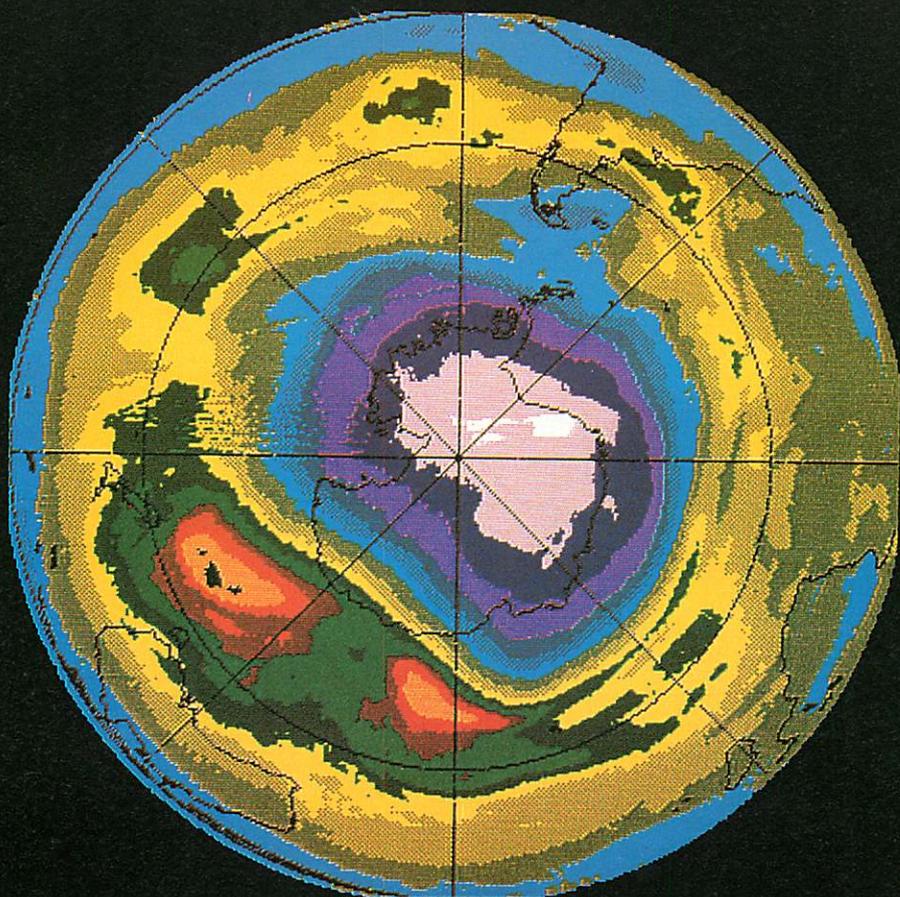


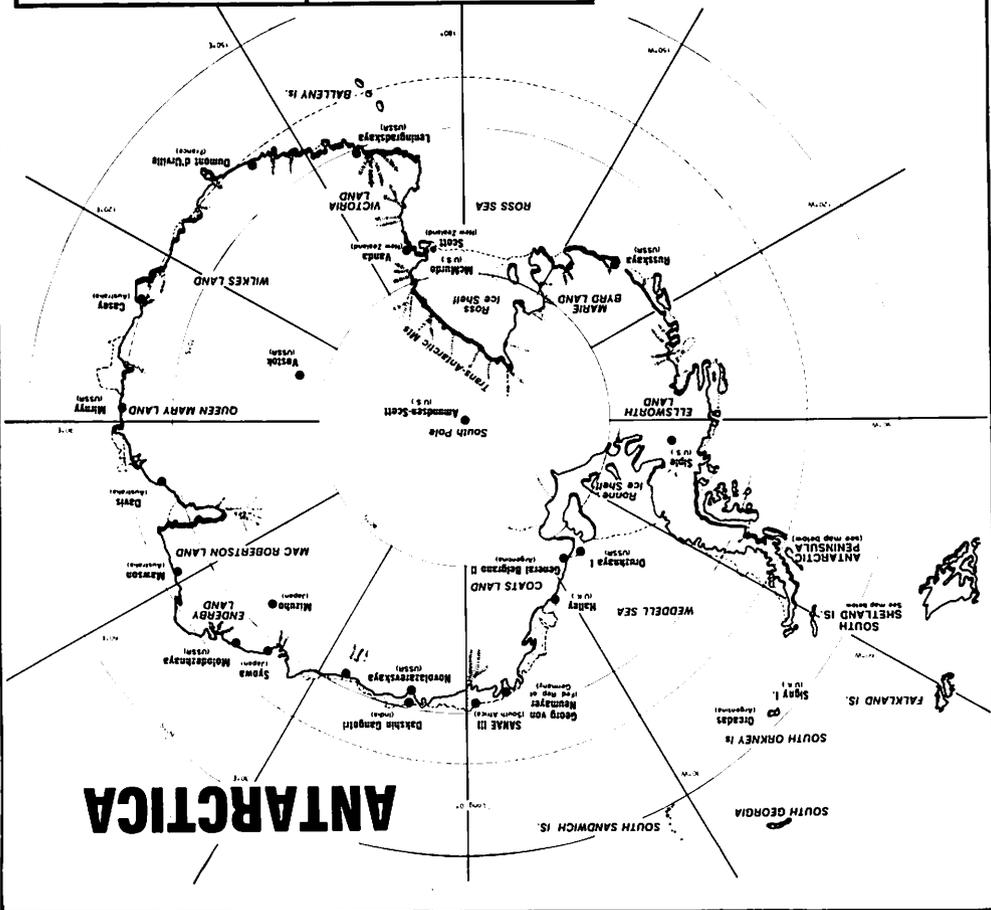
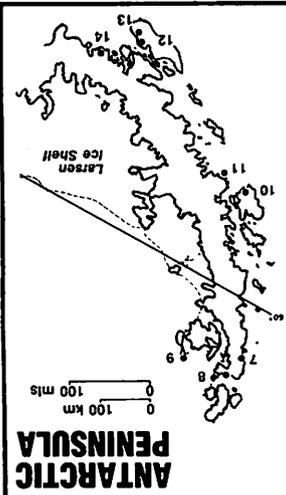
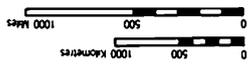
ANTARCTIC



Bulletin Vol. 11 No. 6 Winter 1987



- 1 Comandante Ferraz BRAZIL
- 2 Henry Arctowski POLAND
- 3 Teniente Jubany ARGENTINA
- 4 Artigas URUGUAY
- 5 Teniente Rodolfo Marsh CHILE
- 6 Belinghshausen USSA
- 7 Captain Arturo Prat CHILE
- 8 Esperanza ARGENTINA
- 9 Vice Comodoro Maramba ARGENTINA
- 10 Palmer USA
- 11 Faraday UK
- 12 Roberts UK
- 13 Teniente Carvajal CHILE
- 14 General San Martin ARGENTINA



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Cover: Dobson units represent an amount of ozone equivalent to an 0.01mm thick layer at surface pressure. This colour enhanced version was based on readings taken by Nimbus 7 on October 7, 1987. Reproduced with permission from the National Aeronautics and Space Agency, Washington. Story page 234.

Special report:

Ozone: the hole that is not a hole

Preliminary results from this year's spring ozone measurements made during a series of flights by U.S. scientists in September and October 1987 show the layer of ozone in the stratosphere over Antarctica to be the most depleted on record; 15 percent less than the previous minimum of September 1985. In an effort to explain the causes of the depletion further ground based exploratory work is being undertaken by New Zealand and U.S. scientists throughout the season.

(This article summarises some of these efforts. "Antarctic" would like to thank Dr Tom Clarkson of the New Zealand Meteorological Service and Gordon Keys and Nicholas Jones of PEL, Lauder for their assistance.)

Ozone is a relatively rare form of oxygen comprising three atoms of oxygen in each molecule instead of two. It is formed by the action of sunlight on oxygen at altitudes of 30 to 50 km and some of it is simultaneously destroyed by sunlight and by complex and coupled catalytic reactions involving mainly the oxides of hydrogen, nitrogen and chlorine in approximately equal amounts. Because energy is absorbed in the stratosphere by the ozone its distribution modifies the stratospheric radiation balance and determines the vertical temperature structure. Below 25 km solar ultra violet has less influence on ozone production and loss as it is absorbed by the ozone above.

Ozone is important because of its ability to filter out the sun's ultraviolet radiation. Scientists are concerned that if the area of depletion should spread it will result in increased occurrence of skin cancer and unknown changes in animal and plant life.

Antarctic monitoring

Monitored from Antarctica since 1957, spring time (August to November) decreases in atmospheric/stratospheric ozone have been observed from Halley Bay, Syowa and South Pole Stations since the late 1970's and have been recorded by satellites over a wider area of the continent. Depletion has been estimated as be-

coming as high as 50 per cent during spring in the last three years.

Current photochemical models did not predict a depletion of this magnitude and they cannot explain the decrease. Scientists seeking an explanation are concentrating chiefly on the unusual meteorology over the continent during the winter and spring and associated atmospheric chemistry.

The ozone is threatened globally by the increasing use of a range of chlorofluorocarbon compounds which have enormous utility as refrigerants, plastic foaming agents, aerosol propellants, cleaning solvents and fire extinguishers. The Antarctic ozone hole phenomenon has been a spur to some remarkable international co-operation under the auspices of UNEP. In September 1987, the Montreal Protocol was signed by 24 countries (with many more expected to join). This is an agreement for governments to ensure that the use of fluorocarbons is reduced by 50 percent during the next ten years. This is probably not enough to completely stop ozone depletion but is nevertheless a move in the right direction and a clear signal to industry to develop alternatives to avoid being caught with a dying technology.

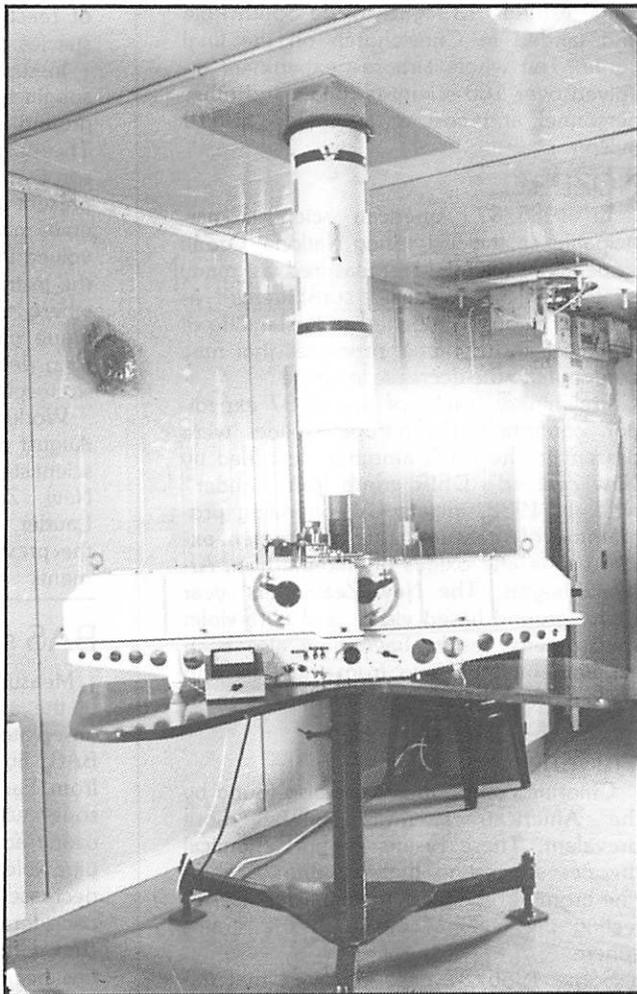
Antarctica is susceptible to abnormal chemistry because of a unique vortex or "self contained" winter weather pattern in which the air in the stratosphere above the continent receives very little influx from warmer latitudes. Almost cyclonic in nature it is characterised by strong horizontal temperature gradients. The stable pattern, which isolates the polar regions from more equatorial areas, persists late into spring and is unlike the northern hemispheric polar conditions which are fragmented earlier by global scale wave motions.

