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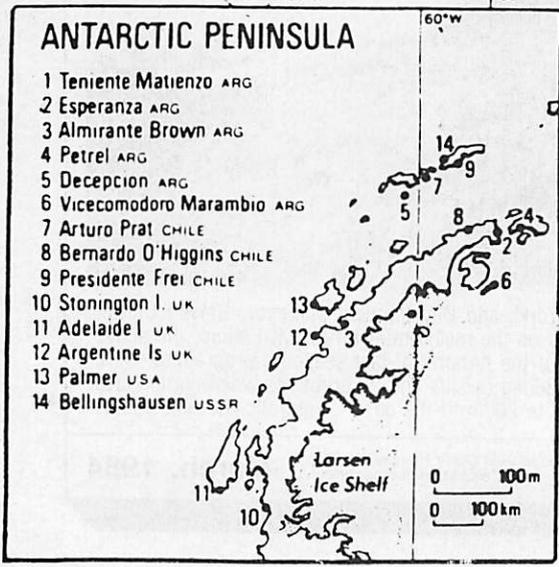
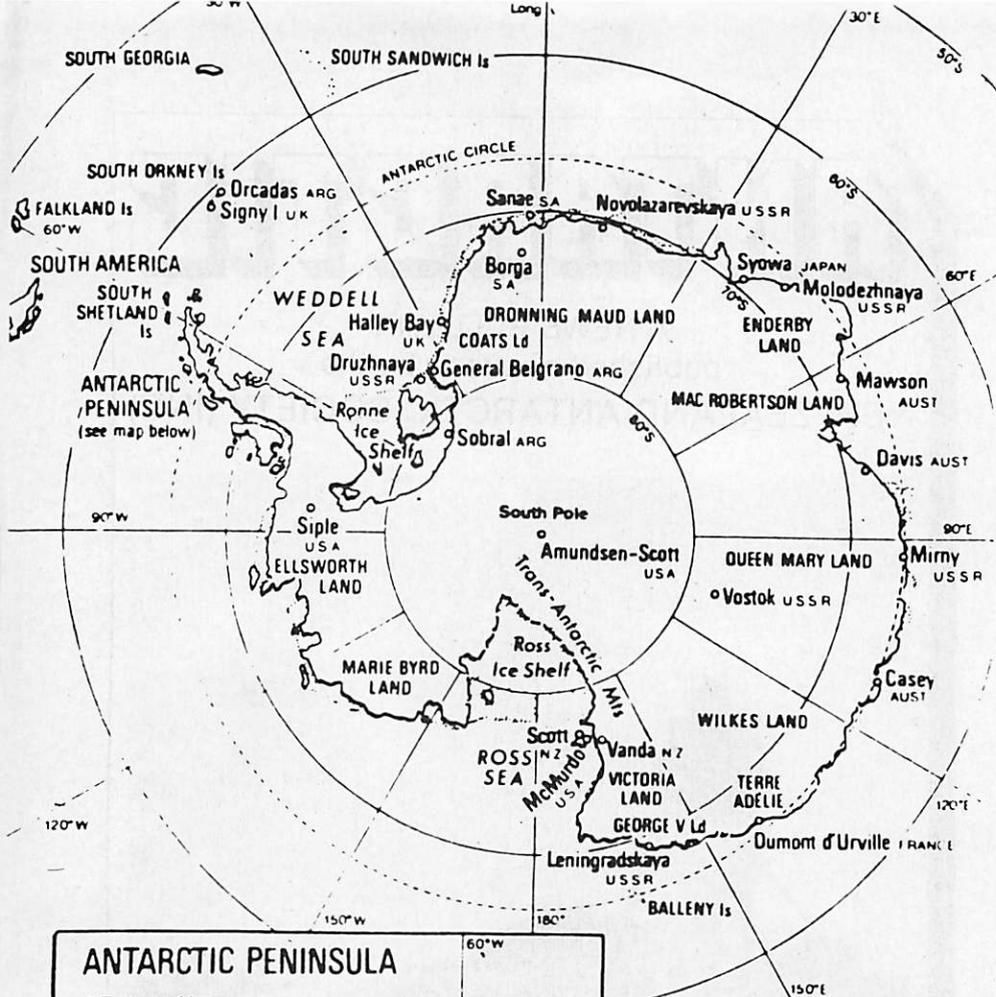


A New Zealand Ministry of Works and Development surveyor, Steven Currie, carries out a triangulation survey on the main crater rim of Mt Erebus, the active volcano on Ross Island. Some of the hazards of last season's programme were average temperatures of minus 30deg Celsius and 23 eruptions which hurled lava bombs from the inner crater up to 200m in the air. — Antarctic Division photo

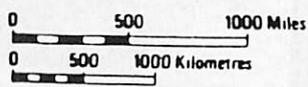
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ANTARCTICA



- ABBREVIATIONS**
- ARG ARGENTINA
 - AUST AUSTRALIA
 - SA SOUTH AFRICA
 - UK UNITED KINGDOM
 - USA UNITED STATES OF AMERICA
 - USSR UNION OF SOVIET SOCIALIST REPUBLICS

ANTARCTIC

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N.Z. PROGRAMME

EARTH SCIENCE PLANS FOR 1984-85

Major earth science projects will be a feature of New Zealand's Antarctic research programme for 1984-85. The largest will be the CIROS (Cenozoic Investigations in the Ross Sea) geological drilling programme which will start next summer with the drilling of two holes off Butter Point in New Harbour to obtain cores of sediments deposited on the seabed of McMurdo Sound.

In North Victoria Land New Zealand geologists will work with United States and West German scientists in a geophysical and geological programme. An airborne geophysical survey will be made with a specially-equipped Dornier 228-100 aircraft based at Gondwana Station, the West German summer station in Gerlache Inlet, Terra Nova Bay. South of McMurdo Sound New Zealand geophysicists will take part in a United State geophysical traverse of the Transantarctic Mountains.

Last season's programme called on the services of more than 200 men and women who worked in the field or at Scott Base or Vanda Station. In addition support for the programme was provided by the New Zealand Army and the Royal New Zealand Air Force.

Most of the research last summer was done in the dry valleys and the McMurdo Sound area. But there was a deep field geological expedition to the Ohio Range of the Horlick Mountains 1422km from Scott Base, and two New Zealand scientists took part in the United States Geological Survey's geological/geophysical survey between New Zealand and Antarctica aboard the research vessel Samuel P. Lee. A new project was a pilot study of icebergs in the McMurdo Sound-Ross Sea area.

Logistic events in the programme were the establishment of the CIROS drilling camp at Butter Point, the completion of the command centre at Scott Base, and the commencement of the fifth stage in the rebuilding programme — erection of

the geophysical laboratory building. A New Zealand-United States team studied the possibility of re-opening Hallett Station, the joint U.S.-N.Z. station established in 1957 and closed in 1973.

As in past seasons some scientific events in the 1983-84 programme were international in nature. New Zealanders took part in or supported projects with United States and Japanese scientists in the dry valleys, and guest scientists from the People's Republic of China and Japan worked in the programme. Logistics observers from Uruguay and the People's Republic of China also studied New Zealand operations at Scott Base and Vanda Station.

NEW BUILDINGS

Another stage — the fourth — in the rebuilding programme for Scott base was completed last season. The command centre, which provides administration offices, conference and field communications rooms, and the Post Office, which has improved telegraph, telephone, and postal facilities, was opened on January 2.

Before the season ended the Ministry of Works and Development and New Zealand Army construction team erected the shell of the new geophysical laboratory, the fifth stage of the rebuilding programme. Installation of mechanical and electrical equipment and completion of the interior work will be started when an advance party flies south at the end of August.

In addition to the outer shell of the laboratory, which replaces the present laboratory laboratory and the accommodation block and completed an observation tower. The laboratory will house equipment for New Zealand's physical science programme in Antarctica and facilities for meteorological observations and research.

Building material for the geophysical laboratory and a wannigan for the team which will begin rebuilding facilities at Arrival Heights, 3km north of Scott Base, were among the New Zealand cargo aboard the Southern Cross shipped south in January. Last season the site and foundations were prepared for the Arrival Heights work which will be done next summer and in the 1985-86 season.

New sleeping quarters were built at Vanda Station in the 1982-83 season. They were completed last summer, giving the station sleeping quarters for 12 persons.

WINTER TEAM

Summer operations ended officially on February 13 when Mr Norman Hardie, officer-in-charge at Scott Base since last October, hauled down his flag and handed over to his deputy, Mr Eric Saxby, who will be in charge until early in October. The last of the summer team, except Roger Ridley (meteorological observer) and Brent Reeks (Post Office technician) who remained until February 18 for the visit of the cruise ship Lindblad Explorer, returned home on February 15.

Eleven men of the winter team will be in touch with New Zealand during the winter months by radio-telephone and telegraph for nearly seven months, but will not see new faces until the arrival of the spring flights by United States Navy

Hercules aircraft at the end of August. They have 17 huskies for company and 81 neighbours close by at McMurdo Station.

Mr Saxby, a 47-year-old snow safety officer from Christchurch is wintering for the second time. He wintered at Vanda Station as leader in 1978, and last summer was his fifth at New Zealand bases.

Deputy officer-in-charge this winter is the postmaster, Mr Ian Sayers, of Hamilton. His companions are: R. Vardy (base engineer, Auckland), I. MacDonald, B. Hobern (electrician, Cambridge), J. Hoffman (mechanic, Hamilton), C. Fry (technician, Christchurch), R. Holwerda (technician, Wellington), J. Ireland (technician, Auckland), A. Roy (field leader/dog handler, Ashburton).

REMOTE PROJECT

As in the 1979-80 season one of the most remote projects in this programme was the Canterbury Museum's geological expedition to the Ohio Range of the Horlick Mountains 1422km from Scott Base and 500km from the South Pole. Last season Margaret Bradshaw led a team of two geologists, Jane Newman (University of Canterbury) and Jonathan Aitchison (Antarctic Division) and Bill Atkinson, an Antarctic Division field leader and toboggan mechanic, which worked for 60 days in the area between November 11 and January 10.

After two abortive attempts the team was flown to the Ohio Range from Scott Base on November 11 by a United States Navy Hercules aircraft which made an open field landing on the Polar Plateau at an altitude of about 2000m. When they unloaded their motor toboggans, sledges, supplies, and equipment the three geologists began their studies of the 500m-thick Lower Devonian Horlick Formation, the 750-thick coal-bearing Permian sequence, and the Buckeye Tillite.

These studies were to amplify work done in the 1979-80 season by Margaret Bradshaw and two United States geologists. The team worked at an altitude of 1700 to 2000 metres in the Ohio Range.

Much of the research was done on an escarpment about 300m high and 35km long and the party had to skirt a large crevasse field when travelling from the top of the escarpment to its base.

Margaret Bradshaw made a detailed study of marine trace fossils and animal burrows and trails about 400 million years old to improve knowledge of the area for that period. Jane Newman, whose speciality is coal measures, investigated the Permian coal measures to determine the conditions under which coal and associated sediments were formed in the Ohio Range after the Antarctic ice sheet disappeared about 250 million years ago.

GLACIAL BEDS

Discoveries made in the Buckeye Tillite sequence in 1979-80 were followed up by Jonathan Aitchison. This 300m-thick sequence of glacial beds was formed 300 million years ago. A large amount of slump material which was discovered suggested that detritus from the glacial beds was discharging into a large body of water.

While working in the Ohio Range the geological party covered about 250km from six camp sites. Strong winds and blowing snow hampered the field work, and the stormy weather also prevented the party from visiting the nearby Long Hills and the Wisconsin Range.

Temperatures averaged minus 20deg Celsius and fell to minus 30deg. Winds blew up to 65 knots and one storm kept the party confined to its tents for four days. One dome tent was demolished.

Communication with the outside world was minimal except for keeping a daily radio schedule with Scott Base and Vanda Station, monitoring other Antarctic radio traffic, and listening to short-wave radio. On December 21 the isolated party was remembered by an airdrop of mail, newspapers, Christmas cake, wine, beer, fresh fruit, and vegetables. With the pre-Christmas goodies were spare parts for the motor toboggans. The only casualty of the drop was a fresh pineapple.

Results of an international drilling programme in the Lower Taylor Valley

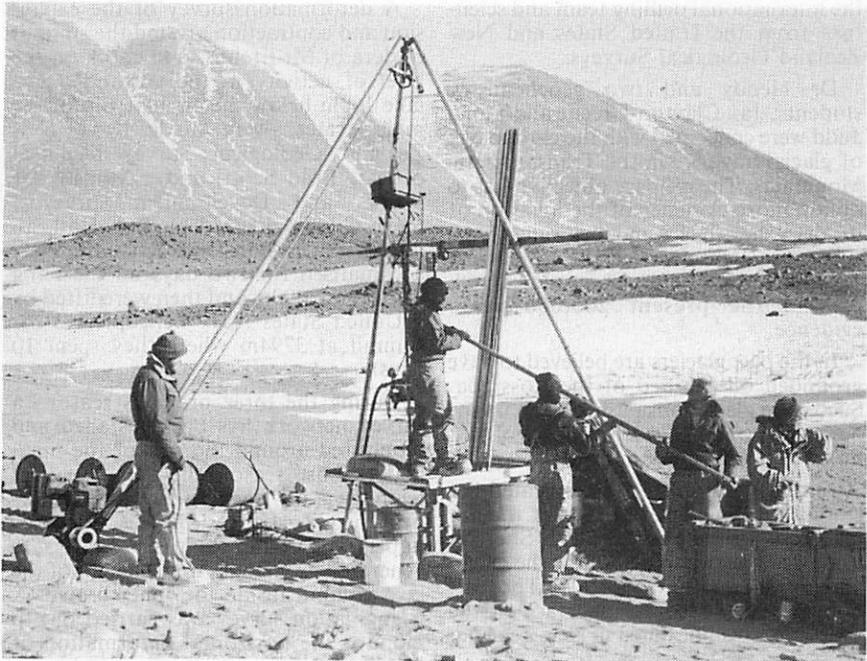
designed to decipher the Late Cenozoic glacial history of the valley as reflected in fluctuations of the Ross Ice Sheet may provide a base for interpreting world-wide climatic changes in the last million years. United States and New Zealand geologists found that deposits on the floor of the valley could be related to surface glacial expressions on the sides which will enable glacial advances and retreats from the Ross Ice Sheet and the Polar Plateau to be interpreted.

Three scientists from the United States Geological Survey, Dr Don Elston (leader), Dr Hugh Rieck, and Gary Calderone, and Dr Paul Robinson (N.Z. Geological Survey) worked in the Lower Taylor Valley because it is the only dry valley in Victoria Land with an extensive record of glacial deposits on the valley floor. The purpose of the project, which began in the 1982-83 season, was to determine the age, environment of deposition, and the source of glacial drift sequences in the valley.

