million of computer and navigation equipment, including a satellite communications system.

Specially designed for geoscience research, the Rig Seismic was built in Norway in 1982. She is 72.5m long, can accommodate 41 passengers in single cabins, has a maximum speed of 14 knots, and the ability to cruise at 2.5 to 5 knots for extensive periods when carrying out seismic research programmes.

Operated for the Bureau of Mineral Resources by the Department of Transport, the 1543-tonne Rig Seismic, which carried a crew of 15, arrived in Australia early in October last year. She underwent survey certification and an equipment refit in Newcastle.

On her maiden scientific cruise to the southern Lord Howe Rise off eastern Australia the Rig Seismic carried out a 1250km multi-channel seismic programme. A preliminary report, based on unprocessed seismic monitor records, indicated an extensive sedimentary basin containing at least 3km of sediment. Part of the section in the basin could be prospective for petroleum.

A more complete study of the Lord Howe Rise region's resource potential will be made this year after the Rig Seismic returns from the sub-Antarctic cruise which began from the Tasmanian port of Devonport on March 7. Present plans are for the ship to make four 25-day and one 60-day cruise, each year. Cruises similar to the Heard-Kerguelen project may be planned in 1986 and 1987.



Something happens to the map of Antarctica when polar analysts turn their attention to the "frozen waste" and the "colossal treasure" beneath its ice-cap. A "Christian Science Monitor" report reprinted in the "Sydney Morning Herald" says inter alia that the Soviet Union maintains Vostok Station at the South Magnetic Pole which was reached in 1907 by a British expedition led by Shackleton and Mawson. Vanda Station is given the distinction of recording the world's lowest temperature — minus 89.2° Celsius in July, 1983.

Heard Island volcano in eruption

Australia's only active volcano, Big Ben, on isolated Heard Island in the sub-Antarctic 22.12 nautical miles south-west of Perth, erupted in January this year. French scientists aboard the research ship Marion Dufresne observed the eruption on the nights of January 14 and 15. Lava was seen flowing down the glacier-covered south flank of the volcano which rises to 2745m and dominates an island almost completely covered by crevassed ice.

Information on the sighting of the eruption and the plume rising high from the volcano, which was visible from the Marion Dufresne for two days, was passed on to the Smithsonian Institution in Washington. The ship was steaming from Kerguelen Island, 500km north-west of Heard Island, on its way to take part in the second phase of the Second International BIOMASS experiment (SIBEX II) in the Indian Ocean. From Washington the report was received by the Antarctic Division and the Bureau of Mineral Resources, Department of Resources and Energy, on February 26.

FREQUENT STEAM

Big Ben's crest is a filled-in volcanic crater surrounded by blizzard-shrouded peaks of which Mawson Peak (2744m) is the highest. Steam and smoke have frequently been noticed issuing from fissures in Mawson Peak and from a vent on the southern side of Big Ben, but Dr Patrick Quilty, the Antarctic Division's chief scientific officer, says the French sighting is the first of a full eruption for some 35 years. The last full eruption is believed to have taken place in 1950.

Earliest reports of an eruption on Heard Island were in 1910 when the Wakefield visited the island in search of survivors from the Australian liner Waratah which had been lost in July, 1909. The Wakefield steamed close to the western shore, and "immense clouds of smoke" were reported billowing from Big Ben.

NOT PICKED UP

No signs of the eruption were picked up by the seismological observatory at Mawson Station, which is operated by the Bureau of Mineral Resources. But seismologists are not surprised. Only very large volcanic eruptions of the explosive type are recorded well over long distances, and the Mawson observatory is some 928 nm from Heard Island.

Heard Island and the small, rocky outlying McDonald Islands 41km to the west were passed to Australia by Britain. Australian National Antarctic Research Expeditions maintained a permanent scientific station on Heard Island from December, 1947 to March, 1955. The most recent visit by ANARE was in March, 1983, after two private expeditions earlier in the year. Big Ben was climbed for the first time in January, 1965, by five members of the private South Indian Ocean Expedition led by Major Warren Deacock. It included three New Zealanders, Colin Putt, Philip Temple, and John Crick, and an Australian, Graeme Budd. The volcano was climbed again by four men and one woman in February, 1983. They were members of one of the two private expeditions that year.