At the centre of the vortex temperatures fall as low as -85 degrees C — lower than anywhere else in the stratosphere — and remain low until well into spring. After months of darkness sunlight gradually returns in August modifying the atmospheric chemical compounds by photolysis.

Several explanations of ozone depletion relating to the chemistry of the stratosphere assume that even in these conditions concentrations of other compounds in the atmosphere would change along with the concentration of ozone; verification of such hypotheses requires atmospheric chemical data which can only be obtained during the Antarctic spring.

Early information

Much of this season's early information was gathered in a series of flights made by two NASA aircraft flying out of Southern Chile. A ER2, or civilian variant of the U2 spy plane, made 12 sorties into the so-called "hole" over Antarctica at altitudes of up to 20,700 meters as part of 14 experiments involving the collection of air



The New Zealand Meteorological Service's Dobson Spectrophotometer as installed in the small laboratory at Arrival Heights. Photo Tom Clarkson

samples and measuring concentrations of various chemicals in the atmosphere.

The other aircraft, a modified DC8, carried out seven experiments using remote sensing devices to measure ozone concentrations at a distance from the aircraft using sunlight, moonlight or laser reflections. Operating at a lower altitude and longer

range it made 13 flights to the South Pole and landed in Christchurch on the final sortie. The whole airborne experiment involved over 160 scientists, pilots and other personnel and cost an estimated \$US10 million.

NOZE 1

In 1986/87 American scientists participating in the first spring National Ozone Expedition (NOZE 1) measured as many stratospheric chemical constituents as possible to obtain a better understanding of chemical and dynamic processes that may contribute to the decrease in ozone.

Preliminary results of the 86-87 expedition confirmed that nitrogen oxides were present in the small amounts described by New Zealand's DSIR group from Lauder* who, in 1982, initiated a continuing programme of measurements of nitrogen oxide, ozone and oxides of chlorine from Arrival Heights. The New Zealanders' year round ground based visible and ultra-violet spectrometry results have now also been supplemented by data from the Pole and Halley Bay adding a spatial dimension to the results.

Chlorine

Chlorine compounds were also found by the American scientists to be more prevalent. These results support chemical theories suggesting that chlorine or chlorine-bromine chemical mechanisms are affecting the level of ozone in the stratosphere.

Some 1986/87 data indicated that the abundance of ozone-destroying chlorine compounds was about 20 to 50 times greater than anticipated and they vary diurnally.

Levels of nitrogen dioxide were consistent with the theory that enhanced chlorine concentrations and reactivity are causing ozone depletion.

This spring further ground based absorption spectroscopy was undertaken by Americans to measure the stratospheric column abundances of ozone, nitrogen compounds and chlorine compounds, the method providing simultaneous measurements of ozone change and the abundance

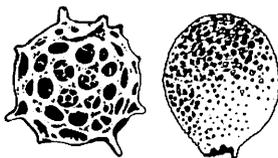
of reactive nitrogen and reactive chlorine species.

In support of NOZE 1 in 1987 scientists sought to obtain infrared solar spectra from ground based stations at the South Pole. These spectra contain thousands of absorption lines produced by compounds present in the atmospheric chemistry at the time measurements from the aircraft, involved in the project, were made. Because the instruments respond to molecules anywhere along the optical path, the technique yields information on the total column density of compounds present in the stratosphere.

Working at Arrival Heights from late August until mid-October the same team of scientists within NOZE 2 were joined by New Zealander Nicholas Jones from Lauder. Using the same instrument as in the previous year the team took measurements which would subsequently be

BAS studies

Measurements of the total ozone content of the atmosphere are made at the BAS observatories. NASA has collaborated with BAS by providing ozone-sondes flown from Faraday in order to make comparisons with satellite observations. Since ozone acts as a shield filtering out harmful ultraviolet radiation from the sun, a decrease in the ozone layer would be of considerable concern. Recent studies have shown that in the last decade or so there has been a 30% reduction in the ozone amount at Halley in spring. This could be attributed to chlorine released from man-made chlorofluorocarbons used as aerosol propellants and refrigerants. New programmes are being planned to study this.



analyzed for total column density of hydrochloric acid, nitric acid, nitrogen dioxide, chlorofluorocarbon gases F-11 and F-12, ozone. With this data they hope to follow the change in column density for these compounds from late winter through early spring.

Vertical profiles

Measurements of vertical profiles of chlorine monoxide, nitrous oxide, hydrogen cyanide and ozone were also made using a millimeter wave spectrometer. Analysis of the measured levels of chlorine monoxide should help scientists describe potential causes of the ozone depletion. If the (so-called) hole is chlorine related the abundance of chlorine monoxide taken approximately 20 kilometres above Earth's surface could be 100 times greater than normal.

As part of NOZE 2 scientists have also sought to further investigate the stratospheric aerosols and cloud distribution by using a ground based lidar (laser infrared radar) capable of continuously monitoring the time and height variability of aerosols and the polar stratospheric cloud layers that occur at altitudes of greatest ozone depletion. These measurements can be correlated with other atmospheric composition measurements to infer the role of aerosols and clouds on observed ozone behaviour.

Role of clouds

The role of nacreous or noctilucent clouds which occur only during winter at high latitudes and comprise frozen particles of moisture forming surfaces on which chemical reactions of chlorine and ozone can take place is also being investigated.

Large balloons instrumented with ozonesondes have been used to measure in detail vertical profiles of ozone and temperature from the ground to about 30 km above the surface. These should indicate where the column changes in the ozone concentration is being effected. Another team of American scientists used a ground based laser radar system in upward looking mode to record ozone pro-

files, aerosol content and temperature profiles. The system was principally designed for aircraft and modified to collect data on the ground instead of in flight.

NZ scientists

Scientists Dr Tom Clarkson and Sylvia Nicol from the New Zealand Meteorological Service will be installing a Dobson Spectrophotometer at the small arrival Heights laboratory during January. The Dobson spectrophotometer is an optical instrument comprising a series of lenses and prisms and which separates out ultra violet light at several different wavelengths. From this comparisons can be made and the amount of sunlight passing through the ozone deduced. The measurements are quoted as Dobson units (DU). Each DU represents an amount of ozone equivalent to an 0.01mm thick layer (at surface pressure). Before 1980 a typical reading over Antarctica in spring would be close to 300 DU.

Total ozone

In October 1987 the layer was as thin as 106 DU. The loss has been identified as occurring between 12 and 20 km up.

Using the Dobson spectrophotometer it is also possible to measure total ozone in a vertical profile when the sun is at fairly low angles in the sky. The atmosphere is treated as nine different layers from ground level through to the upper part of the stratosphere. Separate ozone measurements can be obtained for each layer. The installation of the spectrophotometer is part of a planned five year programme during which the team hopes also to obtain winter measurements by moonlight.

Footnote

In addition to the programmes at Arrival Heights and those in conjunction with Halley Bay and Pole Station scientists from Lauder initiated, in co-operation with the US agency NOAA, a series of ozonesonde balloon flights from Lauder which provide ozone height profiles at 45 degrees S, and which can be compared with the U.S. Antarctic flights.

NZARP

Scott Base post office closed

New Zealand no longer has an official post office in Antarctica. The world's southernmost office at Scott Base on Ross Island was closed on October 1 by New Zealand Post. Mr Michael Morris, chairman of N.Z. Post, says the office generates too little business and costs too much to run because of the combination of high summer and low winter traffic.

Mail services for New Zealanders stationed in Antarctica have been arranged by the Antarctic Division, Department of Scientific and Industrial Research. As from October 1 no mail will be cancelled at Scott Base. It will be flown to Christchurch and mailed with New Zealand stamps attached. Mail for New Zealanders working in Antarctica will be taken south by a bag service operated through DSIR from Christchurch. It should be addressed c/o Antarctic Division, Christchurch.

Philatelic history in the Ross Dependency goes back more than 80 years. Scott did not have an official post office or stamps on his 1901-04 expedition. Instead he used a cachet which had no official status as a cancellation. It read: "Antarctic Expdn 1901 S.S. Discovery."

New Zealand's first postmaster in Antarctica was Shackleton. He was appointed by the New Zealand Government when he arrived in the Nimrod to start his 1907-09 expedition; and was given 24,000 penny "Universal" New Zealand stamps overprinted "King Edward VII Land", which is now part of the Ross Dependency as King Edward VII Peninsula.

Pack ice prevented Shackleton from establishing his base in King Edward VII Land and he opened his post office at Cape Royds on Ross Island. A mail of 1500 letters posted mainly for philatelic purposes, was taken south. Not all the letters reached Cape Royds. Some were sent back to New Zealand aboard the Koonya which had

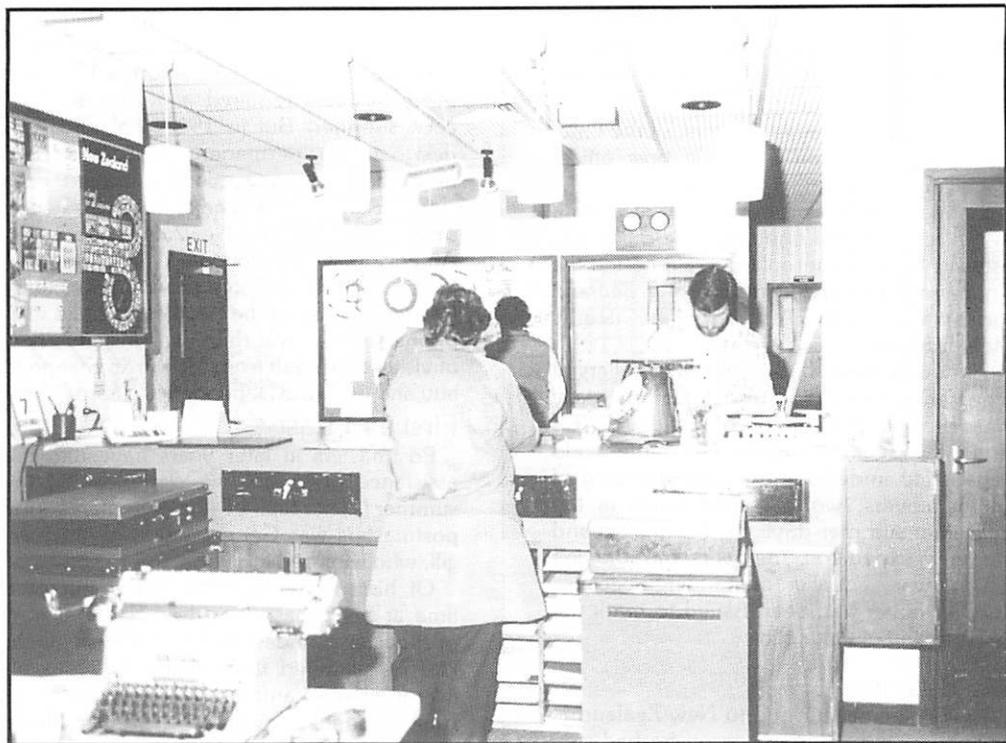
towed the Nimrod to the pack ice. The post office was closed on March 4, 1909.