A major part of the field work included the drilling of five shallow holes at different sites in the Lower Taylor Valley. This was done by four New Zealand drillers, John Hay and Stephen Pilcher (Antarctic Division) assisted by two Victoria University of Wellington geology students, Warwick Potter and Bruce Morris. In the 1982-83 season a series of 60m holes was drilled between New Harbour and Lake Bonney with a Winkie drill.

In conjunction with the drilling and analyses of drill cores Dr Elston and his colleagues carried out a geological mapping programme, studies of the character of glacial sediments, mineralogy, and magnetostratigraphy. Their research tied into studies in the area by the University of Maine, Ohio State University, and geochemical investigations by Waikato University and the Japanese Polar Research Association.

Two holes were drilled last season in the 1982-83 drilling area. The first near New Harbour which was completed on November 26, reached a depth of 66.78m. Material of Ross Ice Sheet derivation proved to be older than the 730,000 years previously recorded.



New Zealand drillers and geologists from the United States and New Zealand Geological Surveys at work near the Commonwealth Glacier, Lower Taylor Valley. Five shallow holes were drilled last season as part of a joint study of the magnetostratigraphy and sedimentology of the dry valleys and McMurdo Sound. — Antarctic Division photo

Near the Commonwealth Glacier the second hole was drilled to 70.77m. It bottomed in fossiliferous glacial marine sediment older than any penetrated before. Near the terminus of the Canada Glacier the third hole reached a depth of 27m. The fourth hole in the Lake Fryxell area was taken to 70.28m.

Drilling problems plagued the completion of the fifth hole south of Lake Fryxell which was spudded in on December 27. It reached about 50.29m. Warmer temperatures rising slowly above freezing point were encountered down to 30m. Complete, almost unbroken cores were obtained from the holes by the drillers. They were about 7.5cm in diameter and up to 3m long because they were extracted from extensive permafrost.

Each core was orientated with reference to north to obtain the east or west magnetic declination and inclination. Then the cores were cut into 60cm lengths and flown to McMurdo Station where they were logged and sampled for paleomagnetism, sedimentology, and diatom analysis.

From McMurdo Station cores were flown to the United States for additional paleomagnetism and diatom studies. Sedimentology studies will also be carried out by the New Zealand Geological Survey.

GYPSUM CRYSTALS

Waikato University's 14th expedition worked in four of the dry valleys and the Asgard and Olympus Ranges. Dr Chris Hendy's team was also associated with

the international drilling team and scientists from the United States and New Zealand Geological Surveys.

Dr Henty and two geochemistry students, Jan Clayton-Greene and Fiona Judd were concerned with the chronology of glacial advance in the Transantarctic Mountains. The primary objective was to obtain more evidence of the invasion of the dry valleys by ice and meltwaters from successive Ross Sea ice sheets, and, if possible, establish the chronology back beyond the present 200,000 years evidence.

In the past glaciers are believed to have grounded on the bed of the Ross Sea. Successive glaciations pushed them up the dry valleys where they left deposits of salt, limestone, and gypsum crystals.

Jan Clayton-Greene concentrated her studies on the glacial history of the dry lake beds in the Miers Valley. She collected carbonates to determine the extent and age in gypsum crystals. The carbonates exposed on the surface of the valley floor will be dated in New Zealand.

A unique series of glaciations is exposed in the stream beds of the Marshall Valley where Fiona Judd did her work. She collected samples of gypsum crystals and carbonates from the stream bed. In New Zealand the samples will be dated and the orientation of the crystals will be determined.

With the Japanese guest scientist Chisato Tomiyama the party also spent some time at New Harbour and Lake Fryxell in the Taylor Valley where the drillers were at work. The two New Zealanders collected fossil algae around the lake. These will be measured in New Zealand for oxygen isotopes to establish the temperature at which the algae grew.

Geomorphic processes in the Taylor Valley and the Asgard and Olympus Rangers were examined by the second Waikato team led by Dr Mike Selby. With him were L. Gaylor, W. R. Doolin, and D. Bailey. They studied glacial and periglacial deposits and processes, slope forms and slope development, and the influence of rock strength and joints upon slope development.

A deformation survey of the expansion and contraction around the summit caldera of Mt Erebus, and check on the level of activity in the volcano's lava lake 160m below the circular rim of the main crater, were made by a New Zealand Geological Survey technical officer, Brad Scott, and a Ministry of Works and Development surveyor, Steve Currie, assisted by Rob Hall, an Antarctic Division field assistant. They acclimatised for two days on the Fang Glacier at 3000m and then were lifted by a United States Navy helicopter to the summit at 3794m where they spent 10 days.

During the three previous seasons a survey network has been installed and monitored around the rim of the main crater. Last season the New Zealand team used tilt levelling to monitor vertical height changes in the volcano's upper and outer flanks. These are generated by changes in the height of the lava column inside the inner crater. A triangulation survey was carried out to monitor the horizontal deformation of the main crater.

Among the hazards of the project were average temperatures of about 30deg Celsius and 23 eruptions. These hurled lava bombs up to 200m into the air. Blisters which formed on the surface of the lava lake discharged fragments of up to 100m away when they burst.

STREAM FILTER

A two-year study of the effects of algal vegetation as a natural biological filter in the dry valley streams of South Victoria Land and its relationship to organic compounds in New Zealand streams was begun last summer by Dr Warwick Vincent and Dr Clive Howard-Williams, of the Marine and Freshwater Science Division, Taupo, assisted by Dr Vincent's wife, Connie, who is a research technician in the division. The team studied four biological and chemically different stream systems.

Algal vegetation has been found to act as a natural biological filter in Antarctica's largest river, the Onyx, which flows 30km inland from Lake Brownworth into Lake Vanda in the Wright

Valley. In the winter the algal vegetation is suspended in the river in a freeze-dried state, and becomes active when water temperatures rise in November and December each year.

During his first two visits to Antarctica Dr Vincent studied the continent's lakes. He discovered that the level of phosphorus in the Onyx River when it entered Lake Vanda was down to less than half a part per thousand million which prevented the growth of algae in the lake. Lake Brownworth was full of nutrients which flowed into the river but were stripped out by algal vegetation before reaching Lake Vanda, one of the purest lakes in the world.

All the organic carbon in the Onyx River is produced by the algal vegetation. Most of the many organic compounds in New Zealand streams are derived from surrounding bush and farm land. Because of the complexity of chemicals entering the streams the carbon cycle is difficult to establish.

From last summer's studies of how the organic carbon was modified by microscopic plants in the Onyx River the scientists will be able to relate their knowledge to the processes in New Zealand streams, particularly those in the Taupo catchment area, Dr Howard-Williams has been growing vegetation for a filter system to improve the water quality of Lake Taupo, and to reduce problems associated with algal blooms.

Other streams studied last season included a turbid one virtually non-algal which flows into Lake Fryxell from the Commonwealth Glacier in the Taylor Valley, and the Adams stream in the Miers Valley which flows through areas of lush algal vegetation. The team also studied the northern rookery stream at Cape Bird which has a rich input of nutrients from an Adelie penguin colony.

SOIL STUDIES

Decomposition processes taking place in the soils of penguin rookeries at Cape Bird, the north-west tip of Ross Island, was studied by three Soil Bureau scientists, Dr Val Orchard, Dr Tom Speir,

Mrs Jan Heine, and Hans Konlechner, of the University of Canterbury botany department. Although Cape Bird is at 77deg 14min S biological activity during the summer is substantial, and it is an ideal location for the study of soil processes because plants are virtually non-existent, and the only important organic input is penguin guano.

Last season's study between December and January built on research done in the 1981-82 season by Dr Speir and Mrs Heine. The team compared four sites at Cape Bird — an occupied penguin colony in the rookery, a recently-abandoned rookery, a depression into which guano had been washed by meltwater, and an old abandoned colony. A fifth site with relatively low biological activity in the soil was sampled in the Wright Valley for comparison.

Dr Orchard used a gas chromatograph to measure the carbon dioxide respired into the air by soil micro-organisms, and radio-labelled glucose to measure the number and level of activity of the active organisms.

To measure the biological activity in the soil Dr Speir studied the enzymes which occur in penguin-urease, protease, and phosphatase. These break down respectively urea, protein, and organic phosphate. Very high levels of phosphatase were found in surface guano from the unoccupied colony and the site into which guano had been washed by meltwater.

PENGUIN COUNTS

Cape Bird's Adelie penguin population is flourishing. The annual census, which has been made since 1965, produced a figure of 43,515 occupied nests and a total of 47,519 birds. Last season's count of occupied nests is 13 per cent higher than the 1982-83 seasonal count, and 28 per cent higher than the 1979-80 count.

This census, a University of Canterbury project, was part of the 1983-84 programme of the International Study of Antarctic Seabirds, (ISAS) and was carried out in early December by Dr Laurence Greenfield, of the university's

botany department, and Lynda Logan. Dr Greenfield also inspected the sites where he studied microbial recolonisation in the 1982-83 season, and the small oil-contaminated plot used to determine the long-term effects of oil on the biology of Antarctic seals.

A count at Cape Royds, which supports the world's southernmost Adelie penguin rookery, was made on December 11 by the two scientists to determine

to Cape Adare. Two other counts were made at Cape Royds by Scott Base staff, the first in November and the second in January.

Eight scientists and logistics observers from the People's Republic of China, Japan, and Uruguay, worked with the New Zealand programme either as guests or under its auspices. Six of them, including two women, worked with New Zealanders in the dry valleys or conducted research of their own.



A Chinese geologist, Mrs Li Huamei (left) gathers Jurassic sandstone samples from the Asgard Range during her visit to Antarctica last summer. With her is Peter Sampson, an Antarctic Division field assistant.

Antarctic Division photo

the breeding potential of the rookery and to monitor long-term population trends. It produced figures of 2217 occupied nests and 2535 birds in all. The nest count was about 9 per cent more than the 1982-83 figures, and 35 per cent more than in the 1979-80 count.

These figures will be compared with the ground check by Rowley Taylor and Dr Peter Wilson before they make their third aerial photographic survey of Adelie and Emperor penguin colonies in the Ross Dependency from Ross Island

A Chinese geologist, Mrs Li Huamei, of the Institute of Geochemistry in Gnizhou Province, who spent a month in Antarctica, stayed at Scott Base and Vanda Station. She worked in the Asgard Range and at Inland Forts collected sandstone samples from the Jurassic period 150 million years ago.

Mrs Li spent some time with a Waikato University team studying glacial history in the Marshall, Miers, and Taylor Valleys. She also visited the joint New Zealand-United States drilling pro-

ject in the Lower Taylor Valley where core samples of glacial deposits were obtained for sedimentology and geomagnetic studies. An Antarctic Division field assistant, Peter Sampson, from Vanda Station, assisted the visitor.

Another woman guest scientist Miss Chisato Tomiyama, of the Water Research Institute of Nagoya University, was sponsored by the Japanese Polar Research Association, and worked with the Waikato University team in the Marshall, Miers, and Taylor Valleys.

Each summer since 1968 a team from the Japanese Polar Research Association has done research into the geochemistry of the dry valley lakes. Once again the team was headed by the Dr Tetsuya Torii, who has visited the dry valley region 18 times since 1961.

With Dr Torii were Drs Genki Matsumoto and Tsurahide Cho, and Mr Tamio Kawano, who were assisted by

Peter Sampson. They continued research into the composition of the freshwater but highly saline lakes, including Don Juan Pond and Lake Vanda in the Wright Valley, and Lakes Fryxell and Bonney in the neighbouring Taylor Valley.

A second guest from the People's Republic of China was an electrical engineer, Mr Xu Chang. He inspected the power supply systems and other electrical installations at Scott Base, and also visited McMurdo Station.

Earlier in the season a representative of the Uruguayan Government, which plans to start an Antarctic research programme, visited Scott Base and Vanda Station as a guest observer. Lieutenant-Colonel Omar Porciuncula y Lamar, studied New Zealand operations and assessed logistic needs for the small research station Uruguay plans to establish on the Antarctic Peninsula in November this year.

N.Z. research projects for 1985-86

Proposals for research projects to be considered for inclusion in the 1985-86 New Zealand Antarctic Research Programme are invited by the Ross Dependency Research Committee. Research proposals can cover any of the earth, life or atmospheric sciences and be directed to a better understanding of the unique environment of Antarctica, its geological and geophysical structure, or those natural phenomenon most suited to research conducted from southern latitudes.

Research proposals can be either short of long term, and based at New Zealand's Antarctic stations or in the field, depending on the logistic support required. Proposals should included a detailed outline of past research in the topic, biographical notes on team members, an outline of anticipated work, and details of required logistic support.

Applications, which close on July 31, 1984, are reviewed by the biological,

physical or earth sciences working groups of the RDRC. Applicants will be informed of the status of their proposals in late December, 1984.

An information package on research directions, available facilities and how to prepare a proposal is available along with a support information form from:

The Secretary
R.D.R.C.
C/o DSIR Head Office
Private Bag
WELLINGTON

Snow toads again

Snow toads, the Antarctic gremlins, can be blamed for any annoying error in the "December" issue of "Antarctic." On the cover and the contents page the issue was described as No.3 of Volume 10. It is, however, No.4.



Hallett Station may have new life

Hallett Station, some 643km north of Scott Base, which was operated jointly by the United States and New Zealand from 1957 to 1965 and abandoned to the elements in 1973, may be re-established as a small emergency and scientific base. Between January 19 and February 7 a New Zealand-United States team inspected the station to assess its future and began a clean-up programme to deal with the results of 10 years of exposure to gales, snow, and drifting ice — buildings damaged beyond repair, rusted tools and machinery, and the potential environmental hazards of leaking fuel drums.

A detailed examination of the station and the surrounding area was made by the leader of the expedition, Mr R. B. Thomson, director of the Antarctic Division, and Mr K. Moulton, the United States National Science Foundation's senior representative in Antarctica for the latter part of the season, with the leader of the work party, Mr Garth Varcoe, buildings officer for the Antarctic Division. Messrs Thomson and Moulton agreed that buildings in the poorest state of repair should be demolished, and that the station and outlying areas should be tidied up immediately.

Members of the New Zealand-United States work party were an Antarctic Division field assistant, John Watson, an assistant maintenance officer, Keith Whitehead and David Waldrip, of Antarctic Services, the National Science Foundation's support contractors. A fuels expert, Chief Petty Officer Terry Templeton, was seconded to the party to assess the condition of the fuel supplies at the station and co-operated measures taken to cope with leakages and other hazards. The five men spent nearly three weeks on the clean-up and recovery project.