N.Z. expedition to South Georgia

Members of a privately organised expedition to South Georgia returned to New Zealand early this year having completed a programme of geological mapping, climbed 17 peaks and collected samples of flora and fauna for New Zealand scientists. They also made a film of local wildlife and the historical and exploitative aspects of man's presence on the island.

Conceived in 1979 the expedition planning was interrupted by the Falklands War and modified by logistic and financial constraints. It was finally underway at a cost of U.K. £30,000 or N.Z. \$80,000 (exclusive of film commitments).

The party, led by Dr Ian Turnbull, Geological Survey, Dunedin, comprised Alan Knowles, media consultant from Wellington who was deputy leader, Dr David Craw, an Otago University lecturer and Peter Johnstone, a biometristian with the Ministry of Agriculture and Fisheries Dunedin. They were accompanied by a film crew of two, Rob and Bev Brown also of Dunedin.

FROM U.K.

The expedition assembled in England towards the end of October 1984 and on November 2 left the RAF Station at Brize Norton in a VC10 for Ascension Island. The following day they were flown by RAF Hercules to Port Stanley to collect food and fuel. On November 4 they sailed in the Royal Fleet Auxiliary ship "Sir Lancelot" for South Georgia arriving at Grytviken three days later. During their stay four members of the team climbed Petrel Peak and Mt. Hodges while the film crew worked around the old whaling station at King Edward Point.

On November 10 they were put ashore in Little Moltke Harbour in Royal Bay by trojan landing craft. A base camp was established near the four bunk BAS hut and from here equipment and supplies were shifted to the Ross Glacier. The Browns remained at Base filming wildlife while the other members of the team crossed the Ross Glacier to a previously unexplored area of the Hindle and Upper Weddell Glaciers which was mapped and described. They found several major faults and numerous fossil localities which contained some species better preserved than earlier finds and which should provide a good indication of the age of the rocks. The area between the Cook and Heaney Glaciers, where volcanic rocks, marble and chert beds were discovered, was also mapped.

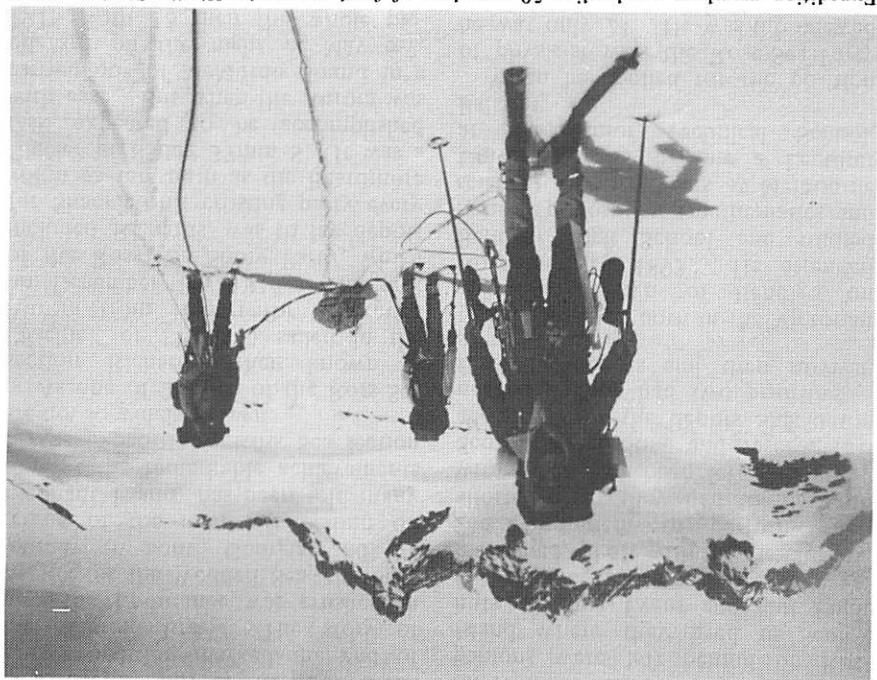
The rock samples are still being analysed; the mapping data will be included in a forthcoming BAS 1:250 000 geological map of South Georgia.