Second Postmaster

Not surprisingly, another overprint of New Zealand stamps was made to assist Scott's last expedition. He was appointed postmaster on November 26, 1910, and the expedition secretary, F.R.G. Drake, was appointed assistant postmaster.

This time the post office was to have been in Victoria Land, and 24,000 penny "Dominion" stamps were overprinted "Victoria Land". But Scott, like Shackleton, had to base his expedition on Ross Island and established his post office at Cape Evans. This post office, closed on February 13, 1913, sent four mails to New Zealand. A supply of 2400 King Edward VII halfpenny stamps, also overprinted "Victoria Land", was sent south on the Terra Nova's last voyage to make up the postage rate of 2½d on letters to certain countries but were used for one mail only.

Forty years later when the New Zealand Antarctic Society began to press the Government to establish a scientific station in the Ross Dependency, its energetic secretary, Arthur Helm, then an officer in the General Post Office, suggested to his department that a post office be established and a set of stamps issued if and when New Zealand participated in an expedition to the Ross Dependency. By early 1955 the time had come. The Ross Sea Committee was set up to organise New Zealand participation in the



Commonwealth Trans-Antarctic Expedition and establish a scientific station for the International Geophysical Year (1957-58), and Mr Helm was its secretary.

Appropriately, on Midwinter's Day, 1955, Helm wrote to the Director-General, Chief Post Office, on behalf of his committee, asking for the opening of a post office in the Ross Dependency and the issue of a set of four stamps not only to meet the needs of the New Zealand party but at the same time to ensure that New Zealand's claim to sovereignty over the dependency was stressed. The committee also suggested the stamps be available only for use on mail posted in the Ross Dependency.

Third Office

All the recommendations were accepted and arrangements for New Zealand's third Antarctic post office began. Three weeks before the expedition began its voyage south

The Scott Base Post Office, photographed in 1986 was a far cry from Helm's tent and packing case. With the potential to serve some 1,200 to 1,300 people during the summer the numbers dwindled to approximately 250 during the winter and without the regular departure of aircraft its usefulness is considered uneconomic.
— Antarctic Division Photo

from Wellington aboard HMNZS Endeavour Sir Edmund Hillary was appointed postmaster on November 23, 1956. He designated Helm as assistant postmaster.

As Antarctic post offices are customarily opened immediately base sites are chosen and the first habitation established Helm had to open the Scott Base post office on January 11, 1957, in one of six tents pitched on the beach near the base site. With a packing case for a counter he did brisk business. Back in New Zealand business was even brisker because Helm had immediately advised the Director-General of the Post Office in Wellington of the opening of the Scott

Base office, and the first Ross Dependency stamps were placed on sale to philatelists who bought them mostly for use on first-day covers.

Helm did not stay in the tent all the time. For a while he ran a mobile post office, travelling between the base and the Endeavour with his stamps and date-stamp in a plastic bag. At one stage the office was established in an aeroplane crate beside the Endeavour to cope with a strong demand for stamps from Americans at nearby McMurdo Station.

Although Helm had a queue of callers at times his task did not become really wearisome until the flood of first-day covers from New Zealand and the rest of the world began. He undertook the date-stamping of all the covers, working long hours in the perpetual summer daylight. For the second summer expedition members did the job which was equally demanding because another cover had been issued to mark the first crossing of Antarctica.

Big Business

Before Helm returned to New Zealand at the end of the summer season he had sold about £600 worth of stamps. Some were bought as sets to use on covers but many purchasers wanted 3d and 4d stamps for everyday use. Helm passed over his responsibilities and more than £1000 worth of stamps to Selwyn Bucknell, the expedition's cook, who then assisted Hillary in his duties. Much of the time he was postmaster in all but name, coping with the second flood of first-day covers.

First-day covers were big business for New Zealand's first Antarctic expedition and most lucrative for the Ross Sea Committee. In the two years the expedition operated from Scott Base 220,000 covers were serviced, 100,000 in 1957 and 120,000 in 1958. They carried Ross Dependency stamps worth £16,500.

After the excitement of Hillary's journey to the South Pole and the crossing of Antarctica the Scott Base post office did not have to deal with floods of first-day covers. But polar philatelists all over the world still wanted Ross Dependency stamps and the

magic Scott Base cancellation on letters or special covers.

In the years after TAE and the IGY post office business required a postmaster only each summer. But in 1967 the office was designated a permanent post office and from that date onwards was staffed each summer and winter. The change was necessary because more New Zealanders and Americans were working each season in their respective research programmes, there was greater use of the Scott Base radio telephone service, and there was a steady flow of visitors and staff from McMurdo Station to buy and use Ross Dependency stamps.

First and Last

Postmasters in later years have had the assistance of up to two clerks during the summer. The first of the summer/winter postmasters was George Edlin, of Invercargill, who wintered in 1968.

Of his successors none has spent more time at Scott Base than Leo Slattery, now postmaster at Leeston, near Christchurch. He has wintered three times, twice as officer-in-charge, and last year was one of six New Zealanders awarded the Polar Medal by the Queen for their services with New Zealand research programmes.

In the 1973-74 season Leo Slattery was a Post Office clerk at Scott Base. He returned as postmaster in the 1979-80 season and wintered first in 1980. During his second winter (1982) he was officer-in-charge and postmaster. He flew back to Scott Base for the fourth time to serve as the 1984-85 postmaster, and when the officer-in-charge returned to New Zealand for health reasons was appointed officer-in-charge for the winter.

Last of the postmasters was Gavin Sanne, of Tauranga, who returned home in October not long after the post office was closed. One of his duties in the past winter was to act as special deputy returning officer for the Ross Dependency in the New Zealand General Election on July 14, 1987.

Footnote: *There have been two sets of definitive stamps for the Ross Dependency since the first in 1957. The second was issued on January 18, 1972, to mark the*

60th anniversary of Scott's arrival at the Pole. A third set was issued on January 20,

1982, to coincide with the 25th anniversary of the official opening of Scott Base.

New penguin colony located

Scientists undertaking the annual aerial survey of penguin colonies on Ross Island and in the McMurdo Sound area have located a previously unknown colony of adelic penguins. Although they have flown over the site at Mandible Cirque in earlier years the light in this area during the flight was regarded as exceptional and enabled them to observe the colony which lies on a dry slope shielded by the tongue of the Mandible Cirque Glacier. Preliminary estimates suggest it is occupied by in excess of 10,000 birds.

The project, part of the International Survey of Antarctic Seabirds, provides data from which environmental changes in the Antarctic ocean ecosystem can be monitored. This year's team from Ecology Division in Nelson comprised Dr Peter Wilson, Dr Mick Clout and Bruce Thomas. Using a VXE-6 helicopter they photographed the colonies on Ross Island. Ground truth verification was undertaken by the team at Cape Royds and by other scientists working at Cape Bird.

On a special RNZAF Hercules flight north to Hallett the team photographed colonies this season at Beaufort, Franklin and Inexpressible Islands, Terra Nova and Wood Bays, Cape Armitage and the three sites on Coulman Island, Cape Jones (Mandible Cirque) Capes Phillips and Wheatstone, Cotter Cliffs and Cape Hallett. This is the seventh year of the project and with the use of both large format and 35mm cameras loaded with a new fine grain film the team report the best photographic coverage ever and hope to be able to obtain a full count from the results.

During the return journey Dr Harry Keys of the Department of Conservation and Mr Denis Fowler of the Information and Technology Directorate of the DSIR in Well-

ington photographed icebergs in the fast ice along the western coastline of the Ross Sea. The results when compared with those of previous years will show the distribution, residence times and drift of the distinctive Mackay Glacier Bergs.

Also on the flight was a team from "Fast Forward", a New Zealand television programme based in Christchurch. Reporter-director Peter Llewellyn and researcher Janet Bertaud joined Paul Donovan (camera) and Ian Masterton (soundman) from the Natural History Unit in filming the aerial census and the iceberg project. Other events recorded for subsequent screening on the programme this year included geological work in the dry valleys, the study of melatonin in seals and monitoring of the Erebus lava lake.

Trace metals

Taking advantage of Lake Vanda's unique characteristics as a closed fresh water system was Dr Jenny Webster of Chemistry Division, DSIR, Wellington. Assisted by the staff from Vanda she drilled a 10 cm hole through the 3.6 metre thick layer of ice covering the lake and collected 45 samples of water from the base of the ice to the bottom of the lake some 74-75 metres below.

The samples, with others collected for comparative purposes from the Onyx River, Don Juan Pond and Lake Hoare, have been returned to New Zealand and are presently undergoing assay for trace metals and anions. This analysis should enable Drs Webster and Reiner Goguel, also of chemistry division, to relate the concentrations of one to the other in terms of the complexes that keep the metals in solution. Preliminary results have shown the ratio of lithium to other alkaly metals to be abnormally high compared with sea or

geothermal waters but the reasons are not known.

Field analysis of acidity (pH), sulphide concentrations, oxidation potential, temperature and salinity were also undertaken. It was discovered that the waters at the bottom of the lake are quite acid with readings of 5.5 increasing to 8.25 at the top. Sulphide concentrations of up to 11.2 ppm were found. These approximate with levels in the geothermal waters of the North Island of New Zealand. The oxidation potential of the Lake reduced downwards but the temperature and salinity were comparable with previous results recorded by Japanese scientists.