When he returned to Scott Base Mr Thomson said that any long-term decision on Hallett Station's future will be made after a report on this year's work has been considered by the United States and New Zealand authorities. A complete clean-up of the Cape Hallett area, dismantling of

existing buildings, and the erection of a small building to support scientific parties of six to eight, would have to be extended over three to four seasons. By then scientists should be able to give a better indication of potential future research in the Cape Hallett area.

Much of the material at Hallett was removed when the station was closed in 1973 but plans to remove more, and some of the buildings in 1974 were not carried out. In the 1982-83 season a New Zealand biological research team which spent two months at Cape Hallett made a complete inventory/status report on the station. As a result of this report and the observations of passengers on cruise ships which called at the abandoned station last season's programme was arranged.

HEAVY ICE

Captain Brian Shoemaker, the United States Navy support force commander, and two Italian observers were included in the party which left McMurdo Station on January 18 for Cape Hallett aboard the United States Coast Guard icebreaker Polar Sea. Drs. Carlo Stocchino and Marcello Manzoni made the visit to Hallett Station as part of their preparation of an Antarctic research programme for the Italian National Council for Research (CNR).

On her way up the Northern Victoria Land coast the Polar Sea encountered heavy pack ice at times, and 36 hours

after leaving McMurdo Station she was still some 36km from Cape Hallett. Two parties were flown ashore by the ship's helicopters, one by way of Football Saddle into Moubay Bay, and the other along the coast.

While the assessment and work parties made their preliminary inspection of the station, which Mr Thomson had last seen in 1971, the helicopters shuttled between ship and shore transferring 3000lb of cargo for the use of the five men who remained when the Polar Sea sailed south again. The last helicopter flight was completed early in the afternoon of January 20.

When the work party began its task it found that most of the 15 station buildings — 11 large and four small — had been damaged by ice and water over the years. Floors were iced up, and melt water in the summer had rotted some of the flooring. Only one of the major buildings had any possible economic value.

VEHICLES STARTED

One of the first requirements was to inspect all the vehicles and try to get them into running order for use in moving fuel drums and other material. After 10 years of neglect two tractors and a truck responded quite quickly to a mixture of warmth, cold weather experience, and joint N.Z.-U.S. mechanical knowledge. They were used regularly for more than a fortnight, and then were parked in the garage for future use before the party left.

A major operation was to stop any further leakage of fuel from drums and other containers. This was a long and tedious operation which took several days because nearly 200 fuel drums had to be drained, and the fuel transferred to the main holding tank. Before the five men departed they transferred 17,000 gallons of Antarctic diesel fuel from smaller tanks to the main tank, and 10,000 gallons of other fuels were pumped from deteriorating drums to more solid containers.

In less than three weeks the work party also disposed of the balloon shed, the mess/galley hut, and two Jamesway

huts. All overhead power lines and poles were removed bar one pole, drums and many loads of rusty metal were cleared from the foreshore of Seabee Hook, the low recurved spit on which the station was built in the 1956-57 season, and out-to-date manuals and masses of paper were disposed of as well as hundreds of dried out cigarettes.

Rubbish, small dilapidated huts, and boxes around the station were included in the clean-up. A stack of timber was left for future use, and most of the buildings were cleared of their contents, valuable items being placed in a secure area.

By February 6 the work party was ready to leave, but heavy blowing snow which started to fall in the morning made it impossible for the Polar Sea's helicopters to operate. The storm continued the next day, and finally when the snow had almost stopped the five men and their cargo were flown to the icebreaker in a 35-knot wind.

After the last helicopter flight about 2 p.m. the Polar Sea headed south, and Hallett Station was left to the few remaining penguins (a mass migration had started on February 2). The ship arrived at McMurdo Station on the morning of February 8.

Between 1957 and 1964 Cape Hallett used to be spoken of by slightly envious Ross Island residents as Antarctica's "Banana Belt." This year it lived up to its reputation. Only one working day was lost because of wind and snow, temperatures ranged from 5deg to minus 3deg Celsius, and most of the days were bright and sunny.

A memorable experience for the hard-working team, particularly the three New Zealanders, was to sit in the sun listening to Radio New Zealand's broadcast on the final day of the cricket test match in Christchurch when New Zealand beat England. Nobody needed to bring a chilly bin or sandwiches. Hallett could still provide 10-year-old fruit cake and 10-year-old American beer to wash it down.



Flood waters of the Onyx River foam over the weir near Vanda Station. The river reached its highest level since 1970-71 on December 17 last summer. Antarctic Division Photo

Onyx River turns into torrent

Antarctica's only respectable river, the Onyx, became a torrent last summer. On December 17 it reached its highest level since the 1970-71 season. Normally, the river, which rises at the eastern end of the Wright Valley and is fed by melt water from the Lower Wright Glacier, then flows 40km inland from Lake Brownworth to Lake Vanda, near Vanda Station, but does not reach its peak until January.

Frozen for most of the year, the Onyx runs for only a few weeks in the summer when temperatures rise. Every summer its flow is measured and recorded by hydrologists from the Ministry of Works and Development. They are assisted by the summer staff at Vanda Station.

Last season the river did not begin to flow until December 16, which is later in the year than normal. The next day it peaked at a flow of about 13 cubic metres a second. This was the highest ever recorded, and was beyond the range of the hydrologist's recording instrument.

A lot of rock was washed away by the high flow which also changed the channel of the Onyx considerably. Scouring in some places caused a silty discharge

into Lake Vanda and nearby Lake Bull. But by early January the river was flowing at a normal rate of between 0.2 and 0.5 cubic metres, and the discolouration had cleared.

On December 19 at 6 a.m. the waters of the Onyx reached the permanent weir near Vanda Station on their way to Lake Vanda. In the 1982-83 season the time was 1.30 p.m. on December 11, and in the 1981-82 summer the water arrived at the weir on December 9 at 11.15 a.m.

Each season the Vanda Station staff organise a sweepstake based on the time and date of the flow over the weir. Last season the winner was Wayne Barnes, one of the New Zealand Army construction team rebuilding Scott Base. His forecast was the closest of the 83 entries received from about 72 people.

GANGOTRI III

Indian station manned by winter team

India's permanent station, Dakshin Gangotri (72deg S/10deg E) on the Princess Astrid Coast of Queen Maud Land, was established by the third expedition last season. The station, which is occupied this winter by 12 scientists and support staff under the leadership of Lieutenant-Colonel S.S. Sharma, of the Defence Research and Development Organisation, will be fully operational in the 1984-85 season.

Organised by the Department of Ocean Development, the third expedition, which was led by Dr. H. K. Gupta, director of the Earth Studies Centre at Trivandrum, capital of the State of Kerala, sailed from Goa on December 3 aboard the chartered ice-strengthened Finnish ship Finn Polaris and reached Queen Maud Land on December 27. It returned to Goa early this month.

There were 82 scientists and support staff in the expedition including two women, 35-year-old Dr Aditi Pandit, a marine biologist, and 32-year-old Dr Sudipta Sen Gupta, a geologist. They were the first Indian women to land in Antarctica.

Projects initiated by the first two expeditions were continued by the summer scientific team which worked from a base a few kilometres from the Soviet station, Novolazarevskaya. The team also carried out research in several fields, including geology, geophysics, glaciology, microbiology, and medicine. Oceanographic, meteorological, and geophysical projects were undertaken during the voyage of the Finn Polaris in the waters of the Indian Ocean and the Southern Ocean.

Lieutenant-Colonel Sharma's team, which has a satellite communications link with India, will remain in Antarctica for nearly 10 months. It will be relieved by the fourth expedition about December 25.

Survival course at Pole

New Zealand and American mountaineers provided Antarctic snowcraft and survival training for more than 400 men and women last season. The courses on and near an ice-fall about 3km from Scott Base were run by Lindsay Main (field leader), Ken West, and Rob Hall, who were assisted for the second time by David Lasorsa, a United States Antarctic Research Programme mountain instructor. Hall, West, and Lasorsa also ran a course for scientists and support staff at the Amundsen-Scott South Pole Station.

Last season marked the 21st anniversary of the joint New Zealand-United States survival training programme in Antarctica. For the last 10 years the Antarctic Division, D.S.I.R., has been responsible for the courses which are run from early October to late January.

Training was given last summer to American and New Zealand research and support staff, guest scientists and logistics experts from Japan, the People's Republic of China, and Uruguay, United States aircraft and helicopter flight crews, and crews of RNZAF aircraft.



East German winter research team

Nine scientists and technicians from the German Democratic Republic will continue their national research programme in Antarctica this winter. Six will work within the framework of the 29th Soviet Antarctic Expedition (SAE) at the GDR base laboratory about 1.5km east of the Soviet station Novolazarevskaya, and three biologists will be with the SAE winter team at Bellingshausen Station on King George Island, South Shetlands.

Four scientists and technicians flew to Novolazarevskaya from Leningrad by way of Maputo (Mozambique) aboard a Soviet Ilyushin 18-D towards the end of October last year. Two geologists, Dr. H. Kampf and W. Stackenbrandt, returned home this month after carrying out geological mapping of the Schirmacher Oasis. Early this month the

two members of the winter team were joined by four colleagues who flew first to Maputo and then joined a Soviet ship for Novolazarevskaya.

Three biologists, Dr H.-U. Peter, M. Kaiser, and A. Gebauer, and a geologist, Dr W. Weber, left home at the end of October and travelled by ship to Bellingshausen Station and the Soviet summer station, Druzhnaya I. on the Filchner Ice Shelf. Dr Weber left Druzhnaya for the GDR last month.

Leader of the winter team at the GDR base laboratory, which was established in 1976, is a chemist, Dr P. Junghans. Others in the party are L. Tharang (meteorologist), H.-J. Heldt (electrical engineer), G. Muller (diesel mechanic), E. Ohland (cook), and W. Teschner (electrician).

Terra Nova Islands off charts

Changes in location of a number of mapped positions in Antarctica were reported or confirmed by two Soviet naval hydrographic research ships, Admiral Vladimirsky and Thaddei Bellingshausen, which completed a circumnavigation of the continent in April last year. The Terra Nova Islands off the Oates Coast were found not to exist and the Bellingshausen Ice Shelf was 80 km shorter than mapped.

While in southern waters the two hydrographic vessels retraced the route of the Vostok and Mirny in 1820, revisited the spot off Princess Martha Coast (69deg 25min S/deg 10min W) from which Bellingshausen's expedition was said to have been the first to sight the Antarctic Continent, and made a series of hydrographic surveys and investigations in southern waters. The Admiral Vladimirsky also made an unexpected and unannounced three-hour visit to McMurdo Sound.

First sighted on March 8, 1961 from the Magga Dan by an ANARE expedition led by Dr Phillip Law, the Terra Nova Islands (66deg 53min S/157deg

57min E) were named for Scott's Terra Nova which discovered and charted coastal points in the area during the 1910-13 expedition. The islands were found not to exist, and the mapped locations of some other islands were reported by the Soviet hydrographers to be off by up to 7-8km.

Corrections were listed for Franklin and Beaufort Islands in the Ross Sea, Bouvet Island in the Atlantic sector, and Scott Island in the Pacific sector, and the New Zealand sub-Antarctic Bounty and Antipodes Islands. Some of these changes in location had been reported previously by other mapping agencies.

Off the coast of Queen Maud Land the hydrographers found that the Bellingshausen Ice Shelf, a tongue of ice shown on Soviet and other maps as protruding north from the Fimbul Ice Shelf at 1deg 3min W was 80km shorter than mapped, i.e. virtually non-existent. The Soviet ships also reported finding about 50 uncharted undersea features, including a seamount which was named Chernomorskaya (Black Sea).

Fewer seals killed to feed huskies

Since the 1956-57 season more than 2000 Weddell seals have been killed in the McMurdo Sound area by official New Zealand parties to provide food for the Scott Base huskies. But records kept by the Antarctic Division, D.S.I.R. for 28 seasons show a steady decline in numbers killed, and also indicate how strictly New Zealand observes the terms of the Antarctic Treaty which regulate the killing of seals in the treaty area for scientific purposes and the feeding of men and huskies.

When there were more than 60 huskies at Scott Base for the use of the New Zealand section of the Commonwealth Trans-Antarctic Expedition the number of seals killed reached a peak of 350. After the completion of the Antarctic crossing only 105 seals were needed to feed a reduced number of dogs. The figure rose to 150 in the 1958-59 season, probably because eight of the original 40 huskies at McMurdo Station were transferred to Scott Base.

In the 1959-60 season the huskies' diet was one-third seal, one-third dog meal, and one-third New Zealand mutton, and in 1960-61 it was half seal and half mutton. The killing totals were 110 and 60-100 respectively.

Weddell seals are normally taken in the January-February period. Under the terms of the Agreed Measures for the Conservation of Antarctic Flora and Fauna permits can be issued for the killing of limited numbers of seals to provide indispensable food for men or dogs, and for scientific purposes. New Zealand permits for scientific purposes and for feeding huskies are strictly controlled.

These measures, the increased use of motor toboggans, and a reduction in the number of huskies kept at Scott Base, have resulted in a progressive reduction in the number of seals killed each season since 1964-65. Since then the maximum number taken in any season has been 75.

Now the taking of seals to feed the huskies has become virtually a culling operation to conserve the population in

the McMurdo Sound area. In most cases older males are culled and selected from a wide spread of locations. The numbers killed in recent years has been minimal in relation to an estimated population of many thousands in the Western Ross Sea.

This year only 30 seals have been killed to provide winter food for the huskies. Additional dog food has been shipped from New Zealand, and the huskies' diet is supplemented by scraps from nearby McMurdo Station. Last year 36 seals were killed and in 1982 the number was 52.

In 28 seasons the total of Weddell seals killed in the McMurdo Sound area is approximately 2149. The detailed figures are: 1956-57, 350; 1957-58, 105; 1958-59, 150; 1959-60, 110; 1960-61, 60-100; 1961-62, 100; 1962-63, 100-130; 1963-64, 80-100; 1964-65, 72; 1965-66, 75; 1966-67, 67; 1967-68, 60; 1968-69, 50; 1969-70, 67; 1970-71, 51; 1971-72, 72; 1972-73, 52; 1973-74, 52; 1974-75, 52; 1975-76, 52; 1976-77, 52; 1977-78, 53; 1978-79, 40; 1979-80, 52; 1980-81, 52; 1981-82, 52; 1982-83, 36; 1983-84, 25.

For the three seasons 1960-61, 1962-63, and 1963-64 the estimates given have been adjusted for this report to 75, 110, and 85. Sources for the detailed numbers first published in "New Zealand Antarctic Record" are the September, 1967 issue of "Antarctic," and the annual New Zealand exchange of information with other Antarctic Treaty nations.