In the Hindle Glacier area members of the team made four first ascents of un-named peaks. During a subsequent visit to the Ross Glacier area tents were damaged in a westerly blizzard and the team spent five days in a four man cave dug into a snow windscoop.

OTHER SCIENTIFIC WORK

Using pit traps located inside and outside the reindeer exclosures, erected by BAS scientists, one member of the team made a collection of insects representative of the popula-

Expedition members manhauling 50 man-days of food across the Hindle Glacier. They are, from left, Alan Knowles, Ian Turnbull and Peter Johnstone.



A skeleton of a rail-like bird, possibly a Purple Gallinule, was discovered in Whale Valley. Only one or two sightings of rails on South Georgia have been reported previously and the skeleton was passed to the BBC Natural history unit for identification. On December 13 the team moved to St. Andrews Bay (climbed two peaks between the Cook and Henry Glaciers) went on to Hounds Bay and Molte Harbour. They included a fauna were collected from around Molte Harbour, New Zealand's Oceanographic Institute is being studied by scientists that region of coastline. The collection includes not previously reported a species not collected from Numberland East Bay. They continued through the Solitary Valley to Numberland East Bay. By December 24 they had returned to Molte Harbour where they were flown by helicopter to the RFA ship "Sir Percival" at Grytviken for return to Port Stanley via the Falkland Islands and subsequently to the U.K. in a Hercules. Structural observations in the area may help solve some problems found in N.Z. geology, as the rock types in the two regions are very similar.

Samples of intertidal flora and fauna were collected from around Molte Harbour. They included a fauna were collected from around Molte Harbour, New Zealand's Oceanographic Institute is being studied by scientists that region of coastline. The collection includes not collected from Numberland East Bay. They continued through the Solitary Valley to Numberland East Bay. By December 24 they had returned to Molte Harbour where they were flown by helicopter to the RFA ship "Sir Percival" at Grytviken for return to Port Stanley via the Falkland Islands and subsequently to the U.K. in a Hercules. Structural observations in the area may help solve some problems found in N.Z. geology, as the rock types in the two regions are very similar.

Other insects were collected from the Mt Brook area and the Hindle Glacier region. All have been brought back to New Zealand for study by entomologists.

Obituary

“Dick” Richards G. C., last of Shackleton’s men

R.G. McELREA

Last of all the men who served with Shackleton, Richard Walker (“Dick”) Richards, G.C., died at his home at Point Lonsdale, near Melbourne, on May 8. He was 91. William Burton, aged 96, who served with Scott in the Terra Nova, is now the only survivor of what has become known as the “Heroic Era” of Antarctic exploration.

Richards was also the last survivor of 56 men who took part in Shackleton’s Imperial Trans-Antarctic Expedition (1914-17) which was to cross the continent from the Weddell Sea to the Ross Sea by way of the South Pole. This expedition marked the end of the “Heroic Era.” The story of how the Endurance was crushed in the ice of the Weddell Sea, the boat journey to South Georgia, and the rescue of the men left behind on Elephant Island, has been told many times; the remarkable achievements of the expedition’s Ross Sea section are not so widely known.

As one of 28 men of the Ross Sea section Richards (then known as “Richie” or “Wally”) sailed in the Aurora from Hobart for Antarctica on December 24, 1914. The task of the Ross Sea Shore Party, which included Richards, was to lay depots for Shackleton’s crossing party every 96km as far south as the Beardmore Glacier at 83deg 37min S. It was a task expected to be accomplished with ease. But when the Aurora was carried out of McMurdo Sound in a blizzard on the night of May 6-7, 1915, with 18 men the whole picture changed.

The Aurora drifted north and she

D.L. HARROWFIELD

was locked in the ice for 10 months eventually breaking free at 2pm on March 10. With battered rudders and with little coal she returned to New Zealand arriving at Port Chalmers on April 3. Richards and nine companions were left behind on Ross Island where they lived in Scott’s huts at Cape Evans and Hut Point during the 25 months they were marooned. Left without the clothing and equipment to perform their allotted task, they had to make do with what had been left behind by Scott’s expedition, and reserve fuel and food for the depots Shackleton needed. They had two priorities — first the depots and then survival.