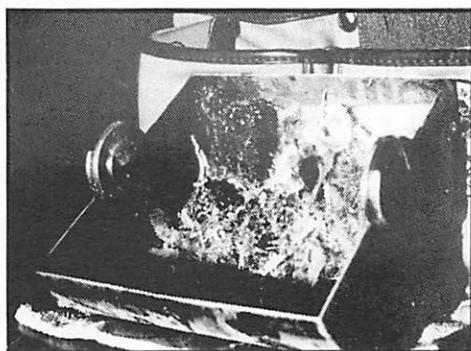
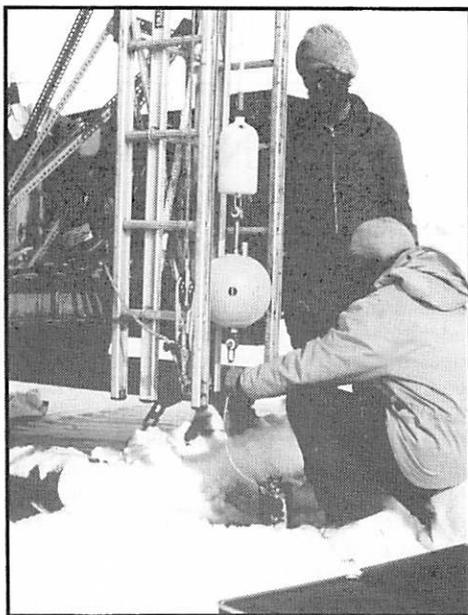
Dr Webster's results will extend available data on Lake Vanda and will provide a working model for other similar research in fresh water environments.

Sediment studies

Seafloor sediment samples were collected from eight locations in McMurdo by a team of scientists from Victoria University who are trying to establish the inshore characteristics of the coastal area and relate them to changes in sediment texture and paleo-environment. This limited zone is of particular interest because work on the MSSTS 1 drill core shows how variations in diversity and sediment texture may be used to show sea level changes in the quartz sequences.

The team, led by Alex Pyne and Barbara Ward, comprised two honours graduates, Barbara Armstrong and Philip Shane. They were accompanied by Antarctic Division field assistant Geoff Blake from New Plymouth and joined for part of their work by Lieutenant Fernando Zurita from Ecuador who was at Scott Base to observe operations.

Using a grizzly toboggan, a D3 bulldozer and a new grab designed and built at the university the team collected samples on both the outward and return journey from Tripp Bay. The eight main locations were off Tripp Island, Gregory Island, Cape Roberts in Granite Harbour, Dunlop Island, Cape Bernacchi and Explorers'



Top: Alex Pyne (kneeling) and Philip Shane, members of the Victoria University team collecting sediment samples from the McMurdo Sound area inspect the S4 current meter prior to dropping it into the hole for profiling.

Bottom: A sample of sediment taken in a test sample from the sea floor in front of Scott Base at a depth of 90-100 metres. Photos: Barbara Ward

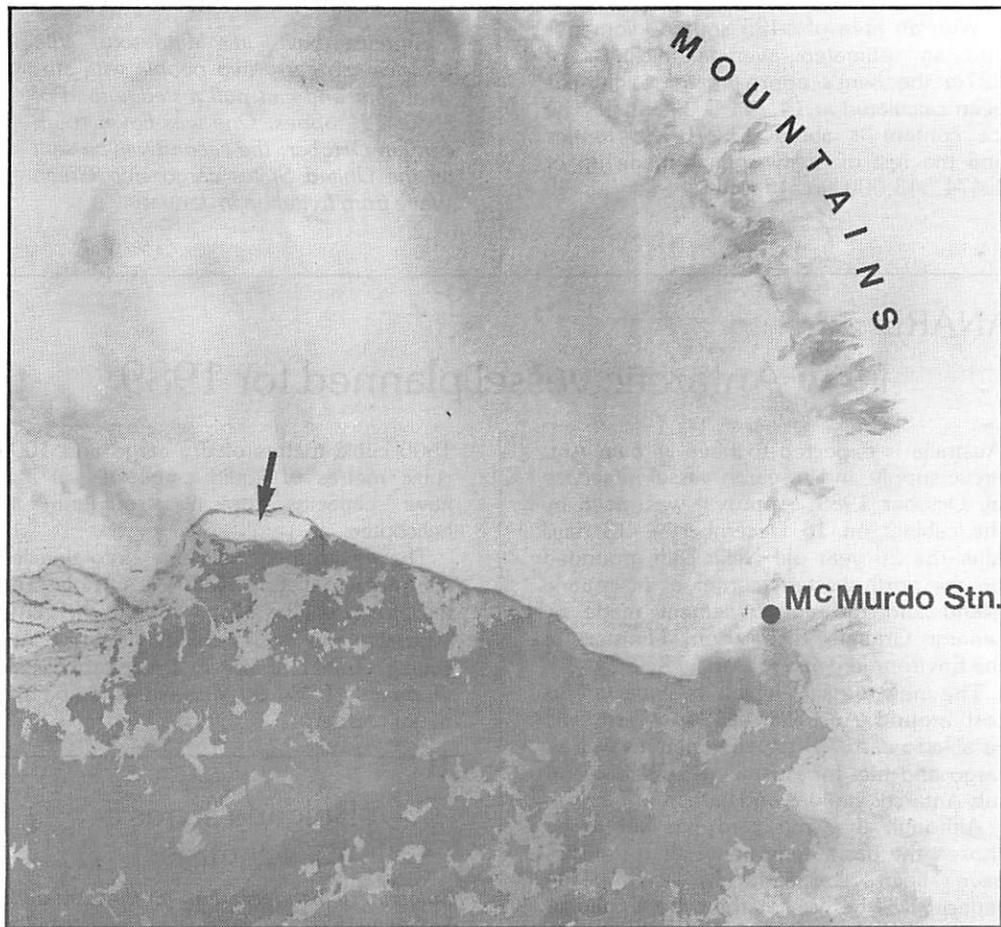
Cove in New Harbour, Blue Glacier and across Cape Armitage off Ross Island.

Preliminary observations indicate that the samples comprise quantities of sediment and foraminifera. They have been returned

to New Zealand for analysis. Current profiling, also undertaken over 12 to 24 hours at most locations, should provide useful supplementary information about water movement and sediment transport. The team also collected water samples which

were analysed for their pH levels for Dr Enriqueta Barrera, who is at Ohio State University where she is doing post doctoral study on isotopes from material from the Ross Sea area.

Huge berg breaks off Ross Ice Shelf



A huge iceberg which broke away from the Ross Ice Shelf early in October has drifted slowly west-north-west in a month and on November 6 was reported to have moved 46km from its original position in the Bay of Whales. Designated B-9 on ice charts issued by the United States Navy/National Oceanic and Atmospheric Administration

Joint Ice Centre, the berg, which measures 159km by 40km, has not been reduced in area during its drift.

Satellite reports gave the approximate centre of the berg as 77deg 50minS/163deg 15min W in the first week of November. The break along the face of the eastern Ross Ice Shelf occurred between

164deg and 158deg W. A section of the shelf bordering the eastern side of the Bay of Whales appeared to have separated between September 25 and October 13.

Separation was observed by high resolution NOAA satellite imagery to be complete on October 13. Lower resolution data indicated that the break began by October 5 at least.

With an area of 6495 square kilometres and an estimated average thickness of 227m the berg's approximate weight has been calculated at 14,744,731 tonnes. The ice content is about 13,270,188 tonnes and the rest of the weight is made up of 1,474,543,000 litres of water.

New Scott Base vehicles

Two new all-surfaces tracked vehicles have been added to the equipment at Scott Base this season. They have been bought by the Antarctic Division, DSIR, for field work within about 80km of the base.

American-built in Minnesota, the vehicles can carry two people with survival gear and can pull a sledge load of about 1.8 tonnes. One was flown south early in October; the second will be sent by the United States cargo ship Green Wave from Lyttelton in January.

ANARE

New Antarctic vessel planned for 1989

Australia is expected to have its own Antarctic supply and research vessel in service by October 1989. Approval was given by the cabinet on 16 December — 13 days after the 26 year old Nella Dan grounded on the north-western corner of Macquarie Island and the announcement made by senator Graham Richardson, Minister for the Environment and the Arts.

The new vessel, which is expected to cost around Australian \$124 million, will be able to carry 70 expeditioners as well as cargo and fuel for Australia's Antarctic and sub-Antarctic stations and bases.

Although the ship yard has yet to be chosen the basic operational characteristics have been specified. Its ice-breaking capacity will be greater than the Canadian Arctic Class 2 which is in excess of either of two vessels which have been under charter in recent years. With a cruising speed of 13 knots the twin engined vessel will have a range of 14,000 nautical miles and an endurance of 90 days. It will be a 92 metre long, stabilised vessel with a double skinned hull and will be equipped with bow and stern thrusters. Able to carry

1500 cubic metres of dry cargo and 1000 cubic metres of liquid cargo, it will also have capacity for two medium lift helicopters.

The government will enter into detailed contract negotiations with P & O Polar and the project will be a joint venture of P & O Australia Ltd and Polar Schiffahts, Consulting GmbH of the Federal Republic of Germany. P & O Australia is to be the major partner.

Bulgaria sends 5 scientists

Bulgaria, which acceded to the Antarctic Treaty in 1978, will send five scientists to the Antarctic Peninsula area this summer. Professor B. K. Kamenov, of the faculty of petrology and lithology at Sofia University and a colleague will work in the South Shetlands with the British Antarctic Survey. Three other scientists will be associated with the Soviet Antarctic programme, probably on King George Island.

ITALY

Two ships used by third Italian expedition

Italy's third expedition to the Ross Dependency sailed from Lyttelton on December 8 for Terra Nova Bay aboard the chartered Finnish cargo ship *Finnpolaris*. On her second voyage south the *Finnpolaris*, which arrived in Lyttelton on December 1, carried 120 scientists, support staff, mountain guides and construction workers, who will be involved in a wide range of research projects, and the extension and improvement of Terra Nova Bay Station on the coast of the Northern Foothills of Victoria Land at the north-east end of Gerlache Inlet (74deg 41min 42sec S/164deg 07min 23sec E).

Established in the 1986-87 season, the Italian station is expected to be occupied continuously from the start of the 1988-89 season. This summer six prefabricated modules were added to the main building for use as specialised scientific laboratories, a second satellite communication terminal was installed, and provision made for treatment of effluents and waste disposal.

In the third week of December the 14,900-tonne *Finnpolaris* was followed by the chartered Norwegian research ship *Polar Queen* (2040 tonnes) which arrived in Lyttelton on December 19. Early in the New Year she began a wide-ranging oceanographic programme planned to take two months in Terra Nova Bay and the Ross Sea. Both ships were expected back in Lyttelton late in February.

Manager of the Antarctic Project and leader of this season's expedition is Dr Mario Zucchelli. The liaison officer is Dr Celio Vallone, who organised the 1985-86 reconnaissance expedition and was manager last season for ENEA, the Agency for Research in Energy, which set up the Antarctic Project to carry out the research programmes and manage the funds allocated for them. Dr Zucchelli is in charge for ENEA.

This season's research programme covered cosmophysics, meteorology and atmospheric physics, earth sciences, biology, oceanography and environmental impact studies. Other scientific activities in-

cluded study of the ozone layer, maintenance of four automatic weather stations installed last season, geological mapping, and data processing for a preliminary geological map covering the area between the David and Mariner Glaciers.