MICROLITES AND COPEPODS

Finger nails and big toe nails grow in Antarctic regions at much the same rate as in temperate regions. There are no significant differences during colder months or in different cold locations. These conclusions were reached by Drs Peter Gormly and Jean Ledingham after watching the nail growths of 28 subjects for 11 months at Mawson, and 14 subjects for 10 months at sub-Antarctic Macquarie Station. In a paper printed in the Australian Journal of Dermatology there is one exception. The big toe nail's relatively high rate of growth may be related to a "hot-house" effect from almost constant use of insulating footwear.

★ ★ ★

East Antarctica is a good place for vegetable growing although the crops are produced in hydroponics rooms at bases on the continent. The Soviet station, Leningradskaya, on the Oates Coast, supplies its own cucumbers, and Australia's three stations, Mawson, Davis, and Casey, have almost everything in the seed catalogue — beans, lettuces, spinach, silver beet, mini tomatoes, parsley, mushrooms, strawberries, capsicums, and potatoes.

★ ★ ★

Whales were among the casualties in the Falklands conflict, according to Professor Daniel Torres, of the Chilean Antarctic Institute, who is an authority on marine mammals. He attributes the deaths of 57 whales which came ashore near the Chilean port of Punta Arenas to disorientation caused by many underwater explosions during the war in the South Atlantic.

★ ★ ★

Antarctica's wind power has been harnessed to good effect at Novolazarevskaya, the Soviet station in Queen Maud Land. Three windmills drive generators which provide enough power to heat all the station buildings during the winter. Last winter's team of 23 included two research engineers from the *Vetroenergiya* (wind energy) Scientific Production Association in Moscow.

Mawson, one of Australia's three Antarctic stations, has lost a husky. Snoopy now lives at the Soviet station, Mirny. The husky was a gift to the crew of a Soviet Ilyushin-14 aircraft which arrived on December 16 last year to pick up an Australian glaciologist who was to join a Soviet traverse. Mawson now has 17 working huskies.

★ ★ ★

A New Zealand encyclopaedia widely advertised in the media as a source of accurate up-to-the moment information, and an invaluable reference book for every household, school, library, and business, is slightly behind on Antarctica. It says that Scott Base was established in 1964, and New Zealand has another base near Cape Adare established in 1957.

★ ★ ★

A former officer-in-charge at Scott Base will be a candidate in this year's general election. Mr R. S. Straight, an English-born retired New Zealand Army officer, who was in charge of the New Zealand research programme for the 1977-78 summer, is the National Party candidate for the Nelson seat.

Mr Straight, who is 56, is not the first Scott Base leader to enter politics. In 1975 Mr Adrian Hayter, who wintered at Scott Base in 1965, stood as an independent for the Tasman seat held by Sir Wallace Rowling, the Prime Minister.



One of four Australians who climbed the Himalayan peak Annapurna II (7937m) by the south face on October 8 last year, was Greg Mortimer, a geologist who worked for the New Zealand Antarctic Division in the 1980-81 and 1982-83 seasons. He did geographical mapping in the Miers Valley, and then was a New Zealand guest scientist with the West German Ganovex III expedition to North Victoria Land.

U.S. research in West Antarctica

Scientists who worked in the United States Antarctic Research Programme last season concentrated most of their field work in West Antarctica. With icebreaker and aircraft support their research was conducted on the Siple Coast along the east side of the Ross Ice Shelf, off the coast of Marie Byrd Land, in the Thiel and Ellsworth Mountains of Ellsworth Land, on islands off the Antarctic Peninsula, and in the Weddell and Ross Seas.

More than 280 scientists were engaged in 90 projects on the continent and in southern waters. They worked with representatives of 10 other countries with polar interests. Projects staged through McMurdo Station ended about the middle of February. Siple Station in Ellsworth Land was closed on January 20 until November next year, the Amundsen-Scott South Pole Station on February 11, and McMurdo Station began winter operations on February 19 when the last aircraft departed for Christchurch. Summer operations began on October 4 last year.

One of three major projects in the programme — a scientific cruise off the coasts of Marie Byrd Land and Ellsworth Land did not end until this month. The Polar Sea sailed from McMurdo Sound on February 16 to support research on Siple Island, in Pine Island Bay, and on Thurston Island.

Early this month scientists confirmed that Mount Siple (3110m) is a major volcano almost as large as Erebus. Geologists have assumed that it was a volcano ever since its discovery 43 years ago.

Mt Siple is a massive conical snow-covered mountain on the north-west part of Siple Island which is separated from the coast of Marie Byrd Land by the Getz Ice Shelf. It was discovered on December 18, during an exploratory flight by a Curtiss-Wright Condor aircraft from the West Base of the United States Antarctic Service Expedition (1939-41) and was named for Dr Paul Siple who was in charge

of the base and navigator on all major exploratory flights including the one on which Mt Siple was sighted.

Bad weather and heavy pack ice have prevented icebreakers from reaching Mt Siple in past seasons. But this month the Polar Sea was able to put vulcanologists, petrologists, glacial geologists, geodesists, and geophysicists ashore or land them in the vicinity of the mountain by helicopter.

On the first visit to Mt Siple in 43 years scientists were able to work on the mountain for four days. An ornithologist found a colony of Adelie penguins, about 2000 pairs, on Lovill Bluff, a rock and snow coastal bluff on the western end of Siple Island.

Preliminary studies by two topographic engineers from the United States Geological Survey indicated that Mt Siple was more than 60km from its position on existing maps. Finally they determined that it was 24.1km north and 20.9km east of the actual position.

A three-year study of the West Antarctic Ice Sheet along the Siple Coast was one of two other projects in last summer's programme. The purpose was to obtain more information about the ice sheet's stability, its response to climatic changes, and its relationship to global climate.

JOINT PROJECT

United States and British scientists took part in another major project — a joint investigation of the tectonic development of West Antarctica and its relationship to East Antarctica. British Antarctic Survey

scientists used Twin Otte aircraft to conduct aeromagnetic surveys and a reconnaissance of the Jones Mountains on the Eights Coast, and United States Navy Hercules aircraft flew scientists to the Ellsworth and Thiel Mountains and placed fuel supplies in position at Siple Station, Mt Smart, and in the Jones Mountains. These will be used when the project is continued in the 1984-85 season.

More projects than usual were undertaken from research vessels and Coast Guard icebreakers which worked in the

A feature of last season's research programme was the discovery of an extremely rare type of meteorite in the Allan Hills area of Victoria Land by a field party led by Dr William Cassidy, of the University of Pittsburgh, who has been engaged in the search for meteorites since the 1976-77 season. The rare meteorite was among 70 fragments found in an ice field west of the Allan Hills.

Three or four of the fragments were carbonaceous chondrites, a rare type

A 33-year-old woman suffering from internal bleeding aboard the Soviet trawler/factory ship Dalniy was brought into McMurdo Sound on February 20 for medical attention. Doctors at McMurdo Station provided minor surgical assistance which was successful and shortly afterwards the Dalniy steamed out of the sound.

Because of bad weather which reduced visibility to .8km the woman was sent ashore by tender with a party of three. The Dalniy stayed offshore 3.2km from the station.

In the 1982-83 season two Soviet research ships visited McMurdo Sound. They were the naval research ship Admiral Vladimirsky on February 9 and the trawler/research vessel Yunony on March 8. The Yunony made a brief visit of less than half an hour on February 14 but the ship's captain and seven scientists spent five hours ashore the second time.

Weddell Sea and the Indian Ocean, the Ross Sea, and off the east and west coasts of the Antarctic Peninsula. The veteran icebreaker Westwind was damaged off the Larsen Ice Shelf but was able to complete her scientific mission before making her way to the Chilean station, Rodolfo Marsh, on King George Island, South Shetlands, for temporary repairs.

Major logistic support for the programme was provided by the ski-equipped Hercules aircraft of the U.S. Navy's VXE-6 Squadron. They resupplied the South Pole Station, and maintained summer research there and at Siple Station. A small base camp and field camps were established on the Siple Coast, a New Zealand geological party was put into the Ohio Range of the Horlick Mountains, and a flight of 630 nautical miles was made to Dome C in Wilkes Land to check automatic weather station systems. In addition squadron helicopters flew scientists into the dry valleys and to the summit of Erebus.

containing carbon molecules. One which still has to be positively identified is believed to be an extremely rare C1 type carbonaceous chondrite. There have been only three or four such discoveries in the world, and the Allan Hills fragment was the first from Antarctica.

A C1 type carbonaceous chondrite is the most primitive form of meteorite. It represents the composition of primordial cloud from which the planets and the Sun were formed. Believed to be about 4.6 thousand million years old, the C1 type is very old by geological standards. Most terrestrial rocks are less than 1000 million years old.

Between December 10 January 22 Dr Cassidy's party searched systematically for meteorites at three sites west of the main Allan Hills icefield. In the 1982-83 season a reconnaissance of one site 75km to the west yielded 41 specimens. Last season 364 meteorites were collected at several locations.

Dr Cassidy's party was put into the field at Griffin Nunatak (75deg 55min S/158deg 20min E) in the Prince Albert Mountains by a United States Navy Hercules aircraft. From there the party moved to the Elephant Moraine, and ice core moraine west of Reckling Peak at 76deg 16min S/159deg 15min E.

After more than two weeks in the area which yielded two rare achondrite meteorites in 1979 the party headed south with its nine toboggans and 12 sledges to the far west ice field in the Allan Hills area. It remained there about 10 days and then moved on the middle ice field. For seven of the 14 days there the party was confined to its tents by a snowstorm.

Towards the end of January the party travelled back to the main western ice field. It was picked up by a Hercules aircraft on January 22 and flown back to McMurdo Station.

In addition to collecting 364 meteorites compared with 144 in the 1982-83 season Dr Cassidy's team made a survey from the far western ice field to the Allan Hills and detailed maps of the locations where meteorites were found. A number of gravity readings was taken to provide information about ice thickness and meteorite concentrations.

Dr Cassidy and one member of the party also flew to Amundsen-Scott South Pole Station where dust collectors were placed in the clean air facility. It is hoped that some of the dust collected will be of extra-terrestrial origin.

LIVING ALGAE

Living algae in a melt pool were discovered in the Harold Byrd Mountains at a latitude of about 85deg 25min S by an Ohio State University team which studied the glaciology and pedology of the Reedy Glacier-Harold Byrd Mountains area. The team worked for two months in the mountains near the north-east extremity of the Ross Ice Shelf.

In the Reedy Glacier area the party studied glacial sediments in two ice-free areas. Samples previously collected had shown that these sediments contained Paleogene and Neogene marine microfossils.

From the McCarthy Glacier near the edge of the Polar Plateau at the head of the Reedy Glacier the party moved to the Harold Byrd Mountains. A systematic search was made throughout the mountains for raised beaches containing datable (fossil) algae which would indicate the surface elevation variation through time of the Ross Ice Shelf. No fossil algae were found.

Before the party returned to McMurdo Station to prepare for final field work in the dry valleys it climbed supporting Party Mountain (560m) at 85deg 27min S/147deg 33min W, which stands 4.8km east of Mt Fridovich in the Harold Byrd Mountains. On the summit the party, which included two New Zealanders, Dr Barrie McKelvey and Carl Thompson, inspected the cairn built there on December 21, 1929 by the Geological Party of Byrd's 1928-30 expedition.

Led by Dr Laurence Gould, the Geological Party sledged 2414km across the Ross Ice Shelf between Little America and the Queen Maud Mountains. Its easternmost camp was at the base of a small mountain which was named because of the good work of the supporting party. Dr Gould, and two of the dog drivers, Eddie Goodale and Norman Vaughan, are among the survivors of the first expedition.

MANY QUAKES

Because the South Pole Station is a seismically quiet platform seismologists can record earthquakes thousands of kilometres from Antarctica. Also deep in the ice below glaciologists can obtain evidence in drill cores of major volcanic eruptions hundreds of years ago.

Seismometers were kept busy at the station last summer. In November 171

earthquakes were recorded, and in December the number rose to 220.

One earthquake in the Timor Sea which was recorded in November was measured at Force 7 on the Richter scale. As a precaution station vehicles were kept in the geodesic dome for the next 40 hours because of the danger of ice fractures.

In the last days of November because of the large number of earthquakes the ultra-long period seismometers used by University of California physicists to measure long-period oscillations of the Earth could not be rechecked and adjusted.

Two large earthquakes were recorded on November 30 and December 2. The first in the Indian Ocean was located in the Chagos Archipelago and measured Force 7.6 on the Richter scale. On the largest island in the group, Diego Garcia, the United States and Britain have established a communications centre. Guatemala was the source of the earthquake on December 2 which registered 6.7 on the Richter scale.

Evidence of several major volcanic eruptions more than a century ago was detected in ice cores obtained during drilling at the Pole Station by a team from the University of Nebraska. The Indonesian eruption of Mt Tambora in 1815 was clearly identified at a depth of 127m and also in holes drilled to 30m. Other major eruptions identified were Coesguina (Nicaragua) in 1835 and Krakatoa in 1883.

ICE CORES

Ice core drilling to obtain more information about past atmospheric constituents and climatic conditions was continued at the Pole Station, and for the first time a project was conducted at Siple Station to recover a 200m ice core. In addition a series of 30m shot holes and a deeper hole were drilled on one of the Siple Coast ice streams for the installation of a freeze-in experiment to support a University of Wisconsin geophysical project.

Drilling by a team from the Polar Ice Coring Office, University of Nebraska, began first at Siple Station on November 20. The site chosen was 750m from the station. By November 23 the drill hole had reached a depth of 82m. Drilling stopped on December 1 at 201m.

A temperature of minus 24deg Celsius was recorded in the drill hole at 40m. Good to excellent cores were obtained to the 150m level, but then down to 200m the ice became more and more brittle and the quality of the core deteriorated.

Equipment and cores were flown to Pole Station on December 3 for the start of projects by the Polar Ice Coring Office (PIOC) and a French team from the Glaciological Laboratory, Grenoble. Ice cores drilled at Siple Station and later at the Pole were analysed and processed by a team from the University of Bern, Switzerland. It was concerned with atmospheric concentrations of carbon dioxide before the Industrial Revolution, Increases from pre-industrial times to 1958, and variations in concentration during the last few thousand years.

A third attempt to drill through the ice to a depth of 500m was made by the PICO team. In the 1981-82 seasons drilling stopped at 204m, and in 1982-83 the electro-mechanical drill reached a depth of only 230.47m.

Drilling started again on December 10 at a depth of 231m and in three days with the aid of new coring drills the depth was extended to 262m. The project ended for the season on December 27 after all attempts to produce core of consistently good quality were unsuccessful. The final depth reached was 353.70m.