Richards was born in the Victorian goldmining town of Bendigo on November 14 1893. He attended Bendigo High School and studied natural philosophy (mathematics and science) for two years at Melbourne University, and became a Lecturer at the Junior Technical School, Ballarat.

When he applied for the position of physicist with the Ross Sea Party he was only 21. He was interviewed in Sydney by Captain Aeneas Mackintosh, the party leader, while

the ship was being repaired at Cockatoo Island, and joined the expedition three days before it sailed from Hobart. There were three other Australians, Lionel Hooke, Keith Jack and Irvine Gaze.

On the voyage south, Richards worked as a volunteer greaser and coal trimmer in the engine room. Although he was employed as a physicist, the party's circumstances were such that little science was possible.

Soon after the Aurora reached the ice, Mackintosh dispatched the dogs and the sledging parties to lay a preliminary depot at 80°S before the onset of winter. Only two men, Mackintosh and Ernest Joyce, had previous sledging experience.

SELEDGE ABANDONED

Richards was attached to the motor party, but the motor sledge soon broke down and was of no practical help. Forty-two years later the abandoned sledge was brought back from Cape Evans to New Zealand where it is now housed in the Canterbury Museum, Christchurch.

After a month in the field man-hauling supplies Richards returned to Scott's old Discovery hut at Hut Point on March 2, 1915. Mackintosh, Victor Hayward and Joyce carried on manfully to lay the depot at 80°S, but at a terrible cost — the loss of all but four of the working dogs.

Richards and five of his sledging mates were soon picked up by the Aurora from Hut Point and returned to Cape Evans. With the ship finally moored off shore, Richards and three others of the shore party set up base in Scott's former hut at Cape Evans. After the breakout of the ship they were joined on June 2 by the six remaining members of the sledging party who had been held up at Hut



"Dick" Richards"

".... awarded the polar medal with clasps for 1914-16 and 1917, and in 1923, the Albert Medal in bronze for gallantry in saving and endeavouring to save life in the Antarctic."

Point.

During the subsequent season, the depots were laid to Mt Hope at the foot of the Beardmore Glacier, as Shackleton had directed. Using improvised equipment the party made a journey of some 2400km over 169 sledging days. On the great southern journey the 22-year-old Richards was the strong man of the party, both mentally and physically. After Macintosh became debilitated by scurvy leadership was by consensus with Richards playing a dominant role by force of personality.

RETURN JOURNEY

On the return journey — a harrowing experience — for the party almost reached the end of its fuel and food —

Richards, Joyce and Hayward, with the four dogs, Gunner, Oscar, Towser and Con, had to push north in the teeth of a Force 9 blizzard to obtain supplies from the Bluff depot 16km away. They took three days and their progress was only about half a kilometre an hour. Richards describes this ordeal in his own account of the expedition published 46 years later.

"We were weak and to all intents and purposes out of food and fuel, and the dogs had lost their spirit. To make matters worse we were uncertain just where we were on the featureless ice shelf. We had lost our guiding cairns in thick weather ... We could see nothing, and we had difficulty in maintaining our footing during the worst of the savage gusts.

ONLY GUIDE

The only guide we had was that we were aware of the bearing of the line of cairns, but the difficulty was to utilise this knowledge. In the cold, with bare fingers, it was only possible to struggle with the metal of the prismatic compass for a few moments before it had to be put away and the hands returned to the mitts. It was my job, being nearest the sledge, to lay the course. This could only be done while we halted, and was accomplished by directing Joyce who was ahead at the end of a long rope, until the rope lay on course . . ."

This navigation was crucial to the lives of Richards and his five companions. But the three men reached the depot and gained a temporary respite. Finally on March 11 1916, Richards, Joyce, Hayward, and Ernest Wild reached the safety of Hut Point but only after the tragic death from scurvy and malnutrition of the padre and photographer, the Rev. Arnold Spencer-Smith. Richards and his

comrades revitalised themselves on fresh seal meat, and, leaving Hayward at the hut, returned to rescue the scurvy-striken and tent-bound Mackintosh.