Biologists continued biochemical studies on molecular bases of cold adaptation in Antarctic fishes, and investigated the structure/performance relationship in the haemoglobins of Emperor penguins. Environmental projects included sampling of surface waters, thermal springs, snow and sediments, and the impact on the environment of organisms in the marine food chain.

More than 30 scientists and officers from the Italian Navy's Hydrographic Institute took part in the oceanographic programme which was conducted with helicopter support from the *Polar Queen* in Terra Nova Bay and the Ross Sea. Co-ordinator of the programme was Dr Carlo Stocchino, of the National Research Council (CNR).

The Ministry of Defence provided three officers and one civilian from the Hydrographic Institute for the oceanographic team. Rear-Admiral Alberto Tarantini, Ministry of Defence representative on the inter-ministerial committee for Antarctica, was the Antarctic Project representative on the *Polar Queen* and responsible for marine operations on the ENEA management staff.

Planned research projects included

surveys of the Terra Nova Bay coastline and some inland lakes, and the region between Franklin and Coulman Islands; identification and preliminary evaluation of Antarctic fisheries resources; and studies of the distribution of dissolved oxygen and nutrients related to phytoplankton dynamics in the area north of Terra Nova Bay.

Environmental studies

Environmental impact studies made at sea are related to the control and surveillance of pollutants and contaminants in the coastal Terra Nova Bay marine trophic chain. Another study was designed to determine the physiological responses of marine organisms to the diffusion of contaminants.

Leaders and co-ordinators of the Italian field programme on the ice and at sea came from ENEA, CNR, the National Geophysics Institute (ING), the National Agency for Hydrocarbons (ENI) and the Institute for Applied Research on Fisheries (ICRAP). Universities and other scientific organisations represented in the field teams were: Rome, Siena, Pavia, Padua, Naples, Venice, Ferrara, Bologna, Florence, Pisa, Genoa, Messina, Catania, Milan and Trieste. The Brescia Civic Museum of Natural Sciences was represented for the second time.

Women scientists

Two of eight women scientists and administrators in the programme were leaders of project teams. Duana Testa headed the ENEA environmental party on land as she did last summer, and Rita Ocone was in charge of the ENEA meteorological team. Other women were engaged in oceanographic, geological, and biological projects.

ENEA was responsible for the management and administration of the expedition and the co-ordination of scientific activities, including co-operative programmes with New Zealand and the United States. Management and related services required a staff of 44. Technical services included electronic technicians and electricians, and logistic services provided drivers of tracked

vehicles, radio communications, stores management and domestic workers for the station, and naval and civilian cooks.

Field guides

A team of field guides with mountain rescue experience was assigned again by the Ministry of Defence. Five were from Corps d'Alpini, the mountain troops, and four were from the Navy. Their leader and co-ordinator was Lieutenant-Colonel Mauro Spreafico, who held the same post in the last two expeditions. As a member of the management staff he was the officer responsible for the station, and also co-ordinator of the medical services which included Navy and Army doctors.

N.Z. pilots

Four New Zealand pilots who are flying French Aerospatiale Squirrel helicopters from helipads on the Finnpolaris and Polar Queen, and from Terra Nova Bay Station, expect to clock up 850 hours in support of the expedition. The helicopters, chartered from Helicopters (NZ) Ltd, of Nelson, are being used for ship to shore operations, ice reconnaissance, and in support of field camps established along the Victoria Land coast and around Terra Nova Bay.

This will be the third summer the company has provided air support for the Italians. Senior pilot this year is Don McLeod, who was south in 1986-87. He is assisted by Cranleigh Lee, one of the two pilots aboard the Aurora when she took a Norwegian research party to Peter I Island and then picked up Dr Monica Kristensen and her party from the Bay of Whales. Alfie Speight has been borrowed from a subsidiary company, Southern Lakes Helicopters (Queenstown) and Ken Tustin has been borrowed from The Helicopter Line. The engineer, Duncan Atkinson, is from the Helicopters (NZ) Ltd base at Nelson.

Three pilots and the engineer sailed on the Finnpolaris with three helicopters. Cranleigh Lee followed on the Polar Queen, and joined the rest of the team in Terra Nova Bay.

A civilian construction firm, Snam-progetti, of Milan, which had the contract

for the station and associated buildings last season, was responsible for the additional construction this summer. When the *Finnpolaris* left Lyttelton she carried a team of 11 headed by construction manager, Georgio Mongardi. His team included plant operators, pipe fitters, welders, electricians, and men skilled in the erection of prefabricated buildings. Master of the *Finnpolaris* which was chartered from Finnlines, of Helsinki, was Captain Antila Markku Tapani, who had a crew of 22. His predecessor last summer, Captain Lasse Kulju, took the ship to Antarctica on two earlier voyages when it was chartered by the 1983-84 and 1984-85 Indian expeditions to Queen Maud Land.

Captain Magnar Aklestad, master of the *Polar Queen*, chartered from G.C. Rieber

and Co., of Bergen, is well-acquainted with Terra Nova Bay and the ice of the Ross Sea. In the 1982-83 season his ship was chartered to take the West German GANOVEX III expedition to North Victoria Land. He returned to Terra Nova Bay in the 1985-86 summer when the *Polar Queen* was chartered for the first Italian expedition.

Representatives of two Italian newspapers, "Corriere del Sera" (Milan), and "La Repubblica" (Rome), and a Milan magazine, "Epoca", sailed south aboard the *Finnpolaris* to report the work of the expedition. Radio and television coverage will also be given by a reporter and cameraman from RAI, the national radio and television organisation.

Japan

Asuka Camp will replace Mizuho Station

Japan will have a new permanent station in Antarctica this season. It is Asuka Camp, established at 71deg 31min S/24deg 03min E in western Queen Maud Land near the Sor Rondane Mountains. The camp, 670km from Japan's main station, Syowa, on East Ongul Island, Lutzow-Holm Bay, was built in the 1984-85 summer by the 26th Japanese Antarctic Research Expedition (JARE-26) and was occupied by eight geologists between late December and mid-February. It was manned again in the last two seasons by JARE—27 and 28.

Mizuho Station, established on the inland ice sheet at 70deg 42min S/44deg 20min E, in the winter of 1970, was closed in late October this year and will be listed as an unoccupied refuge for the winter of 1988. It is 270km south-east of Syowa and 760km from Asuka, and was operated first in summer as a satellite station to Syowa for research in meteorology, glaciology, geomagnetism, and upper atmosphere research. Since 1976 the station has been occupied by winter teams, and in the summer has been used as a traverse base by

scientists engaged in the glaciological research programme in eastern Queen Maud Land which began in 1982.

This season the winter and summer teams which will work from Asuka will be put ashore from the ice-strengthened supply and research ship Shirase at Breid Bay (70deg 15min S/24deg 15min E) on the princess Ragnhild Coast 140km north of Asuka. Transport to the camp will be provided by the Shirase's three helicopters — two Sikorsky S61A's and one Bell 47GA.

Air support for field parties working

deeper in Queen Maud Land will be given by two fixed wing aircraft, a Pilatus Porter PC-6 and a Cessna 185, owned by the National Institute of Polar Research. The aircraft were flown from Syowa to Asuka late in October and will be based there until late December. To provide for the continuous operation of the camp extensions to the laboratory and stores section completed in January this year.

Japan's research programme began officially on November 14 when members of the JARE-29 winter and summer teams left Tokyo aboard the Shirase which was due at Fremantle on November 28. She was expected to sail south on December 3 and will be operating in the Antarctic Treaty area from December 8 to March 15. On her way north she is expected to call at Sydney towards the end of March and then return to Tokyo in mid-April.

Two other Japanese research ships will be in Antarctic waters this season. They are the Kaiyo Maru which will spend two months on fisheries research in Drake Passage and the Scotia Sea, and the geological survey ship Hakurei Maru, which will continue the series of marine geophysical surveys initiated in the 1980-81 season.

Between December and February the Kaiyo Maru will make two cruises in the Pacific sector along 90deg W, working in Drake Passage and the Scotia Sea. The first will start from Valparaiso and the second from Montevideo. Projects for the Fra Seas

Fisheries Research Laboratories will include physical and chemical oceanography, collection of plankton, and an investigation of the krill biomass. The Kaiyo Maru will return to Valparaiso in early February and after a call at Honolulu is expected to reach Tokyo in mid-March.

Sponsored by the Japanese Agency for Natural Resources and Energy the Japanese Metal Mining Agency's Hakurei Maru is expected to leave Tokyo early in November for the South Orkney Islands area and return at the end of March. Scientists aboard the ship will carry out a marine geology and geomorphology programme for the technology research centre of the Japan National Oil Corporation.

In 1980-81 the programme of marine geophysical surveys began in the Bellingshausen Sea (1980) and was continued in the Weddell Sea (1981) and the Ross Sea (1982). A second three-year programme began in 1982-1983 in the Wilkes Basin area of the Dumont d'Urville Sea off Adelie Land and in part of the Ross Sea. The survey was made in two stages.

A two-stage survey was completed by the Hakurei Maru during the 1984 summer in the Australian sector of Antarctica as far as Amundsen Bay (66deg 55min S/50deg E) Enderby Land. The three-year programme was completed in 1985-86 by surveys in the Norwegian sector of East Antarctica off the Queen Maud Land coast.

South Korea's first base to cost US\$7.2 million

South Korea plans to spend 6 billion won (US\$7.2 million) on its first Antarctic research station in the South Shetlands which will be built on King George Island this summer. Construction began in November, and the station, likely to be sited on the Keller Peninsula of Admiralty Bay near the Brazilian station Comandante Ferraz (62deg 05min S/58deg 23.5min W) will be completed by March 1988.

Thirty scientists will work from the station

in summer and 20 in winter. They will conduct research in biology, oceanography, meteorology, geology, and geophysics, and explore the maritime resources in the surrounding waters.

South Korean construction materials and equipment were transported by sea from the port of Inchon to King George Island aboard a 1000-tonne cargo ship which sailed in mid-September and reached the South Shetlands early in November. The

station will have a combined floor space of 1650 square metres. Seven buildings will

house laboratories, offices, a food storage section and an electric power system.

BAS

40th anniversary of two bases celebrated

Hormone levels in fur seal cows, a wandering albatross chick census, recreational trips, penguin census, maintenance of bases and checking of glaciological strain rosettes in preparation for the new Halley Station were among the activities for BAS personnel during a winter in which the 40th anniversaries of two bases were celebrated. For those on Bird Island it was also the coldest and snowiest winter on record.

RRS Bransfield made her final call into Bird Island during a lull in the bad weather on April 11 to drop off 2.5 tonnes of supplies. She then sailed north leaving the three base members to settle into their winter routine. A wandering albatross chick census was carried out at the beginning of April and a programme of taking blood samples from fur seal cows to test their hormone levels was begun. Other winter fieldwork included food-sampling of gentoo penguins and at the end of September, 800 or so wandering albatross chicks, about to fledge, were ringed. The first sighting of a brown-hooded gull on Bird Island was recorded on May 21.