As part of the International Antarctic Glaciological Project French and United States glaciologists began the first stages of a project for recovering a core of 125,000-year-old ice from a depth of 2600m above bedrock. They used a French thermal probe, the "Climatopic," which has been designed to sample melted ice continuously from the surface to bedrock.

Towards the end of November the first hole was drilled through the firn to 127m, and a series of tests was made with the thermal probe to 201m. High quality cores and valuable solid conductivity measurements were obtained at temperatures of minus 16deg and minus 45deg C from 5m.

Problems arose, however, when a small electro-mechanical drill was used to obtain a 50cm ice core. This drill unscrewed and fell down the hole. It was caught with a special tool but came unstuck near the bottom and could not be lifted up.

Another hole was drilled in the firn to 143m and work with the thermal probe began again. By January 1 the new hole was down to 173m. When the PICO project ended preparations were made to recover the equipment left in the first hole before the season ended. The French team used the PICO hot water drill for the purpose.

As well as the deep drilling the United States and French teams drilled several shallow holes of 25m and 30m a few kilometres from the station. Some cores were used to establish a correlation between solid and liquid conductivity. Others will be analysed for isotopic and chemical measurements in France.

LAKE SEDIMENT

Scientists from Miami University, Oxford, Ohio, who studied trace metal and nutrient dynamics in three of the dry valley lakes were able to sample the water column in one lake — Lake Joyce — to 35m. This was the greatest depth ever recorded there.

In November the team headed by Dr William Green worked at Lake Miers in the Miers Valley east of the snouts of the Miers and Adams Glaciers. A 10cm hole was drilled through 5.5m of lake ice and temperatures and conductivities were determined for the water column.

A 25cm hole was then drilled and the water column was sampled at 2m intervals to a depth of 18m. Two sediment cores, the first from the lake, were taken with a gravity corer.

Early in December an attempt to drill a hole in the ice of Lake Joyce on the northern side of the Taylor Valley in Pearce Valley was unsuccessful. Ice cover was reported to be 4.5m to 5.1m but the team drilled to 5.4m without striking water. As a result an unscheduled visit was made to McMurdo Station to obtain a 25cm drill extension.

When the team began field work later in this month Lake Joyce was drilled and the ice thickness was found to be more than 5.4m. The water column was successfully sampled at 4m intervals to 35m, the greatest depth ever recorded there. Coring attempts were unsuccessful because of the lake's sandy bottom.

Two more holes were drilled in Lake Fryxell at the lower end of the Taylor Valley between the Commonwealth and Canada Glaciers. A 2.5cm hole was drilled over a 12m deep site and two bottom cores were taken.

A 10cm hole was drilled over an 18.5cm site and the lake was sampled at 1m intervals. This was the greatest depth at which Lake Fryxell has ever been sampled.

From December 14 to January 9 two ornithologists aboard the Polar Sea collected data on the pelagic distribution of marine birds in the southern oceans. They studied the effect of hydrographic boundaries and the pack ice upon the species, composition, and abundance of these birds.

Between Valparaise and McMurdo Station by way of Palmer Station 1072 ten-minute transects were collected. A dense aggregation of red phalaropes was noted over the continental slope of South America, and an actively feeding flock of about 2500 Cape pigeons over a krill swarm on the slope of King George Island. As in the two previous seasons observations showed that several bird



species are more abundant at the interface between the pack ice and the open ocean than elsewhere.

Studies were continued during the Polar Sea's trip to Hallett Station. Two transects were made across the continental slope north-east of Cape Adare. Plankton samples were collected simultaneously in an attempt to relate bird distribution to food supply.

CARGO LOAD

To support the United States and New Zealand programmes and maintain the two American inland stations aircraft of the United States Navy and Air Force and the Royal New Zealand Air Force carried 920.87 tonnes of cargo and 1612 passengers to Antarctica during the four months of the season. On the flights north the aircraft carried 229.95 tonnes of cargo and 1600 passengers.

Between October 3 and February 19 aircraft made 101 round trips between Christchurch and McMurdo Station. Of the last season's flights 70 were made by VXE-6 Squadron's ski-equipped Hercules aircraft and 17 by the U.S. Air Force wheeled Starlifters, and 14 by the RNZAF. Between November 4 and December 4 the New Zealand wheeled aircraft carried 137.16 tonnes of cargo and 302 passengers south. The northward figures were 31.10 tonnes of cargo and 176 passengers.

Less fuel was shipped south than in the previous season because the U.S. Coast Guard had one icebreaker operating in the Ross Sea area, and the Southern Cross made only one voyage from Lyttelton. The fleet tanker U.S.N.S. Maumee took about 6,500 gallons of fuel for McMurdo Station and the icebreaker Polar Sea compared with 7,380,000 gallons in the 1982-83 season.

More than 750,000 gallons of fuel were transferred from the Maumee to the Polar Sea which escorted her through the sea ice channel in McMurdo Sound to Winter Quarters Bay on January 16. The remainder of the

tanker's cargo — jet fuel, Antarctic diesel, and motor spirit — was transferred to McMurdo Station's 8.8 million gallon storage tanks. On January 22 the Maumee was escorted to the ice edge and sailed for Lyttelton. She arrived on January 27 and sailed again on January 28.

CHANNEL CUT

On her third voyage to Antarctic waters the Polar Sea relieved Palmer Station where she arrived on December 24 and sailed again on December 26 for McMurdo Station. Two days later she entered pack ice which became heavier by the end of the month. The ship was called to assist the Westwind which was caught in the Weddell sea pack on January 1, but continued her voyage when the Westwind reported she had reached open water.

In the western Ross Sea the Polar Sea encountered ice and dense fog which slowed her down in the first week of January. She arrived at the edge of the fast ice in McMurdo Sound 14 nautical miles from the Hut Point on January 9 to begin her first task of cutting a channel in the seasonal ice to Winter Quarters Bay. This task was combined with Arctic hull stress tests and took longer than usual.

By January 11 the icebreaker had cut through 12nm of ice to Hut Point. Then she started the channel into Winter Quarters Bay. She cleared the turning basin and fared off the ice wharf in readiness for the Maumee and the Southern Cross by January 16.

When the ice wharf was ready the Polar Sea escorted the Maumee in from the edge of the fast ice. She refuelled from the tanker and on January 18 sailed for Hallett Station with the New Zealand-United States inspection and work parties. On the way north a meteorological team was flown to Franklin Island to obtain data for checking automatic weather stations.

After her return to McMurdo Station from Hallett on January 21 the Polar Sea reopened her support of science pro-

jects in the western Ross Sea. She returned to the edge of the fast ice on February 1, rebroke the channel and escorted the Southern Cross into Winter Quarters Bay.

Another escort task had to be abandoned. The Polar Sea started to lead the United States Geological Survey research ship Samuel P. Lee to Winter Quarters Bay for refuelling but after only half a nautical mile the ship became beset and did not have sufficient power to force her way through brash ice in the channel. Refuelling was done in the channel and passengers and cargo for the Samuel P. Lee's second cruise were transformed from the Polar Sea near the ice edge.

Both ships then continued their science cruises in the Ross Sea. On her way to pick up the Hallett Station work party the Polar Sea landed a scientific team on Inexpressible Island in Terra Nova Bay to instal an automatic weather station.

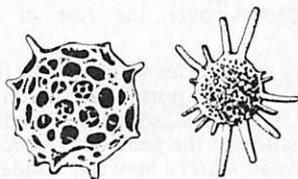
The transfer of passengers and cargo from Hallett was completed on February 7, and on her return to McMurdo Station the Polar Sea escorted the Southern Cross to the fast ice edge on February 9, and resumed her science cruise. On February 14 the Southern Cross returned to Lyttelton with 1000 tonnes of cargo and machinery and 200 science and support staff. A small electrical fire on the day of her arrival delayed her departure for Port Hueneme until February 18.

A rendezvous with the Samuel P. Lee near Cape Bird for the transfer of magnetic tape containing seismic data was arranged for February 14 but was not possible because of bad weather. The Polar Sea proceeded to McMurdo Station, loaded 40 tonnes of cargo for Palmer Station and sailed on February 16 to begin her second cruise along the coasts of Marie Byrd Land and Ellsworth Land for geological research in the Cape Dart-Mt Siple area, Siple Island, Pine Island Bay, and Thurston Island.

On her way to Cape Burks the Polar Sea reported snow showers, fog, and numerous tabular icebergs near the fast ice edge. Plans to send scientists ashore at Cape Burks by helicopter for projects and to visit the Soviet station, Russkaya, had to be abandoned because of bad weather.

Early in March the Polar Sea completed her science cruise along the coasts of West Antarctica. She made a logistic stop at Palmer Station early in the second week of March and then proceeded to Punta Arenas to disembark her passengers and end the season.

During the season the National Science Foundation research vessel. Hero made two cruises from Punta Arenas to the Antarctic Peninsula between November and April. The first brought the new Palmer Station team and summer science parties, and then for six weeks the Hero supported marine biology programmes. Her second cruise continued support of marine science in the Antarctic Peninsula area. then she picked up summer science and support staff and returned to Punta Arenas in the middle of April.



Vanda to North Pole

A New Zealand mountaineer and electronic technician, Mr J. R. McKerrow, who wintered at Vanda Station in 1970, and is now director of the Outward Bound school, will be one of four men who plan to walk to the North Pole from Ellesmere Island in 1986. The expedition will be led by Mr W. Steger, of Minnesota. He and Mr P. Schurka, also of Minnesota, are former directors of American Outward Bound schools. A fourth man may be recruited from Europe.

Wilkes Land and Ross Sea seismic survey

A two-month geophysical survey of the Antarctic continental shelf near Wilkes Land and in the Ross Sea was completed early this month by scientists working from the seismic research ship Samuel P. Lee (1318 tonnes), which is owned and operated by the United States Geological Survey. The survey was part of a project costing \$US12 million called Operation Deep Sweep which is designed to explore the Pacific Ocean floor for potential sources of energy and strategic minerals and analyses the geological structure of the seabed.

Operation Deep Sweep began in August last year and by the end of last month the Samuel P. Lee's scientific teams — about 150 in all — had carried out 13 research programmes from the Arctic Chukchi and Bering Seas to McMurdo Sound. The survey between New Zealand and Antarctica was the first of possibly five to be carried out in these regions over the rest of this decade.

On her two cruises which began from the New Zealand port of Lyttelton the Samuel P. Lee's scientists made a general study of the geological structure in Antarctic waters between 130deg E and 160deg W. The primary aim of the survey was to investigate the continental drift processes which split the ancient supercontinent Gondwana into the present-day continents of South Africa, Africa, India, Antarctic and Australia.

Data collected will be combined with previous French and West German studies in the area from the West German seismic research ship Explora which has also operated in the Weddell Sea. The data will be exchanged with other Antarctic Treaty nations.

Last year the exchange between treaty members of scientific data collected in the Antarctic Treaty area which may be "indistinguishable from those activities

which would take place in the early stages of exploration for offshore hydrocarbon resources" was reaffirmed at the 12th meeting of consultative members in Canberra. The United States delegation made available its plan to release data from the Samuel P. Lee.

JAPANESE DATA

Japan also informed the meeting that all scientific data would be available on request to its Government. This would include data from recent marine geophysical surveys made by the geophysical survey ship Hakurei Maru which has worked in the Bellingshausen (1980-81), Weddell (1981-82), Ross and Dumont d'Urville Seas (1982-83), and this month completed the first survey of a three-year programme which began off Australian territory and will end in Norwegian territory in 1985-86.

When the Samuel P. Lee sailed from Lyttelton on January 5 she carried a staff of 18 United States, Australian, and New Zealand scientists headed by the chief scientist, Dr Stephen Eittrim. New Zealand, which contributed \$120,000 to Operation Deep Sweep was represented by Dr Keith Lewis, of the Oceanographic Institute, and the Australian representatives were Howard Stagg of the Bureau of Mineral Resources, and John Veevers, of Macquarie University.

After seismic studies in the Bounty Trough east of the New Zealand port of Dunedin the Samuel P. Lee made her first cruise of 28 days in the Wilkes Land region between 170deg and 130deg E as far as the Clarie Coast. This is an area where French and West German geophysicists have worked in previous seasons.

When the Samuel P. Lee arrived off the edge of the fast ice in McMurdo Sound she was led up the channel towards Winter Quarters Bay by the

icebreaker Polar Sea on February 2 so she could transfer scientific passengers and equipment from the first cruise to McMurdo Station. But after .5nm she became beset and could not force her way through brash ice. Refuelling had to be done in the open sea on February 3 and the second scientific team, which included a New Zealander, Dr Fred Davey, of the Geophysics Division, D.S.I.R., and its equipment were taken aboard by helicopter and boat.

For most of the second cruise the Samuel P. Lee worked in the western Ross Sea between 170deg E and 160deg W in the latitude of about 75deg S. Floating ice below 60deg S hampered operations, and off the Drygalski Bank in Terra Nova Bay the 3m long seismic streamer was lost. It sank but was recovered later.

In the middle of February a rendezvous was arranged with the Polar Sea so

magnetic tape containing seismic data could be transferred for shipment to California by air through McMurdo Station. This was necessary to verify that the seismic streamer was being operated properly. Bad weather prevented a rendezvous and the tape was brought back to Lyttelton where the ship arrived on March 3.

Because of a vibration in her stern which developed when she was following the Polar Sea a month earlier the Samuel P. Lee spent nine days in dry dock. An inspection showed that the ship's propeller had been damaged by ice in McMurdo Sound which bent four of the five blades.

After the hull fittings and balance tanks had been checked, and the propeller shafts inspected the Samuel P. Lee sailed for Suva on March 19. From there she resumed her programme in the central Pacific.

Veteran icebreaker caught in Weddell Sea pack

A veteran United States Coast Guard icebreaker, the Westwind, now 44 years old, made an inauspicious return to Antarctica last season. She completed her first cruise in southern waters since 1967 without incident, but on New Year's Day was severely damaged when caught in a field of old brash ice off the Larsen Ice Shelf in the Weddell Sea.

Early on the evening of January 1 the icefield shifted the 6600-tonne Westwind mile against a 30m sheer ice cliff on the Larsen Ice Shelf. Her hull was gashed for a distance of more than 9m on the port side 1.8m above the waterline. Two forward compartments were flooded, and the icebreaker developed a list of 8.5deg.

On her first cruise from Punta Arenas, Chile, the Westwind joined the oceanographic research ship G. W. Melville in support of research along the edge of the sea ice for AMERIEZ — Antarctic Marine Ecosystem Research in the Edge Zone — which included studies of krill, seals, plankton, and seabirds.