In 1980, Richards gave his sealing knife and navigating compass to the Canterbury Museum. He believed that these and the four dogs, had saved the party. He wrote: "On the way back on the Aurora, Shackleton drew me into his cabin and asked me whether there was anything I particularly wanted from the equipment. I asked for the compass. He thereupon scratched on it . . . "To R.W. Richards from E.H. Shackleton. Jan 1917."

COLLAPSED

From March, 1916, in increasing darkness, the five men sheltered at Hut Point. A poignant reminder of their stay is the inscription "RWR 1916" on the end of a packing shelf. Then on May 8, 1916, Mackintosh and Hayward, against the advice of their companions, set out across the fragile sea ice to Cape Evans and were never seen again.

Shortly after Joyce, Richards and Wild returned to Cape Evans in July, 1916, Richards collapsed as a result of the strain of the southern journey. It took several decades for him to recover from his ordeal.

During the months after his collapse Richards was cared for by John Cope, the party's biologist and acting medico. For some months before Richards' illness, Cope, because of illness, isolation, and the privations of the party, had ceased to be an effective member. In later life Richards often recalled the debt of gratitude he owed "Copey" for his unremitting care.

Slowly Richards convalesced, and

on the morning of January 10, 1917, he was outside the Cape Evans hut after breakfast when he sighted a ship lying off the Barne Glacier to the north-west. After 25 months the ordeal and isolation were over. The Aurora had returned under the command of Captain J.K. Davis, and on board was Shackleton, who met Richards and his fellow-Australians for the first time. The party learned of a world still at war, the loss of the second expedition ship Endurance, the rescue of the men by Shackleton from Elephant Island, and of the 10-month ice drift of the Aurora until its arrival in Port Chalmers on April 3, 1916.

LOYALTY TO LEADER

Richards took an immediate liking to The Boss, as Shackleton was known by all who served with him. In Australia Richards met Shackleton again when he gave public lectures in aid of Mackintosh's widow. His loyalty to Shackleton never waivered. Indeed, Richards had a loyalty to all his colleagues in the Ross Sea party and a quiet pride in their achievements. He believed the party was remarkably harmonious despite its trials and tribulations.

When he regained his health, Richards returned to teaching. In 1946 he became principal of the School of Mines and Industry at Ballarat, a position he held until he retired in 1958.

In recognition of his Antarctic service, Richards was awarded the Polar Medal with clasps for 1914-16 and 1917, and in 1923, the Albert Medal in bronze "for gallantry in saving and endeavouring to save life in the Antarctic." Other Ross Sea Party recipients of the Albert Medal were Joyce, Wild and Hayward whose award was posthumous. Forty-eight

years later living holders of the Albert Medal exchanged their award for the George Cross which ranks immediately after the Victoria Cross. Richards received his at an investiture at Buckingham Palace in 1972. It was a fitting honour for a man who his old leader Mackintosh had described as "... hardworking, zealous and an officer whom I hold in the highest esteem. His services have been such that no money can buy."

Over the last three decades of his life, Richards corresponded worldwide with an ever-increasing range of friends and gave generously of his time and views, which were always forthright and vigorous. The part he played in a tragic and little-known episode in Antarctic history did not become widely known for many years because in Shackleton's "South" the Ross Sea Shore Party's great southern journey and the Aurora's drift became almost a postscript to the Endurance story.

GIFTS TO MUSEUM

In 1958 the School of Mines in Ballarat published a limited edition of Richards' sledging diary, now one of the rarest of Antarctic volumes, and in the same year Shackleton's biographers, James and Margery Fisher gave fuller recognition to Richards and the expedition. So too did the New Zealand Antarctic historian, L.B. Quartermain, in "South to the Pole" and other books.

Richards wrote his own account of the Ross Sea Shore Party which was published by the Scott Polar Research Institute in 1962. His modest and moving story, simply told in only 44 pages, appeared as a special publication and did not gain the wider circulation it richly deserved.