In July and in mid September, on her way back from relieving the garrison at South Georgia, HMS Dumbarton Castle made brief visits to Bird Island to deliver mail and fresh food. On August 4, the crew of a Lynx helicopter from HMS Penelope made a short visit and there were low fly-pasts by Hercules aircraft during that month which was the coldest, snowiest winter on record at Bird Island.

At the end of April at Signy, a circumnavigation of the island was made in inflatable boats. During the winter months, field work was restricted by the thick snow and ice cover, but terrestrial microclimate data loggers were maintained to monitor the winter extremes. Studies of nutrient

cycling in nearshore waters and sediments continued by under-ice diving. Laboratory studies further elucidated the ability of terrestrial insects to avoid freezing at temperatures as low as -20°C by producing anti-freezes.

Eight men travelled to neighbouring Coronation Island in mid-June and visited the Shingle Cove refuge hut. This was the first of many recreational field trips around the islands. Many more trips than usual were possible because of the excellent sea ice, not seen for the last few years.

Diving through the sea ice was resumed. One dive in August was on the wreck of Tioga, a whaling ship wrecked in 1913. An Anglia television cameraman (an ex-Fid) wintering at the base filmed the daily routines and the Signy wildlife, concentrating on Weddell seals. With the approach of spring, a record low October temperature of -24.1 deg C was recorded and rare sightings were made at Signy of silver-grey fulmars and even rarer Antarctic petrels. Celebrations were held on base at the beginning of October to mark 40 years of Base H.

On April 25, the US Polar Duke called at Faraday and a party of Palmer station personnel and scientists came ashore for the afternoon.

Permanent creek ice first visible in early May became extensive as the winter progressed and the usual season's recreational

trips were made to Skua Island, Winter Island and after midwinter, to the mainland and Uruguay Island. Several visits were made to Wordie Hut and the chimney was replaced. Bad weather which prevented a team reaching more than a third of the way up Mount Shackleton continued during October and many skiing trips were cancelled. On September 5, Faraday celebrated its 40th anniversary.

Towards the end of October, paths and walkways to the shore were cleared in preparation for the relief and clear water around the base meant some boating could be done. On October 22 one of the three Twin Otters, en route to Rothera, tried to airdrop some mail to the Base as they had done the previous year, but low cloud prevented this.

Dogs exchanged

The beginning of winter at Rothera meant that the dog teams could, once again, be taken out on some of the many, mainly recreational, field trips which enabled all base members to get away from base for at least a few days before mid-winter. One 90-km sightseeing trip was made to the south side of Adelaide Island. The party checked Blaiklock Hut, and the good sea-ice enabled several others to visit Ridge Island, Jenny Island and Pourquoi-Pas Island later in the winter. An emergency depot at Sighing Peaks was replenished and a party which included one of the base electricians visited Horseshoe Island at the beginning of October.

At the end of July a party visited Stonington, making a brief call into the Argentinian station San Martin on the way. They were very well received and during a further visit there they swapped two of the Rothera dogs (a bitch and a dog) with a bitch and a dog from San Martin to introduce new blood into the Rothera teams. Although two dogs had to be put down, eight new pups — two from the Argentinian bitch — born during the winter have secured future generations.

Work continued all through the winter on the internal fitments of the new two-storey building, most of which has now

been completed and should be fully operational for the summer.

Airstrip prepared

During August and September, Rothera radio operator flight-followed for NASA's ozone high level reconnaissance flights. Preparation of the airstrip for the arrival of the three BAS Twin Otters began at the end of September. On October 22 three Chilean aircraft arrived from Carvajal (old Adelaide), carrying nine crew. Later that same day, the three Twin Otters, which had left the UK two weeks earlier, arrived. In continuing good weather, two men were flown to Fossil Bluff the following day to open it up for the summer.

The first aurora seen at Halley was on April 6. During this month, one party travelled to the hinge zone to retrieve the caboose normally left there as a refuge. It was returned at the end of September.

Glaciological strain rosettes on the Brunt Ice Shelf were checked twice during the winter as part of the preparation for the new Halley Station to be constructed in 1988-89.

Several skiing trips were made to Mobster Creek. The nearby emperor penguin colony was visited on many occasions and a penguin census carried out. At the beginning of August the first new-born chick was sighted and at the end of September, a visit to the coast revealed large open leads 2 km out from ice cliffs where several penguins were swimming. The parties noted that a large number of chicks had died, but were unsure of the cause.

Halley maintenance

Meanwhile, on base, due to the pressure of the ice on the wooden tubes housing the present Halley, one tube became deformed to such an extent that the ceiling panels and exterior tubular panels of the lounge had to be removed and ice chipped away to relieve pressure from the interior building. The lounge finally became habitable at the end of September after much hard work from base personnel. Three of the Halley cabooses, housing scientific equipment, were raised to keep pace with the accumulating snow.

The RRS John Biscoe sailed from Grimsby in the middle of September. On board were three scientists who carried out extensive sea trials between the UK and Madeira, of equipment to be used in the forthcoming season's Offshore Biological Programme.

After a brief call into Montevideo during the second week of October, they made for Bird Island arriving on October 22. The sea ice was more extensive than ever known before and this, combined with high winds, made offloading difficult. After a weekend dodging bergy bits off South Georgia, the discharge of 17 tonnes of cargo was completed and she sailed, leaving the base crowded with nine personnel including two who are part of the Anglia television crew continuing last year's filming.

The Biscoe sailed north in fair weather but made several detours around extensive areas of bergs. After four days at Stanley

she headed for James Ross Island, reaching the Antarctic Sound on November 6. Here, it was planned to land a geological field party at the Prince Gustav Channel ice edge or at Hope Bay; rough surface conditions prevented this and the Biscoe headed for Damoy, Wiencke Island, anchoring in Dorian Bay the following day. The James Ross party and personnel for Rothera disembarked but poor weather conditions prevented onward flights to Rothera for several days.

In the meantime the Biscoe headed for Signy, but strong winds, heavy seas, poor visibility and large numbers of growlers forced her to heave-to and wait for better weather. In improved conditions, but unable to get through the pack ice, the ship followed the ice edge for 30 miles. One further attempt to reach Signy failed and with conditions unlikely to improve the

Rothera in the summer of 1986.

Photo: B. Thomas, BAS.



ship headed for Stanley. She returned in late November to off-load staff and equipment, despite further delays due to strong winds.

The RRS Bransfield left Grimsby on

October 30, two days later than scheduled due to engine problems. She was due to call into Montevideo at the end of November, on her way to Stanley and then South Georgia.

USARP

Rebuilding of stations and 69 scientific projects for 1987/88 season

United States expenditure on scientific research in Antarctica and its support for the 1990s may exceed \$US150 million. The National Science Foundation, which finances and co-ordinates the whole programme, expects the cost of rebuilding McMurdo Station and improving its environment will be at least \$US100 million. This includes \$US15 million for a new science facility which was started this summer and should be completed early in 1992.

Rebuilding or expansion of the Amundsen-Scott South Pole Station are also included in the long-range planning of the foundation's Division of Polar Programmes. Opened in 1975, the present station was expected to last 10 years; it is now more than 12 years old. Another major expense will be major overhauls of the foundation's seven aging ski-equipped Hercules aircraft. This will cost about \$US45 million.

In its total budget of \$US117.1 million for fiscal year 1987 which runs from October 1 last year to September 30 this year the foundation allocated \$US104.6 million for operations and \$US12.5 million for research. Part of the operational costs of the 1987-88 programme are met from the fiscal 87 budget. The total budget for fiscal year 1988 is expected to be no less than the previous allocation.

This season about 290 scientists and technicians are engaged in some 60 scientific projects in a wide range of disciplines on the Antarctic Continent, in the South Ocean, and on islands off the Antarctic Peninsula. In addition to their grants and direct support of their projects the foundation's budget has to cover maintenance and support of four inland and coastal stations — Siple Station, closed this winter, will now be

opened each summer only — contract services, and payment for support by aircraft and icebreakers, and the charter of research and cargo vessels.

Major projects in this year's programme are studies of the impact of the annual depletion of stratospheric ozone over Antarctica on the fragile ecosystem, and of the relationship between the stability of the West Antarctic Ice Sheet and global climatology. Working from Palmer Station on Anvers Island marine biologists will measure the effects of ultra-violet radiation on phytoplankton, and determine the ability of marine organisms to repair genetic damage caused by exposure to radiation.

Glaciologists and geophysicists will continue for the fourth year their survey of the interior Ross Embayment, the portion of the ice sheet along the Siple Coast extending from the Rockefeller Plateau down to the Ross Ice Shelf.

Depletion of atmospheric ozone over Antarctica has been accompanied by increased levels of incident ultra-violet (UV) radiation which is potentially harmful to phytoplankton and could affect their productivity. These microscopic plant organisms are the base of the Antarctic food chain, feeding small fish, molluscs, and

crustaceans like krill on which in turn penguins and some whales depend.

Dr Sayed El-Sayed, of the Department of Oceanography, Texas A & M University, leader of the team which will assess the effects of UV on marine phytoplankton, says that be weakening the base of the food web ultra-violet changes could have far-reaching ecological reverberations in the southern oceans. He and three other marine biologists will expose phytoplankton to chronic long-term doses of UV radiation at five levels — incident, two reduced levels, and two enhanced levels.

This work will be done in the laboratory at Palmer Station on Anvers Island off the Antarctic Peninsula as will research by Dr Deneb Karentz, of the Department of Energy Laboratory and Environmental Health, University of California, San Francisco. She will survey the ability of Antarctic marine organisms to repair genetic damage caused by exposure to UV radiation. DNA molecules which carry the genetic code for cells can undergo changes in structure when exposed to UV.

If the DNA molecules are not repaired, mutations affecting the physiology of the species and the genetic makeup of future generations can occur. Existing work on DNA damage reveals three major pathways for repair.

DNA repair

Dr Karentz's experiments are designed to determine how effective the pathways for repair of DNA damage are in Antarctic organisms. In the laboratory phytoplankton and zooplankton, seaweed, some invertebrates whose shells might block out harmful rays, and possibly some terrestrial plants, will be exposed to the most harmful short wavelength radiation (UV-C) for differing periods of time. UV-C and UV-B have direct lethal effects on organisms but much of the radiation is absorbed by atmospheric ozone.

Glaciological investigations of the Siple Coast region and related projects will require the largest science support effort of the season. Hercules aircraft will put in fuel, camp equipment, and field teams, and a Twin Otter aircraft has been chartered to provide

flight support for radio echo soundings and surface surveying.

To support the studies of the Ross Ice Shelf ice streams three main camps will be established at the Crary Ice Rise drill site, the Downstream B ice stream, and in the catchment area between ice streams B and C. Camp support will be provided by the NSF contractors, ITT Antarctic Services.

Glaciologists led by Dr Charles R. Bentley, Department of Geology and Geophysics, University of Wisconsin, Madison, will work at Downstream B (DNB) and the catchment area (CBC). They will study the configuration, physical properties, and dynamics of the ice streams, and also

U.S. Navy support commander

A former commanding officer of the U.S. Navy's VXE-6 Squadron, Captain Dwight Fisher, has succeeded Captain David Srite as Commander, Naval Support Force, Antarctica (CNSFA). He assumed his new command on June 24 this year.