In the second half of December the Westwind sailed from Punta Arenas to support the work of scientific parties on Seymour Island, south of Erebus and Terror Gulf off the north-east tip of the Antarctic Peninsula, and on James Ross, Snow Hill, Cockburn, and Vega Islands, and make bathymetric surveys. She remained off Seymour Island until December 27, except for a call at the Chilean station, Teniente Marsh, King George Island, to land an injured member of the crew who was flown by the Chilean Air Force to Punta Arenas for treatment.

After a rendezvous with the Coast Guard icebreaker Polar Sea in Moon Bay,

Livingston Island, to pick up parts for one of her two helicopters the Westwind returned to her anchorage 1nm east of Seymour Island. Four base camps were established for the field parties, and on December 27 the ship set a course south-south-west to the pack ice on her way to the Jason Peninsula for geological surveys.

On her way south the Westwind encountered compact ice 1.5m to 2.1m thick, but by December 29 found leads to the south-west. Three scientists were landed by helicopter on Robertson Island to take geological samples. When they returned the icebreaker continued south along the Larsen Ice Shelf towards the Jason Peninsula and the Antarctic Circle.

Early on January 1 a Westwind helicopter landed a scientific party on the Jason Peninsula. By 6 p.m. G.M.T. the icebreaker had been caught in the shifting icefield and jammed against the ice cliff. Two hours later she had worked clear of the Larsen Ice Shelf and the flooded compartments were clear of water. Before the day ended the ship was in an open lead at 65deg 42min S/59deg 39min W and reported no structural damage.

Although the Westwind encountered heavy ice on her way back to Seymour Island and made slow progress she was free of the pack ice by January 5. She anchored 2nm off the island and then waited for calmer weather to resume her support mission.

Field parties and equipment were picked up from the islands early on the morning of January 7, and the icebreaker then left for Teniente Marsh by way of Antarctic Sound and Bransfield Strait. She arrived in Maxwell Bay the next morning and anchored to await the arrival from the United States of two Coast Guard Hercules aircraft with divers and damage control experts.

When the aircraft arrived on January 11 they brought steel plating and gaskets to patch the damaged port side of the ship's hull. While repairs were in progress with Chilean co-operation 14 scientists from the Seymour Island programme were flown to Punta Arenas by a

Brazilian Air Force Hercules on their way back to the United States.

Before the Westwind made the crossing of Drake Passage on her way to Punta Arenas the hull repairs were tested in Bransfield Strait. The ship then sailed from King George Island on January 20, and called first at the Argentine port of Ushuaia to get medical treatment for a crew member with a seriously injured left hand.

From Punta Arenas the Westwind sailed up the west coast of Chile to Valparaiso, and then through the Panama Canal to Mobil, Alabama where she will undergo extensive repairs. She arrived at Mobile last month.

Ross Island accident

A 21-year-old New Zealand student employed at McMurdo Station last season suffered a compound fracture of his lower right leg and foot when he fell about 60m from Castle Rock in the early hours of December 23. Greg Reid, and three companions employed by a Christchurch catering firm, were on a sightseeing trip when the accident occurred.

With his companions Reid was climbing Castle Rock about 8km from McMurdo Station when he slipped and fell on to rocks at the base of the hill. Mark Baxter saw Reid sliding down and with Douglas Broughton climbed down and found that the Lincoln College student was severely injured.

While Broughton and Anthony Davies looked after Reid as best they could Baxter ran more than 8km to McMurdo Station for help. Reid, who had worked for only two days as a kitchen hand, was picked up by a United States Navy helicopter, treated at the station dispensary, and then flown back to Christchurch the same day and admitted to hospital. He was discharged last month.

Five men climb Vinson Massif

Five mountaineers — three Americans, one Englishman, and one Japanese — climbed Antarctica's highest peak, the Vinson Massif (4897m) in the Sentinel Range of the Ellsworth Mountains between November 23 and 30 last year. The Vinson Massif was first climbed by an American expedition in 1966, and again in 1980 by two West German scientists and a Soviet exchange scientist with a United States expedition in the Ellsworth Mountains.

With Chilean support the United States Seven Summits Expedition which plans to climb the highest peaks on the seven continents, was flown to the Vinson Massif area from Punta Arenas aboard a modified ski-equipped three-engined DC-3 piloted by Captain Giles Kershaw, the English pilot who provided Antarctic and Arctic air support for the British Transglobe Expedition. There were five climbers, Frank Wells, Dick Bass, Dick Ridgeway (U.S.), Chris Bonington (U.K.) and Yuichiro Miura (Japan), American and Japanese cameramen, Steve Marts and T. Maeda, an official Chilean Air Force observer, Captain Alejandro Frias, and two crew members.

Bad weather for three days delayed the first attempt to reach the summit of the 16km long block-shaped prominence that stands 2743m above the surrounding ice. But on November 23 with winds of about 70km an hour and a temperature of minus 30deg Celsius, Bonington, who left the group below the summit and made a solo ascent.

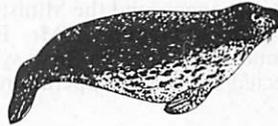
After reaching the summit Bonington dropped back in support and the group waited four days for the winds to drop before Wells, Bass, and Ridgeway made the climb. They reached the summit on a bitterly cold but still day.

Last to make the ascent on November 30 was the Japanese professional skier Yuichiro Miura, who is famous for skiing down Everest. When he reached the summit the temperature was minus 40deg C and the wind 72kmh.

Miuro planned to ski down the Vinson Massif but the upper part was too steep. He managed to run a 20km course down the lower levels over thick ice slopes.

From the Vinson Massif area the expedition was flown to the United States Siple Station where it arrived on December 2. Bad weather delayed the return flight to Punta Arenas by way of the British Antarctic Survey station. Rothera, until December 5.

Including the charter of the turbo-prop DC-3, the expedition is reported to have cost \$250,000. The Americans are said to have climbed the highest peaks in South America, Mt Aconcagua (6960m), Africa Mt Kilimanjaro (5895m), and North America, Mt McKinley (6182m) but not Everest.



Hungary accedes to treaty

Hungary became the 29th country to accede to the Antarctic Treaty on January 27 this year. There are now 16 consultative parties to the treaty, and 13 acceding nations.

Brazil and India became consultative parties on September 12 last year. The 16 nations are: Argentina, Australia, Belgium, Brazil, Chile, France, Federal Republic of (West) Germany, India, Japan, New Zealand, Norway, Poland, South Africa, United Kingdom, United States, and Soviet Union.

China acceded to the treaty last year. With Hungary's accession the 13 members are: Bulgaria, Czechoslovakia, Denmark, German Democratic Republic (East Germany), Hungary, Italy, Netherlands, Papua New Guinea, People's Republic of China, Peru, Spain, Rumania, and Uruguay.

Antarctic transport plan review

Because of Budget priorities the Australian Government has decided to review the plans for a new Antarctic transport system to support its summer research programme. All steps taken so far to acquire a specialised ice-breaking marine research vessel, introduce air transport to the three bases, Casey, Davis, and Mawson, and arrange the long-term charter of an additional cargo vessel, were halted this month until a definitive decision is made.

Provision for \$2,555,000 to be spent on the first stages of the new transport system was made in last year's Budget. Plans for a more flexible system were first announced by the Liberal Government three weeks before the General Election last year. They were reviewed by the new Labour Government, which made some changes, and the Minister of Science and Technology (Mr Barry Jones) announced that the new system was expected to be fully operational in 1988-89.

Now it is possible that the system will be modified in the course of forthcoming discussions. The Government has asked for further options on air transport to be presented in the new future, and for detailed shipping proposals to be submitted for consideration in the Budget context.

Under the proposed new system provision was made for the construction of a compacted snow runway at Casey to take Royal Australian Air Force wheeled aircraft operating from Hobart to Antarctica. Light aircraft were to be used to deploy staff between Casey and the two other stations, Davis and Mawson. These stations would have a rock-based conventional runway in the nearby ice-free Vestfold Hills, and there would be a blue ice runway at Rumdoodle 16km inland from Mawson.

Just over \$1.7 million was allotted last summer for studies of the planned compacted snow runway on Law Dome

30km from Casey. A support camp was established there during the summer for the investigation team which included engineers from the Antarctic Division and the Department of Housing and Construction, a glaciologist, and a surveyor. Work carried out last season was expected to provide sufficient information for the Federal Public Works Committee hearings into the provision of the Casey air facility.

Studies of three sites were made also at Davis last summer to determine which was the most suitable, and to provide geotechnical information for a survey of the chosen site. The work, estimated to cost \$120,000, was done by a Department of Housing and Construction team of an engineer, three surveyors, and two laboratory technicians.

Third Norwegian Expedition

Norway will send a third expedition to Queen Maud Land next season. The expedition, which is being organised by the Norwegian Polar Institute and a scientific committee at the University of Bergen, will base its research programme on the experience gained in the 1976-77 and 1978-79 expeditions.



Heavy pack ice affects ship operations

Heavier than normal pack ice, bad weather, and damage to one ship, seriously affected shipping operations in support of the 37th research programme of Australian National Antarctic Research Expeditions (ANARE) which ended this month. Ships were delayed, delivery of some cargo was slowed, and Australia's participation in the first phase of the Second International BIOMASS Experiment (SIBEX-1) had to be cancelled.

ANARE used three chartered ships, Nella Dan, Nanok S, and Lady Franklin, to deliver men and materials to the three continental stations, Casey, Davis, and Mawson, and to the sub-Antarctic station on Macquarie Island. Between October and March these ships made eight voyages south.

All three ANARE vessels encountered heavy ice and stormy weather during the season. The Lady Franklin, sub-chartered from Expeditions Polaires Francaises, returned to Hobart from Dumont d'Urville early in January with a damaged rudder. Repairs delayed her departure on the sixth ANARE voyage to Davis and Casey for four days.

In the 1982-83 season the Nanok S was caught in pack ice north-west of Davis for eight days on her way back to Hobart. Last month she hit an uncharted rock on February 26 when 90 minutes offshore from Mawson and damaged her hull. She was able to continue on her way to Hobart.

But several hours later the crew discovered that about 100 tonnes of fuel had been lost. Some rivets had been broken when the ship hit the rock, allowing water to seep into fuel tanks. To take on extra fuel and have the damaged hull inspected by a diver the Nanok S returned to Mawson.

FUEL LEAKAGE

Damage appeared to be limited to denting in bottom plates, resulting, in leakage from the bottom fuel tanks. Having completed her mission to Davis

the Nakok S was able to resume her voyage to Hobart where she arrived on March 13.

Except for cancellation of the Nella Dan's contribution to the SIBEX-1 programme other ANARE scientific projects were not affected by the shipping problems. Originally the Nella Dan was to have spent only 14 days on the SIBEX-1 exercise because of the tight logistic programme. When she was delayed in the pack ice on her first two voyages this time was cut to less than eight days.

Only limited marine research could be carried out during the Nella Dan's fifth voyage in January to Davis and Mawson. The programme was executed on an extended Davis-Mawson leg of the voyage.

Scientific echo sounders were run continuously south of 60deg S to obtain confirmation on the distribution and abundance of krill along the ship's track. Periodic samplings were made to identify the types of marine life recorded by the acoustic sounders, and krill larvae and krill were caught from swarms. Some were brought back alive for study by Antarctic Division biologists in Hobart.

When the Nella Dan relieved Mawson and Davis on her second voyage in December scientists aboard conducted ornithological studies as part of the Australian contribution to the International Survey of Antarctic Seabirds (ISAS). A party of ten visited the Scullin

Monolith on the coast of MacRobertson Land 150km east of Mawson on December 10 for eight hours to study the estimated 500,000 Antarctic petrels and other birds which breed on the Monolith.

During the visit the white undersides of 865 Antarctic petrels were marked with a yellow dye. This was done to provide information on the distance the birds travelled out to sea from their nest sites during the breeding season to feed. Some dyed birds were sighted later some 160km north-east of the Monolith on December 12 and 800km north-east on December 22.

In addition to the marking programme a study area which included some 247 occupied Antarctic petrel nests was marked out. This site will be visited in future seasons to observe any population changes.

MAJOR TRAVERSE

A major project last season was a glaciological traverse west from Casey to extend the International Antarctic Glaciological Project (IAGP) study of the East Antarctic Ice Sheet to the ice region between Casey and the Soviet station, Mirny. This was the first surface journey ever made over that region of the icesheet. Six men made a round trip of 2200km in nearly four months, returning to Casey in time for Christmas.

This traverse was to establish ice movement markers at 50km intervals as far west as possible. Continuous radar measurements of ice thickness were made during the journey, and also observations of ice density, snow accumulation, gravity and magnetic values.

A glaciologist, Tim Medhurst, led the traverse train of three D5 tractors which towed living and workshop vans and fuel, food, and stores sledges. With him were Peter James (surveyor), Lex Harris (electronics engineer), George Hedanek (plant inspector), Bob Yost and Brian Harvey (diesel mechanics).

For the first week after leaving Casey on September 2 the traverse party made good progress. Then it was slowed down by blizzards and soft, deep snow. After

50 days on the trail the party reported it had encountered rough surface with sastrugi up to 2.5m high but had reached a point 750km from Casey at an elevation of 2300m in continuing drift and windy weather with temperatures reaching a low of minus 52.5deg Celsius.

SOVIET MEETING

There was a memorable meeting on December 7 with a Soviet tractor train travelling between Mirny and Vostok. The meeting point was at 69deg S/95deg E some 1000km from Casey and 300km south-south-east of Mirny, and was fixed after ham radio contact between the Casey party and Mirny.

Both parties fired many flares when they sighted each other. It was the first time traverse parties from the two nations have met in the field. The Australians were invited to a meal and drinks in one of the large Soviet vehicles, and both groups exchanged information on their equipment.

With 16 vehicles the Soviet party, which left Mirny on November 1, was on its way with building materials, stores, and fuel for the annual resupply of Vostok Station. Of the 20 men in the party 16 were mechanic-drivers. With them were a medical officer, navigator, radio operators, and cook.

On December 8 the groups parted. The Soviet tractor train headed for Vostok and the Australians stayed at the meeting place to establish their most westerly ice movement marker before they headed back to Casey. When they arrived on December 24 they were reported to resemble "an Antarctic version of Hell's Angels." They were all dressed in brown leather jackets, hats, and boots as a result of exchanging clothing with the Soviet party.

GLACIER SURVEY

As another contribution to IAGP an Antarctic Division glaciologist, Trevor Hamley, continued studies of the East Antarctic Ice Sheet with a Soviet traverse party on its 3000km trip from Mirny to Dome C (74deg 40min S/32deg 50min E) in Wilkes and back. He was

picked up at Mawson on December 16 by a Soviet Ilyushin-14 aircraft from Molodezhnaya and flown to Mirny. Mr Hamley is expected back in Australia next month.