Richards had both respect and admiration for New Zealanders, and he

never forgot how well the seven survivors of the expedition were looked after when the Aurora brought them to Wellington in 1917. His continuing affection for New Zealand prompted him to present to the National Antarctic Centre at the Canterbury Museum, his George Cross and Polar Medal. Later his Albert Medal also came to the museum.

Australians also held Richards in high regard. Sculptors have made two busts of him and the Richard W. Richards Medal has been awarded annually since 1959 to the most outstanding final-year student in an applied science degree course at the Ballarat College of Advanced Education.

LAST HONOURS

Dick Richards was laid to rest in the peaceful cemetery at Point Lonsdale overlooking the sea. At his funeral service, addresses were given by Dr Phillip Law, Australia's best-known Antarctic scientist and ex-

plorer since Mawson, and Richard McElrea, a former president of the New Zealand Antarctic Society. Reference was made to his great contribution to the outcome of the Ross Sea Party, his contribution to education and science, his vitality, integrity, and humanity.

New Zealand has honoured Richards for all time by placing his name on the map of Antarctica. Fifty kilometres north of the Beardmore Glacier and the depot long-buried under ice and snow which Richards and his companions laid at Mt Hope is a large ice-filled inlet (83° 20' S/168° 30' E). It was named Richards Inlet by a New Zealand geological survey party in the 1959-60 summer and was on a list of place names in the Ross Dependency later approved by the New Zealand Geographic Board. New Zealand also honoured two of his companions on the southern journey in the same way: Spencer-Smith and Hayward.

ANTARCTIC BOOKSHELF



ANTARCTICA – Great stories from the Frozen Continent

Reader's Digest Services Pty., Ltd., Surry Hills, N.S.W. 1985 310 x 230 mm ISBN 0 949819 64 6. 320 pages hardback.

(This book is available at present through Reader's Digest at a price of N.Z. \$37.95 plus postage. It is now obtainable through retail outlets at N.Z. \$45.

The subtitle and the publisher might well be sufficient to dissuade anyone with a scholarly interest in Antarctica from taking any further interest in this volume. The design of the contents is such that each topic occupies an open pair of pages in a style of the old encyclopaedias bought in weekly parts. Photographs, maps and diagrams comprise half

the space, often arranged collage style. The title of each topic is followed in journalistic fashion by a subtitle, for example "A LONG NIGHT – Madness stalks the men of the Belgica". Altogether offputting for the aficionado.

The two-page formats add up to three larger components; The Continent and its Wildlife; The Explorers;

and Antarctic Atlas and Chronology. Articles are not credited, which avoids further fragmentation, but there is a list of major contributors at the front which includes well known New Zealand Antarcticans such as Margaret Bradshaw, John Darby, David Harrowfield and Chris Hendy. Colin Monteath is the principal photographic contributor and others such as Bernard Stonehouse, David Lewis and Phil Law are well known in this country. Thus "noblesse oblige" does indeed oblige the reviewer to record that it is by no means as bad as it would appear.

The reviewer vowed in his youth never to read any more of the literature of the TIME, LIFE, READERS' DIGEST type. It was only his good natured inability to say "NO" in his old age that led him into reading this volume, and that in the most inauspicious circumstances while lying painfully in bed with a slipped disc. But after trying, irritably to find every reason to reject it he has to say that once one gets below the surface of the journalistic headings it is the "Compleat Antarctica" and

the most complete, single, general reference volume on the subject to date.

He wouldn't even mind owning the copy sent to him for review (carefully covered up in brown paper of course) but unfortunately it was a borrowed and not a complimentary copy. Does this mean he will have to buy one?

One last comment, about the perennial use of the phrases "hostile environment" and "sensitive environment" in works about Antarctica. Ever since the publication of Spencer Chapman's superb book surely everyone accepts that any natural environment is not hostile — merely neutral; and with our own record of extinct and endangered species, that every natural environment, not solely Antarctica, is sensitive.

— Trevor Hatherton

Footnote: Concerned readers will be interested to know that Dr Trevor Hatherton, chairman of RDRC, was subsequently asked to review this book for another publication and has now been provided with a copy. He is, of course, keeping it wrapped in brown paper.

OF ICE AND MEN — Sir Vivian Fuchs.