Born in Chicago, Captain Fisher, who has been a naval aviator for 21 years, was commissioned in 1966 when he graduated from Marquette University with a B.Sc. degree in electrical engineering. Since then he has served in the United States, Iceland, the Azores, Sicily, Crete and Antarctica.

In June, 1982 Captain Fisher was posted to VXE-6 as operations officer. He commanded the squadron in 1984-85 and then attended a 10-month course at the Naval War College, Rhode Island. Promoted last year, he was then posted to Washington in the office of the Chief of Naval Operations where he was engaged in long-range planning with the Department for Manpower, Personnel and Training.

Captain Srite is now at the University, of New Mexico, Albuquerque. There he is responsible for students in the Navy's Reserve Officers Training Corps and also lectures to other students.

will do airborne radar surveys of ice streams D and E, seismic shooting, and micro-earthquake recording. With other field teams they will determine the ice movement rate and collect ice core samples.

Over thousands of years the size of the marine-based West Antarctic ice sheet has fluctuated greatly but little is known of the extent of the fluctuation or what the sheet's present dynamic behaviour is. This summer a team from the National Aeronautics and Space Administration's Goddard Space Flight Centre will continue its efforts to assess the dynamic state of the ice near ice stream B.

Surface measurements in the mouths of ice streams B and C will be finished, the network of stations in the catchment basin of all the ice streams will be continued and two holes will be drilled to bedrock with a hot water drill through the Cray Ice Rise. This is to measure drill temperature profiles and calculate the age of the rise and the migration rate of the grounding line.

Ice coring

A team of four from the Polar Ice Coring Office, University of Nebraska, Lincoln, will drill the two holes, and will also drill 10-metre ice cores at several sites on the Siple Coast to support the project. Support will also be given to the University of Wisconsin glaciologists.

A modern radar system for probing ice sheets, first tested in the 1986-87 season, will be used by Dr Richard K. Moore, Remote Sensing Laboratory, University of Kansas, and his team to support the Siple Coast investigations. The system, which can take measurements from a sledge or Twin Otter aircraft will be tested in the aircraft from Downstream B and Catchment Camp. In addition the team will continue to test the measuring capabilities of a sledge-drawn radar at the South Pole.

Low-frequency ice radar will be used by a U.S. Geological Survey team to obtain more knowledge of the internal flow and structure of ice, particularly at bedrock. Dr Steven M. Hodge, Water Resources Division, Tacoma, Washington, and his team will work at ice streams B and C. All the equipment will be

tested first on the ice shelf near McMurdo Station.

Research to be done in the remote Scott Glacier region of the Transantarctic Mountains by Arizona State University geologists will have implications for the glacial history of Antarctica. A major continental range, the mountains run some 3000km across the continent at heights of up to 4500m. They are believed to have been uplifted by thermal forces from below, creating a large rift valley and mountain system.

But unlike the majority of other major mountain ranges the Transantarctic Mountains show no evidence of the faulting, folding, and volcanism associated with uplift. Also Antarctica has not experienced the degree of seismic activity or incidence of earthquakes which typically accompany a large rate of uplift.

Dr Edward Stump and his field team will attempt to determine the uplift rates for a broad strip of the mountains 1600m wide. The four geologists will be flown from McMurdo Station by a ski-equipped Hercules which will make an open field landing near the 193km-long Scott Glacier (85deg 45min S/153deg W) in an area adjacent to the Taylor Ridge which runs along the west side of the glacier. An alternate site is on the Souchez Glacier (86deg 17min S/154 W).

Sheet relationships

One of the geologists in Dr Stump's team is a New Zealander, Paul Fitzgerald, who has worked in the New Zealand research programme with Victoria University of Wellington expeditions. He is doing post-doctoral research at Arizona State University.

Research planned to expand upon data already gathered in Victoria Land will help to determine how fast the mountains are growing. It will also explore the relationship of the East and West Antarctic ice sheets — inception, growth, and fluctuations occurred simultaneously with the mountain uplift — to tectonic events and the lack of usual seismic activity.

Rifts formed during the uplift of the Transantarctic Mountains create basins where snow and ice accumulate. These sites are uniquely suited for the recovery of ice cores

containing the history of past atmospheric events — indications of long-term climate change.

Dr Paul A. Mayewski, who heads a glacier research group in the Department of Earth Science, University of New Hampshire, and three colleagues, will spend two months in Southern Victoria Land working at sites in the Convoy, Asgard and Royal Society Ranges to gather and study in detail samples from various layers in a snowpit and in two ice cores each about 200 to 300mm long. This work will be similar to research done previously in south Greenland and the Dominion Range near the Beardmore Glacier.

Chemical analyses and examination of individual layers in each core will yield a comprehensive record of glacial history over several thousand years. Combined with existing records from ice sheets and marine cores this data will enhance the assessment of global climate change, including temperature fluctuations.

Ice and snow cores also contain particles of volcanic ash. These provide clues to the activity of Mt Erebus over long periods and of other volcanoes in the Southern Hemisphere and possibly some in the Northern Hemisphere. Such information will enable scientists to evaluate the influence of volcanic and solar activity on climate and add greatly to understanding of the chemistry of the global atmosphere.

Airborne surveys

Results of an airborne geophysical survey of Antarctic Peninsula basins will improve understanding of the relative motions of tectonic plates and interpretation of the peninsula's geology. It will also provide constraints on the time of opening Drake Passage and the evaluation of Southern Ocean circulation patterns.

To obtain magnetic and gravimetric data within the continental margins and basins surrounding the Antarctic Peninsula and southern South America the Lamont Doherty-Doherty Geological Observatory, Columbia University, New York, and the Naval Research Laboratory will use a specially-instrumented Orion P-3 aircraft.

The joint project is directed by John L. LaBrecque, working under an NSF grant to Lamont-Doherty, and the Orion has been provided by the Naval Research Laboratory.

In the 1985-86 and 1986-87 seasons more than 150,000km of geophysical data was obtained in four series of flights covering much of the previously unsurveyed western Weddell Basin. Field work this season, based on the previous season's research, will concentrate on a low-level survey of the western Weddell margin, a complete survey of the Powell Basin, and a reconnaissance survey of the western Bellingshausen margin.

Supanova 1987A

In past seasons much of the research in the McMurdo Sound area and on Ross Island has been concerned with Weddell seals, penguins, and Antarctic fishes, and the seismic and volcanic activity of Mt Erebus. This season scientists will study the spectrum of emissions from the exploding star Supernova 1987A, launching from McMurdo Station a balloon measuring 11.6 million cubic feet which will carry a gamma ray detector.

First observations

Supernova 1987A, first observed by a Canadian astronomer at Las Campanas Observatory in northern Chile on February 24 this year, is the brightest exploding star to appear in terrestrial skies since 1604. All the heavy elements in the universe are believed to be generated by thermonuclear processes in the supernova.

Outward shock waves are emitted by the exploding star when its iron core collapses at the end of its life. The resulting violent explosion creates and disperses the heavy elements as atoms into space. Scientists from the University of Florida, led by A. Carl Rester will launch the balloon, which is expected to reach an altitude of 120,000ft. The gamma ray detector which it will carry was originally designed for use on the American space shuttle.

Better results are expected because of the high latitude location, the clear, dry atmosphere, and the light winds in January. These should enable measurements of the

gamma ray spectrum to be made with a high degree of sensitivity and over a much longer period than is possible for any other location.

Results of the research will help verify theories about the forging of elements in supernovae. They will also pave the way for future ground-based cosmological studies in Antarctica.

Micro-processors

Small submersible micro-processors, electronic markers, and radio transmitters now enable biologists to study Weddell seals in and out of the water in McMurdo Sound. Dr Gerald Kooyman, of the Scripps Institution of Oceanography, a pioneer in the development of miniaturised technology for free-ranging animal behaviour, and his team will obtain data on the physiology of diving in Emperor penguins as well as Weddell seals, working on the sea ice near McMurdo Station.

Emperor penguins, believed to be the most capable divers of all birds, will be fitted with sensing electrodes connected to a waterproof micro-processor which measures only 3cm by 15cm and weighs just 300 grammes. Fixed on the penguins' backs the equipment will collect and store — until the bird is recaptured — measurements of body temperature, heart rate, swim velocity, metabolic rate, respiration, and other factors relating to the body's adaptation and functioning when deprived of oxygen.

Free-diving

None of these data have been determined for free-diving birds, and the information obtained will be compared to results from similar studies of Weddell seals. The team will also study how the seals' diving behaviour relates to muscle blood flow.

These experiments will contribute to better understanding of how muscles regulate oxygen consumption in conditions of extreme hypoxia (lack of oxygen) and the role of cardiovascular responses to natural dives of birds and animals. The research will also reveal the foraging limits for the seals and penguins and thus shed light on the depth and geographic distribution of various species.

As part of a long-term study of the population dynamics of the Weddell seal in McMurdo Sound a field team from the University of Minnesota will continue seal studies initiated several seasons ago by Dr Donald B. Siniff at a site near Hutton Cliffs, Ross Island. The project will focus again on male territorial and reproductive behaviour, and the life span of pups born in the colonies, and the activities of and relationships between mothers and pups.

Physical and electronic markers have been used over the last two summers to identify the peak of breeding activity underwater. As males appear at the site they are tagged with proximity transmitters and small radio transmitters to record their activity in and out of the water. Females are also equipped with proximity recorders to document approaches and copulating activity by males.

Seal census

In November and December the scientists will conduct a census of the seal population in McMurdo Sound between Pram Point and Cape Evans. A survey of the west and north coasts of Ross Coast will also be made for females tagged at the pupping colonies on the eastern side of the island. This will be to establish the distribution of tagged seals and unbiased estimates of female reproductive rates.

Because penguins are major predators of krill, an important component of the Antarctic marine food web, biologists from Point Reyes Bird Observatory, California, have spent several seasons banding Adelie, Chinstrap and Gentoo penguins at Cape Thomas, King George Island near the Polish Arctowski Station. Their purpose is to study the penguins' breeding and feeding ecology.

This season Dr Wayne Z. Trivelpiece and his team will be put ashore at Arctowski in the South Shetlands from the NSF research ship Polar Duke. At Cape Thomas they will attach transmitters to penguins of known age and sex during their chick rearing periods, track them at sea by triangulation from two receiver stations, and record their behaviour using continuous strip chart records. These penguins will also carry time/

depth recorders to record simultaneously diving depth during foraging trips.

Present knowledge of the feeding ecology of the Adelies, Chinstraps and Gentoos, has been derived from stomach samples obtained ashore. The Cape Thomas study, which will compare the foraging areas and behaviour of the three groups, and, within each group, compare young inexperienced breeders with older established breeders, is expected to advance understanding of the nutrition relationships among the penguins, and test hypotheses regarding age-related foraging abilities within the species.