Glaciologists from the Antarctic Division continued a detailed survey of the huge Vanderford Glacier 30km southwest of Casey. The survey, started in the 1982-83 season by Damien Jones and Evan Davis, is designed to determine the glacier's movement and its role in the drainage of ice from a large area of the East Antarctic Ice Sheet.

As a result of a comprehensive airborne survey of the glacier completed at the end of last month a large-scale (1:100,000) detailed map of it can now be drawn. Two Bell 206 helicopters flown by Vic Barkell and Bruce Cameron were used to continue the topographic radar survey started in the 1982-83 season, and supported the

investigations by Damien Jones and Evan Davis.

Because of funding difficulties the rebuilding programme at Davis has been placed on care and maintenance for 1984. Provided funds are available next year work is expected to resume in the 1984-85 season. One Department of Housing and Construction officer is at the station this winter to maintain the partially completed works. Tradesmen recruited earlier to winter at Davis worked during the summer at Mawson and Casey instead.

Building materials shipped south last season included the knocked down \$A1.7 million domestic building for Casey. Erection of the building on the site began in the summer and is expected to be completed in the 1986-87 season. The 63 × 17 × 7m facility will be the largest ANARE structure built in Antarctica.

Brazil's first station in South Shetlands

Brazil's first summer Antarctic research station, Comandante Ferraz, was established last season on Plaza Point (62deg 6 min S/58deg 26 min W) at the head of Admiralty Bay, King George Island, South Shetlands. Materials for the erection of a mobile modular station to house up to 15 were carried south in January by the Brazilian Navy's oceanographic support ship, Barao de Teffe, formerly the Thala Dan. The station was occupied until the end of last month by a team of 12 headed by Lieutenant-Commander Edison Martins..

Two ships were used last summer to support Brazil's first research programme as a consultative member of the Antarctic Treaty. In addition to the establishment of the summer station the Barao de Teffe transported scientific teams to work on Elephant Island and King George Island in the South Shetlands, and hydrographic, atmospheric, and ornithological studies were conducted by scientists aboard the ship.

First to head south was the oceanographic research ship, Professor W. Besnard, which is operated by the Oceanographic Institute, University of Sao Paulo. She made two cruises in January and February with scientists who did marine biological and physical

oceanographic research in Bransfield Strait between the South Shetlands and the Antarctic Peninsula as part of Brazil's contribution to the Second International Biological Experiment (SIBEX) which is part of the Biological Marine Systems and Stocks Programme (BIOMASS).

When the Barao de Teffe sailed early in January from the Antarctic support station in the port of Rio Grande her cargo of supplies and equipment included eight prefabricated fibreglass modules mounted on wheels and runners which will provide accommodation at Comandante Ferraz. Built by Sociedad Equipamentos Ferroviarios Ltd, a Sao Paulo railway equipment company, at a cost of more than \$US240,000, the modules cover an area of 250 square meters. They contain living quarters, laboratories, a communications station, storage buildings, a water heating and treatment plant, a power generator, and a garage.

Commanded by Captain Paul Adriaio, the 2182-tonne Barao de Teffe, which has a crew of 58 officers and men, and carries two Wasp helicopters, called first at the Chilean station, Rodolfo Marsh, on King George Island, to pick up staff who had been flown from Brazil. A call was made also at the Polish station, Arctowski, to disembark research teams and their equipment.

A survey of the Plaza Point area was started when the Barao de Teffe arrived there in the middle of January. When a site for the station was selected the modules, equipped with hydraulic mechanisms for easier loading and unloading, were carried ashore on a navy barge.

By the end of the month the new station was almost fully operational. A meteorologist from the National Institute of Meteorology maintained a programme of observations, and two electronics experts from the Space Research Institute initiated studies of VLF radio wave propagation in the lower atmosphere.

SUPPORT TEAM

Eight men provided support for the scientific programme and ran the station until the return of the Barao de Teffe towards the end of February. They were a doctor (cardiologist), engineer, two survival experts, a driver, electrician, communications technician, and a cook.

From Admiralty Bay the Barao de Teffe sailed to the Chilean port of Punta Arenas, Tierra del Fuego, to refuel and embark scientific staff for the second phase of her programme which began early in February. She remained in the Elephant Island area for two weeks to support a geological research project and a survey of Stinker Point on the west side of the island.

Towards the end of February the Barao de Teffe arrived at Comandante Ferraz to pick up the summer team and some equipment. The station was partly dismantled but the eight modules and most of the equipment will remain until next season. From Comandante Ferraz the ship proceeded to Arctowski Station to embark scientists who were to return to Brazil by air.

Early this month the Barao de Teffe left the Antarctic Peninsula area for the Uruguayan port of Montevideo. Her next call was at Rio Grande to unload equipment at the Antarctic support station and refuel. Then she sailed for Rio de Janeiro where she was expected on March 20.

Radon measurements in the lower atmosphere and hydrographic surveys were made from the Barao de Teffe by research teams from the Space Research Institute and the Directorate of Hydrography and Navigation. Others engaged in scientific activities during the two cruises included scientists from the Interministerial Commission for the Resources of the Sea, National Institute of Meteorology, Space Research Institute, the University of Rio Grande, the Federal University of Rio de Janeiro, and the University of Vale do Rio dos Sinos. Two of the scientists were women — one a biologist from the Federal University of Parana, and the other from the National Council for the Development of Science and Technology.

There were also observers from the Uruguayan, Chilean, Argentine and Peruvian Navies, and the Brazilian Ministry of External Relations. The ship also carried a cadet from the Brazilian Naval Academy, and six journalists.

On the first stage of the programme the 696-tonne Professor W. Besnard, commanded by Captain Waldir da Costa Freitas, of the Brazilian Merchant Marine, sailed from the Sao Paulo port of Santos for Rio Grande in the last week of December. She called at the Argentine port of Ushuaia, Tierra del Fuego, to refuel, and then sailed for Rodolfo Marsh Station to embark some of her scientists who had been flown from Brazil.

From Rodolfo Marsh the ship sailed in the second week of January to begin her work in the SIBEX area. She first calibrated her instruments with those of the Polish research ship H. Siedlecki.

SIBEX WORK

Biochemical, physiological, and morphological studies of Antarctic krill were carried out during 12 days of the first stage of the SIBEX programme. The chief scientists for the first stage was Dr Phan Van Ngan, and with him were scientists and technicians from the Oceanographic Institute and the Institute of Biomedical Sciences, University of Sao Paulo. Dr Monica Montu, of the Marine Biology Centre, Federal University of Paranha, was the chief scientist for a related study of Antarctic and sub-Antarctic euphausiids (krill) and accompanying fauna, conducted from the Barao de Teffe.

Studies of the comparative histology of Antarctic fish were carried out in the first stage by a team from the Oceanographic Institute and the Institute of Biomedical Sciences, University of Sao Paulo. Biologists from the Superintendency of Fishing Development were also concerned in the research on other marine resources beside krill.

When the first stage in the SIBEX area was completed the Professor W. Besnard sailed for King George Island towards the end of January. After visits to Arctowski, Rodolfo Marsh, and the Soviet station, Bellingshausen, the ship left for Punta Arenas to refuel and embark a new team of scientists for the second stage of SIBEX under the direction of the chief scientist, Dr Yoshimine Ikeda.

During the second 12-day cruise in the SIBEX area three projects were carried out by scientists and technicians from the Oceanographic Institute, University of Sao Paulo. These covered physical environmental parameters in Bransfield Strait; plankton and primary production; and ichthyological Antarctic fauna.

Projects carried out by research teams from the Marine Biology Centre, Federal University of Paranha, covered phytoplankton primary production in areas adjacent to the Antarctic Convergence; qualitative and quantitative studies of ichthyoplankton in the Antarctic region; Antarctic pelagic polychaetes; and parasites in Antarctic fishes. Ornithologists from the University of Vale do Rio dos Sinos studied continental and marine birds of Antarctic from the Professor W. Besnard and the Barao de Teffe, and at Rodolfo Marsh Station.

When the Professor W. Besnard completed her SIBEX programme in the third week of February she visited the United States Palmer Station on Anvers Island, and then spent two days at Comandante Ferraz. Then she left for Rodolfo Marsh to disembark scientists and refuel from the Barao de Teffe.

Early last month the ship arrived at Rio Grande to unload equipment and refuel. She was expected to reach Santos from Rio Grande on March 16.

GEOLOGICAL SURVEY

Five projects in the Brazilian programme were carried out in the South Shetlands last summer, one on Elephant Island and four on King George Island. A Space Research Institute team at Rodolfo Marsh and on board the Barao de Teffe used rockets and balloons to measure radiation in the Antarctic region, and marine biologists from the Federal University of Paranha studied the biochemical and physiological behaviour of Antarctic animals at Arctowski. A woman biologist Edith F. Feofiloff, headed the research team.

Geologists from the Federal University of Vale do Rio dos Sinos spent two weeks studying the deformation and

metamorphism on Elephant Island and in adjacent areas. Another geological team from the University of Vale do Rio dos Sinos worked at Arctowski and Rodolfo Marsh to carry out geological mapping of the Fildes Peninsula.

A preliminary chemical and taxonomical survey of Antarctic lichen flora was made by a team from the Pharmaceutical Technology Laboratory of the Federal University of Pararaiba. This work was done at Arctowski.

West Germany's ice shelf research

Major biological and glaciological investigations were made in Antarctica last season by West German scientists who took part in the Antarktis II expedition, the second to go south aboard the research and supply ship *Polarstern*. Between late November and early March the *Polarstern* worked in Bransfield Strait and the Scotia and Weddell Seas on projects related to the Second International Biomass Experiment (SIBEX), resupplied Georg von Neumayer Station in Atka Bay, Queen Maud Land, and supported the first major phase of the Filchner Ice Shelf Project.

More than 120 scientists and technicians from more than 30 West German and foreign universities and research institutions took part in last season's programme. Scientists from the United States, the Netherlands, Poland, and Argentina worked aboard the *Polarstern* on oceanographic, fisheries, and geological projects. Twelve West German field parties took part in the Chilean programme in the South Shetlands and on Anvers Island. One was engaged in an upper atmosphere project at the Argentina base, Belgrano III, and another participated in a British Antarctic Survey airborne magnetometry and radio echo-sounding project in the Thiel, Ellsworth, and Whitmore Mountains, and Palmer Land.

For the first time West Germany was able to use fixed-wing ski-equipped aircraft for airborne geophysical measurements and photogrammetry of the Ekstrom Ice Shelf and western New Schwabenland, and the Filchner-Ronne Ice Shelf. Two Dornier high-wing aircraft, the Do 288-100 and Do 128-6 were ferried by way of South America and the Antarctic Peninsula to Neumayer Station where they arrived early in January.

Before the main mission on the Filchner-Ronne Ice Shelf the two aircraft went through trials on the station's snow runway. Scientific equipment was tested during flights over the Ekstrom Ice Shelf and western New Schwabenland. Because of its limited availability *Polar II*, the specially-equipped Do 288-100 was used for photogrammetric purposes only near the station, but photographic cover was provided of mountainous and nunatak regions for the production of topographic maps.

Air support for Antarktis II field parties was provided also by the *Polarstern's* two helicopters during her operations in Antarctic waters. Last season she carried a Bell 206 Longranger and an Aerospatiale 355 Squirrel. These were used by geologists who collected rock samples in the South Shetlands from Elephant and Livingston Islands.

HELICOPTER DAMAGED

In the 1982-83 season the *Polarstern's* Bell 212 Jetranger was damaged beyond repair soon after a geological expedition was landed on the Riiser-Larsen Ice

Shelf. Because of the accident the field party made a traverse to the Kraul Mountains of western New Schwabenland instead of the Heimefront Range. The *Aerospatiale Squirrel* replaced the *Jetranger* last season.

When the *Polarstern* left Bremerhaven towards the end of September the long cruise to Rio de Janeiro was used to make investigations of atmospheric trace elements and measurements of the vertical distribution of physical parameters in ocean and atmosphere along meridian transects. Similar meteorological and trace element measurements were made on the homeward cruise from Cape Town to Bremerhaven where the ship was expected early in April.

In the middle of October the *Polarstern* sailed from Rio de Janeiro to begin marine biological and hydrographic research in the framework of SIBEX I. The ship was in the area of the South Shetlands, Bransfield Strait, and Elephant Island. Included in the programme were investigations of the krill population in the Bransfield Strait area and a smaller area around Elephant Island, experiments in krill processing, estimation of krill abundance by echosounding surveys, the distribution of phytoplankton, and a study of contaminants and trace elements in marine organisms from the Weddell Sea and adjacent seas as a basis for further monitoring programmes.

In an area around Elephant Island about 60deg to 61deg 30min S and 54deg to 55deg W, which was the centre of Western German investigations in 1975-76, 1977-78, and 1980-81, krill and fish resources were surveyed. An assessment of the biomass of krill and their predators was made in two phases, and the combined studies are expected to yield valuable information on processes within the ecosystem.

FISH STOCKS

More than 40 bottom dwelling fish species have been counted around Elephant Island by Soviet scientists and during the three West German fisheries research expeditions. Krill form the staple diet of a large number of species,

but little is known of the distribution and abundance of fish species in relation to krill and hydrographic conditions.

Scientists from the Institute for Sea Fisheries, Hamburg, therefore carried out bottom haul trawls from the *Polarstern* in two limited areas of high and low krill abundance down to 500m to obtain information on the abundance of fish in relation to krill. The project is part of a long-term study to assess the biomass of fish stocks around Elephant Island, and the influence of commercial fishing which started in 1978-79.

Towards the end of November the *Polarstern* completed her second cruise at the Chilean port of Punta Arenas. She sailed again after a short stay on the third cruise which included extensive marine sedimentology and geophysical programmes in the regions of the South Shetland Trench, Bransfield Strait, and the north-west Weddell Sea. These investigations are expected to provide information on the paleo-oceanography and climatic history of the Quaternary period in the Scotia and Weddell Seas.

This programme was supplemented by research in microbiology, planktology, marine chemistry, and physical oceanography. Cores from Holocene (post-glacial) marine sediments in seabed depressions were taken from Bransfield Strait, Admiralty Bay, King George Island, and the South Shetland Trench for a study of climate, ice drift, and organic production during the period. Microbiology investigations of the production and decay of organic substances were also carried out. On her way back to Punta Arenas where she arrived in the last week of December the *Polarstern* called at the Argentine port of Ushuaia.