Anthony Nelson, U.K. 1982 220 x 150 mm, ISBN 0 904614 06 9, 383 pages, hardback, £13.95.

Great Britain has been closely associated with Antarctic exploration from its inception. Since 1943 it has been continuously engaged in the systematic examination of that part of the continent lying between longitudes 20° and 80° west. Sir Vivian Fuchs' book is the story of the first 30 years of the Falklands Islands Dependencies Survey (BAS). Sir Vivian was well placed to write this book, as he spent the winters of 1948 and 1949 at Stonington Island, and returned home to become Director

of the Survey until retirement in 1973. His initiation and leadership of the Commonwealth Transantarctic Expedition from 1955-58 is well known.

The book briefly sketches the historical background of Antarctic exploration, before the main narrative begins. It is written in a style which reflects the very personal experience which a period 'down South' represents to those fortunate to have the opportunity. It recounts the tragedies and successes of life on the bases

and the stresses and rewards likely during a winter of isolation. The scientific purposes of the operation is not lost among the tales of adventure but are summed up in one of the appendices.

It is fortunate that such a record has been produced, for the early days

of this important organisation are of particular interest with its military and political motivation at that time. The book, dedicated to the British taxpayer, offers readers an interesting and useful history of the development of BAS.

— Howard Chapman

ANTARCTIC SOCIETY



Conservation Trophy awarded.

Dr Laurie Greenfield, a biologist with New Zealand's Canterbury University, has been awarded the Antarctic Society's Conservation Trophy for 1985. The award marks his recognition of the plant and animal microbe system in the McMurdo Sound area and his educational efforts relating to its protection.

The Trophy, an emperor penguin carved in walnut, is awarded by the Council of the Society each year, if possible, to any person or organisation contributing significantly to any aspect of Antarctic or sub-Antarctic conservation which in this context includes the preservation of flora and fauna, buildings, sites, artifacts of historic significance and of the natural features of Antarctica or the sub-Antarctic. The recipient is normally associated with New Zealand activities. There have been 12 such awards since 1972.

Dr Greenfield's studies began with measurements of the microbial biomass of soils and marine sediments near White Island in the 1978-79 season, and continued at Cape Bird

during 1980-81 with an investigation of moss, algae and their associated insect faunas along old drainage channels.

The work was extended briefly into the dry valley region. The results subsequently led Dr Greenfield to participate in joint NZARP and BAS projects based mainly at Cape Bird to determine the factors and processes affecting plant establishment in Antarctica as well as the interaction of plants and microbiota and the physiology and biochemistry of soil microflora in relation to nitrogen transformation.

As well as initiating long term studies on the environmental protection of soil microbial colonies, Dr Greenfield has promoted the mapping of plant distribution in the Ross Dependency with a view to long term protection. He has established a reputation among his students and associates as an advocate of Antarctic conservation both through education and the application of simple rules of conduct while in Antarctica.

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.

Yearly subscription is NZ\$15.00; this entitles members to:

- Antarctic which is published quarterly in March, June, September and December. It is the only periodical in the world which gives regular up to date news of the Antarctic activities of all nations at work in the far south. It has a world wide circulation. (Airmail postage is extra.)
- Newsletters for New Zealand members, many of whom are able to attend the regular meetings held by the Wellington and Canterbury branches. Annual newsletters are sent to overseas members.

You are invited to join:

North Island residents should write to the:

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

South Island residents should write to the:

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

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\$13.00 a year. Airmail postage is extra.

Student membership of the Society is NZ\$10.00.

ADVERTISING RATES

Advertising rates for "Antarctica", which is published four times a year
in March, June, September, and December are:

Whole page: 180 x 115mm NZ\$100

Half page: 180 x 57.5mm or 90 x 115mm NZ\$50

Quarter page: 90 x 57.5mm NZ\$25

These rates can be reduced by negotiations for standing orders of three issues or more.

All advertising inquiries should be addressed to the Treasurer, New Zealand Antarctic Society, P.O. Box 1223, Christchurch 5, New Zealand.

Wellington, New Zealand, as a magazine.
Registered at Post Office Headquarters.

Printed by Lincoln Print Ltd., Wellington