WINTER TEAM

From Punta Arenas the ship sailed at the end of December for the Weddell Sea to relieve and supply Neumayer Station and support the Filchner Ice Shelf Project. Her passengers included the new winter team of four scientists and four technicians headed by a physician, Dr W. Herold, geophysicists and glaciologists who were to work later from

Filchner Station, two West German television journalists, and an Austrian radio journalist.

On her way to Atka Bay the Polarstern continued marine biological, meteorological, and atmospheric investigations. She arrived in Atka Bay early in January and after discharging supplies and equipment sailed for the inner Weddell Sea with the Filchner Ice Shelf team.

Summer research projects in the Atka Bay area and New Schwabenland included ice movement studies, an investigation of cosmic dust in recent ice shelf layers, and a search for blue ice fields using Landsat-Earth satellite image data. Photogrammetric survey flights were made for mapping and recording ice dynamics. The study of the ice motion and strain behaviour of the Ekstrom Ice Shelf started in 1979 was continued, and glaciological engineers measured the ice flow near Neumayer Station and the rate of settlement of the tubes housing the station.

During the summer a steel entrance hall with a ramp, covered by steel arches and leading from the hall to the surface, was built at the station. It will be used to shelter the station's nine vehicles and food containers.

In the third week of January the Polarstern arrived off the Filchner-Ronne Ice Shelf to begin its support of the glaciological programme, the major project of West German glaciological research in Antarctica. A region west of Berkner Island was selected in 1980-81 as the primary target for studies to determine the mass balance and ice dynamics of the ice shelf.

Using Filchner Station (77deg 09min S/50deg 38min W) as the base camp more than 20 glaciologists, geologists, geophysicists, meteorologists, and technicians, completed the first major phase of the project in a month. A 100 by 100km station grid was used to obtain the major glaciological parameters needed for mass balance and ice dynamics studies. Airborne geophysical measurements were made using the specially-equipped Dornier 228-100 aircraft.

A glaciological traverse was made south of Filchner Station to determine snow accumulation rates and obtain data on recent climatic changes. Shallow core drillings were made to a maximum depth of 10m in snow pits along the traverse at intervals of 50km, and at the grid points close to the ice edge.

Measurements of thermal conductivities of snow and firn were made at stations along the traverse by using needle probes, and a quick thermal conductivity meter on shallow drill cores. The meter was used also to measure deeper ice cores obtained from a maximum depth of 100m.

During its cruise along the ice front from Neumayer Station to Filchner Station and back the Polarstern measured and mapped the edges of the Ekstrom, Riiser-Larsen, Brunt and Filchner Ice Shelves. Icebergs in the Weddell Sea were surveyed and classified to obtain an estimate of the size and shape distribution of those which could be suitable for use.

While the Filchner Ice Shelf project was in progress the Polarstern cruised in the southern Weddell Sea. For oceanographic investigations. Measurements were made to obtain data on the apparent generation of Antarctic bottom water under the shelf ice around Berkner Island.

Seismic refraction investigations were made of crustal structure in front of and beneath the Filchner Ice Shelf. Marine geology projects included sedimentological mapping of the uppermost sediment layers in an area close to the Filchner Depression, and along a westward profile close to the ice edge. Biological studies were made of marine benthos and the community of bacteria, algae, protozoa, and some larger organisms under the sea ice in the Weddell Sea.

After completion of all these projects the Polarstern returned to pick up the Filchner summer team, and then sailed for Atka Bay in the third week of February to load various materials from Neumayer Station and take aboard the summer support staff. Early this month she sailed for Cape Town and Bremerhaven.

BAS NEWS

New Halley Station now operational

A major logistic task for the British Antarctic Survey — replacement of the Halley geophysical observatory built in 1972-73 — ended last month when the new Halley Station on the Brunt Ice Shelf off Coats Land became fully operational. Major construction was completed in the 1982-83 season, and last summer scientific equipment was transferred from the old station 18km away. The old Halley was closed down as it is moving uncomfortably close to the edge of the ice shelf.

BAS programmes in the 1983-84 season concentrated mainly on the earth sciences. Geologists worked on islands in the Marguerite Bay area south of Anvers Island, on Elephant and Clarence Islands in the South Shetlands, and on the Ronne Ice Shelf. A major event was a joint geophysical-geological project with United States scientists extending from the Ellsworth Mountains to the Thiel Mountains.

There was a notable lack of sea ice off the west coast of the Antarctic Peninsula south to 65deg S and around the South Orkney Islands all last winter; these areas remained generally clear throughout the 1983-84 summer, which assisted the relief.

After a mid-voyage visit to Punta Arenas, Chile, to exchange staff, the Royal Research Ship John Biscoe landed earth scientists at Damoy, Wiencke Island, in late November so that they could be flown south via Rothera to the Ellsworth Mountains — Thiel Mountains region. The ship next proceeded to the South Shetlands to discharge fuel at the Chilean station, Teniente Marsh, and to land two geologists on Livingston Island where they were to work for a month locating the Jurassic/Cretaceous boundary.

Further geological landings were then made on islands south of Anvers Island, as part of a programme to fill in the gaps in the existing geological maps.

Bad weather prevented the airlift of the field parties waiting at Damoy so they were re-embarked. The ship then took them to Rothera through pack ice,

arriving there on December 6 — the earliest that a BAS ship has ever managed to reach the Marguerite Bay area. After this geological landings further north were continued for two weeks in spite of bad weather and rough seas.

SHIP SUPPORT

Then the geologists were taken to Faraday Station, Argentine Islands, to await the arrival of HMS Endurance which was to provide helicopter support for landings on the Antarctic Peninsula. Cargo was discharged on to the fast ice and the ship turned north again to pick up the party from Livingston Island before entering Deception Island harbour.

Over Christmas the John Biscoe remained at Deception Island and then returned to Faraday again before collecting air freight from Teniente Marsh and landing geologists on the almost inaccessible Elephant and Clarence Islands. The ship arrived back in the Falkland Islands at the beginning of January.

After picking up more staff at Punta Arenas the John Biscoe returned to the

Antarctic Peninsula to deliver more supplies to Faraday and Rothera, inspecting Damoy and Port Lockroy en route. The latter, which was one of the first two permanent British bases established in 1944, is now in a poor condition but is still usable as a refuge.

Then the ship returned to the Falkland Islands again to take on fuel which was delivered to Signy Station, South Orkney Islands, in early February. The final calls of the season were to Bird Island Station and Grytviken, South Georgia, before the ship turned north for Rio de Janeiro and home.

LITTLE ICE

RRS Bransfield arrived at Halley at the end of December after relieving Signy and encountering only light pack ice on the eastern side of the Weddell Sea. She remained in the area until mid-February discharging stores (including 3000 drums of fuel), assisting in the completion of exterior and interior work at the new station and the transfer of equipment 18km from the old station. The old station was then closed down as it is moving uncomfortably close to the Brunt Ice Shelf front.

During the remainder of the season the Bransfield completed the relief of all stations. She also set up a large depot in the vicinity of the Ronne Entrance south of Alexander Island.

Satellite communications have been installed at Faraday and Rothera stations, completing the new BAS communications network.

Bird Island, which is a small station will continue to be relayed through Signy. Routine geophysical programmes have continued at Faraday and Halley — the latter with brief interruptions while equipment was transferred to the new station.

Before the Bransfield's arrival a serious melt problem had occurred at old Halley. Differential movements in the ice had dislodged the Aga stove flue, so that hot fumes were entering the cavity between the huts and the metal tubes around them. This mishap necessitated a lot of ice chipping and baling out.

Rothera was very busy, as usual, throughout the summer as the centre of air operations in support of extensive earth sciences programmes. One major project was a joint geophysical/geological work with United States scientists extending from the Ellsworth Mountains to the Thiel Mountains. Four geologists, two BAS and two USARP, with BAS aircraft support and USARP fuel had an extremely successful season and were able to visit almost all the isolated nunataks in the region.

A large variety of rock types was encountered, including possible metamorphic basement, which in conjunction with airborne geophysics, should lead to new ideas on the genesis and evolution of this enigmatic region. Aeromagnetic flights amounted to 85 hours in 21 days — 65 of them on a joint BAS/National Science Foundation project. Half of the Martin Hills grid was completed together with a few lines over the Haag and Rutford Ice Streams.

Other earth sciences programmes included the collection of specimens on the east coast of the Antarctic Peninsula to enhance the geochronological study of the plutonic rocks, and the remapping in detail of the plutonic and metamorphic rocks of north-western Palmer Land. New fossil discoveries were made on Alexander Island in rocks of the fore-arc accretionary complex. On the Ronne Ice Shelf, a geophysical party of four continued the gravity, radio-echo and seismic depth-to-bedrock traverses begun in 1982-83.

Throughout the summer, Fossil Bluff Station in George VI Sound was manned as a staging post and emergency landing strip.

STUDY OF LAKES

At Signy Island biological station, terrestrial work (on fellfields and small invertebrates) was slowed down by summer snowfalls. Investigation of the island's freshwater lakes continues and is yielding interesting information on a variety of fundamental processes. The marine biologists initiated a physiological programme on the energetics of Antarctic fish.

Up to 17 men, mostly biologists, were at the Bird Island station during the summer, working on the prolific colonies of albatrosses and fur seals, but only three will remain for the winter. Unusually high mortality last season among albatross and penguin chicks and fur seal pups appears to be related to the absence of krill noted during the winter, Offshore Biological Programme cruise in 1983 ("Antarctic," December, 1983). The interval between feeds was two times longer than previously recorded. The biologists on Signy and Bird Islands used micro-computers to monitor soil and plant micro-meteorology, lake parameters and albatross chick feeding and growth.

Two tourist ships, Lindblad Explorer and World Discoverer, visited Faraday, Signy and Grytviken several times during the summer. The French yacht Damien II arrived at Signy from South Georgia in December and later went on to Faraday and Paradise Harbour. The West German research ship Polarstern visited Signy in December and January en route between Neumayer and South America.

Large numbers of trawlers were sighted near the South Orkneys and South Georgia. Most of these appeared to be from East European countries which have fished in the area for a number of years.

Eric Webb was last of Mawson's men

One of four New Zealanders with Mawson's first expedition, Eric Norman Webb, who was the chief magnetician, died in England on January 23. He was 94. Webb was the last survivor of the 25 men of the 1911-14 Australasian Antarctic Expedition who wintered at Cape Denison in Adelie Land, and on the Shackleton Ice Shelf in Queen Mary Land 2200km to the west.

Nicknamed "Azi" — the word azimuth figured largely in his conversation — Webb was in charge of the magnetic observations, one of the most important objects of the expedition. The base in Commonwealth Bay was only about 563km from the South Magnetic Pole, and therefore every fact discovered was of the utmost scientific importance.

Antarctic scientists remember Webb for the quality of his magnetic recordings and his manhauling sledge journey in 1912 with Lieutenant Bob Bage and Frank Hurley towards the South Magnetic Pole. The three men hauled their sledges through blizzards in sub-zero temperatures for 484km and made their last camp at 70deg 36.5min S/148deg 10 min E within 80km of the Pole. Protected from the bitter wind by a low barricade of snow blocks Webb spent four hours in freezing temperatures at an altitude of 1798m making his observations which

established that the magnetic dip was 89deg 43.4min.

Three years earlier in the Shackleton expedition Douglas Mawson, Edgeworth David and Forbes Mackay manhauled their sledges 2000km from McMurdo Sound, and on January 16, 1909, established the position of the South Magnetic Pole at 72.4deg S/155.3deg E. On December 21, 1912, Bage, Webb, and Hurley were 281km from the spot.

Webb's work at the base during the winter was almost as unpleasant as his observations in the field. Day after day he had to fight his way to the tiny magnetograph hut in appalling weather to obtain records made automatically during the previous 24 hours. Periodically he spent four hours noting and checking the magnetic recordings, working in temperatures of minus 23.3deg to minus 28.9deg Celsius.

Born in the New Zealand port of Lyttelton, Webb was educated at the local high school. He trained first as a pupil teacher and then went to Canterbury University College, now the University of Canterbury, to study civil engineering. He was nearly 22 when he was invited to join Mawson's expedition. To prepare for his role as magnetician he worked on the magnetic survey of Australia by the Carnegie Institution of Washington, D.C.

Mawson's terrible journey alone after the deaths of Ninnis and Mertz has to some degree overshadowed the remarkable sledging efforts of other members of the expedition from Cape Denison and the western base on the Shackleton Ice Shelf. The journey by Bage, Webb, and Hurley, has a high place in polar history for the hardships the three men endured and the scientific results they achieved.

A few weeks later Webb and most of the men at the main base returned to Australia. He spent a year preparing for analysis many of the thousands of magnetic observations made at Cape Denison and on his journey with Bage and Hurley. But he was unable to com-

plete his work at Canterbury University College because he went off to serve in the First World War.

After the First World War in which he served with the Royal Australian Engineers and was awarded the Distinguished Service Order and the Military Cross, Webb worked on engineering projects in many parts of the world for a Swedish company. In the Second World War he joined the English Electric Company. When he retired he assisted in the preliminary planning of the Churchill Falls hydroelectric power project in Labrador, the largest such project in the Western world.

Let Charles Laseron, who wintered and sledged with Eric Webb, have the last words on a brilliant, unassuming man.

"Naturally rather austere, he was conscientious to a degree and remarkably efficient. No matter what the conditions he allowed nothing to prevent him doing his job. He was a man in whom respect engendered affection; he made friends slowly, but was of the staunch type who would never let anyone down."

U.S. bases' winter population

Only three United States bases in Antarctica are occupied by winter teams this year. Siple Station in Ellsworth Land was closed on January 20 for the 1984 winter. This year there are 108 men and women at the three stations; in 1983 there were 117 men and six women in the four winter teams.

There are 81 men and women at McMurdo Station on Ross Island. Four, including one woman, are scientists and 11 men and one woman work for the National Science Foundation's support contractors, Antarctic Services. Sixty-five are naval officers and men.

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 is one woman, a cook employed by Antarctic Services.

A small winter team of eight — two

scientists, five support staff, and one United States Navy medical orderly — occupies Palmer Station on Anvers Island off the Antarctic Peninsula this year. One of the two scientists is a woman.

Ross Island has a winter population of 92 men and women this year. There are 11 New Zealanders at nearby Scott Base.

Winter warning

Early warning of the annual mid-winter reunion in Auckland of old Antarctic hands has been given by Michael Wing, one of the organisers for the last 10 years or so. Mike, who wintered at Scott Base in 1974 and 1976, wants to get in touch with as many people as possible who are unaware of the reunion. They can obtain more details by writing to him at 34 Haycock Avenue, Mt Roskill, Auckland.

ANTARCTIC

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