Mt Erebus

A New Zealand geologist who first saw bright red molten lava welling up from the active inner crater of Mt Erebus in 1972 will be back on the summit of the volcano again this summer to document the nature of and changes in its activity. Dr Philip Kyle, now of the Department of Geoscience, New Mexico Institute of Mining and Technology, has worked on the slopes and summit of Erebus with New Zealand and United States research programmes almost every season for 15 years.

Mount Erebus contains a persistent connecting lava lake which represents the top of the volcano's magma from which molten lava is ejected during eruptions. For the vulcanologists the lake is a window through which the magma chamber system can be observed.

In September, 1984 a series of large magmatic eruptions rocked the volcano. More than 200 shocks were recorded. They were probably the largest since Sir James Clark Ross discovered and named the volcano in 1841.

Observations made in December, 1984, suggest that Erebus has begun a new cycle of strombolian eruptions. These are continuous small explosive eruptions. Later observations in December, 1985, indicate that a lava lake 15m in diameter is present in a site similar to that of the former lake.

Between early November and January Dr Kyle and his colleagues will document the nature of and changes in volcanic activity on Erebus to understand better the nature, behaviour, and evolution of the magma

chamber. Samples of material ejected from the volcano will be collected for later analysis, and the scientists will also determine the temperature of the lava lake and measure the emission rate of sulphur dioxide and particulate matter.

Emission analysis

Limited sampling of trophospheric and Mt Erebus emission plume aerosol particles in the size range of 0.1 to 10 microns (micron, one millionth of a metre) suggests a relationship in size distribution and elemental composition between the two sets. In samples collected during the sustained 1983-84 eruption particles similar to those in the Erebus plume were found at an 8km altitude as far away as halfway between the McMurdo and Pole stations.

Dr Raymond L. Chuan, of the University of New Hampshire, believes that this data can be verified it indicates that Mt Erebus has a significant effect on the Antarctic trophosphere (the layer of the atmosphere in which weather occurs, below the stratosphere) and on regional ice chemistry. Many of these particles consist of soluble salts not seen in previous ice core particle studies because the ice is melted before testing.

Aerosol particles

For two months this summer Dr Chuan and his assistant, Mary Jo Spencer, will sample trophospheric aerosol particles up to tens of microns in size and correlate data from them with data on particles samples from the Erebus emission plume. Aerosol sampling in the trophosphere will be done from a Hercules aircraft on flights between McMurdo Station and inland stations. A multi-stage cascade impactor that uses piezo-electric crystals as collectors will make mass measurements of the aerosols in size-segregated bands and retain samples (on the collector crystals) for post-flight analysis.

Freeze-drying techniques will be developed to obtain particles for analysis from ice cores taken near Erebus. A U.S. Navy helicopter will land the scientists on the slopes of Mts Erebus, Terror and Terra Nova to obtain snow and ice samples.

Hercules destroyed: two dead in Wilkes Land crash

Two men were killed and nine injured, one seriously, when a United States National Science Foundation ski-equipped Hercules crashed in Wilkes Land on the morning of December 9. The aircraft, flown by a US Navy VXE-Squadron crew of seven, and carrying four passengers, caught fire and was destroyed.

The Hercules was on a resupply flight from McMurdo Station to D59 (68deg 20min S/137deg 21min E), a staging point for French geological traverses in East Antarctica. A United States recovery team has been camped near D59 since mid-November to repair another Hercules, Juliet Delta 321, which was badly damaged on December 4, 1971, while supporting a French traverse towards the Soviet Vostok Station, and remained buried in snow and ice for 15 years until brought to the surface on December 25, 1986.

Of the four passengers aboard the Hercules on December 9 two were killed. They were:

Lieutenant-Commander Bruce Bailey (45), maintenance worker, San Diego, California.

Petty Officer Donald Beatty (24), Waterdale Lakes, Florida.

Another passenger, Lieutenant-Commander Einar Corelli (45), Washington State, received serious leg injuries. The other eight injured suffered cuts and bruises, and one man's ribs were broken.

Observers at the D59 camp saw the Hercules veer off the 2438m skiway after a wing tip hit the snow, and then crash and catch fire. Some members of the recovery and support teams — there were 20 on the ice at the time — tried to extinguish the fire with the limited fire-fighting equipment available. Others bravely entered the aircraft to locate and bring out the injured.

Because of operational demands a medical emergency team was unable to reach the crash site until about 6 p.m. Its aircraft landed in deteriorating weather on the skiway which is 1389km north-west of

McMurdo Station — a seven-hour return flight — and 217km inland from the French Dumont d'Urville Station at an altitude of 1828m on the Polar Plateau. The nine injured and the two dead were flown back to McMurdo Station, arriving late in the evening. After preliminary treatment in the station hospital four of the injured were flown to Christchurch on December 10 by a Royal New Zealand Air Force Hercules and admitted to hospital.

Skiway preparations

Last summer six Americans and one Frenchman prepared a skiway and established a camp near Juliet Delta 321. In 23 days they removed the accumulated snow and ice of 15 years, the French meteorological observer sharing the work with the six Americans, and brought the aircraft to the surface on December 25, 1986. The four engines and three undamaged propellers were taken to McMurdo Station on one of 14 resupply and return flights needed to support the operation carried out by ITT Antarctic Services, support contractors to NSF.

In mid-November this year preparations for the repair of Juliet Delta 321 so it could be flown to Christchurch by way of McMurdo Station in January were begun. A small team was flown to D59 by a chartered Twin Otter to prepare the skiway and re-open the camp. VXE-6 crews then began flights with supplies, additional materials, and staff for the two-month operation.

Repairs to the Hercules are being carried out by a recovery team from the Naval Air Rework Facility, North Carolina, and the

aircraft makers, Lockheed-Georgia Company. Camp support is provided by an ITT Antarctic Services team which also operates all heavy equipment.

Major repairs to Juliet Delta 321 for its flight from D59 will include replacement of all four engines and propellers, and in-

stallation of flight instruments removed at the time of the 1971 crash. Main and nose struts will also have to be replaced, and skin damage repaired or patched. When the Hercules crashed on December 9 it was bringing an engine and propeller and starting equipment to D59.

U.S. mercy flight to South African station

A South African radio technician suffering from kidney stones and at risk of renal failure was flown from Sanae IV, the South African base in Queen Maud Land, to McMurdo Station early in November by a ski-equipped Hercules aircraft. To bring the technician, 26-year-old Louis Roode, of Kempton Park, near Johannesburg, back to McMurdo Station for medical attention a United States Navy VXE-6 Squadron crew flew 1840 nautical miles across Antarctica to land on the snow-covered Fimbul Ice Shelf near Sanae IV. The round trip was 3731 nm.

After 40 minutes on the ice the Hercules flew another 1891nm by way of the Amundsen-Scott South Pole Station where it stopped for refuelling, and on to McMurdo Station. Louis Roode, whose condition had been monitored during the flight, was taken immediately to the station dispensary where Lieutenant-Commander Ker Boyce, the Naval Support Force, Antarctica, medical officer, determined that he was not approaching renal failure and could travel to Christchurch by a scheduled U.S. Air Force Starlifter.

Sanae IV at 70deg 18min 36sec S/02deg 24min 10sec W on the Princess Martha Coast was manned this winter by 15 men who had been isolated since December 12 last year. They were due to be relieved in the first week of December by the research and supply ship Agulhas. Medical facilities, equipment, and supplies are available at the station and the winter team includes a medical officer. In the summer the Agulhas and its two Puma helicopters can give assistance when the ship is near the station.

But Sanae IV has no permanent airfield. Twin Otters and other such light ski-equipped aircraft can land on non-treated snow. There are no radio aids for navigation or instrument landing facilities.

On October 20 — his birthday — Louis Roode, who was spending his first winter in Antarctica, developed pain in his back. The medical officer, Dr W.P. Venter, diagnosed kidney stones with complications which could lead to renal failure. When the winter leader, Steven Comfort, reported this to the Antarctic Division, Department of Environment Affairs, Pretoria, a request was made to the U.S. National Science Foundation for assistance.

Immediately after McMurdo Station was advised of the situation Lieutenant-Commander Boyce tried to call Sanae IV but could not make the connection because of atmospheric conditions. He then used the INMARSAT marine satellite station to call the South African Antarctic Division and obtain the latest information.

In the evening Lieutenant-Commander Boyce achieved a garbled communication with Sanae IV and found that Roode's condition was stable. Communications with Pretoria and Sanae IV on Sunday, November 1, indicated that Roode's condition was not critical but that routine evacuation for a potentially serious medical condition was necessary.

Bad weather at Sanae IV delayed the start of the flight until the afternoon of Tuesday,

November 3. A 3600-gallon internal fuselage fuel tank was installed in the Hercules, which is operated for NSF by VXE-6, and it carried about 1152 gallons of extra fuel for the direct trip of 1840nm to the Fimbul Ice Shelf.

With a crew of 11 and medical assistance on board the Hercules lifted off the annual ice runway in McMurdo Sound at 2.45 p.m. (local time) on November 3. The aircraft was piloted by Lieutenant-Commander Bradley Lanzer with Lieutenant Chris Callahan as his co-pilot. Also aboard were a VXE-6 medical officer, Lieutenant-Commander David Mills and a medical corpsman, Chief Petty Officer Dennis Overley.

Charted by grid

Lieutenant-Commander Lanzer flew without the usual ground-based electronic navigation aids, charting a course by the sun and his position on the Antarctic grid system. The Hercules covered the 1840nm to Sanae IV in 6hr 45min, flying a straight line and passing 115nm from the Pole.

Steven Comfort and his men had prepared a skiway but it was too close to a station building so Lieutenant-Commander Lanzer did a ski drag nearby to test the surface and then landed at an elevation of 62m on a surface he described later as smooth as McMurdo Station's Williams Field.

The crew of the Hercules were the first people the South Africans had seen for more than 10 months. They had prepared a meal for their visitors but the time factor prevented the Americans from enjoying the station's hospitality. Louis Roode said goodbye to his 14 colleagues and the Hercules took off for the Pole Station.

Refuel at Pole

Only about 4hrs 20min later the aircraft which had covered another 1163nm landed at the Pole to refuel. The temperature there was minus 53deg Celsius, and 16 men and one woman, Dr Nancy Schnaffner, the station doctor, who have been isolated for more than eight months, welcomed their visitors.

As Louis Roode's condition was still stable when he arrived at the Pole he was given a

short tour of the station during the refuelling and was presented with a certificate confirming his visit. Nearly 30 years ago another South African, Hannes la Grange had come the same way but in the Snocat Haywire with the Commonwealth Trans-Antarctic Expedition.

Favourable winds were encountered on the last leg of 728nm to McMurdo Station which was covered in 2hrs 55min. Slightly less fuel than planned was used and the Hercules completed its 3731nm round trip in 14 hours flying time when it landed at 7.34 a.m. (local time) on Wednesday, November 4.

Death under sea ice

A diving accident under the sea ice in Explorers' Cove, New Harbour, about 80km west of McMurdo Station, claimed a research assistant's life on November 14. He was

Mark T. MacMillan, aged 22, of San Jose, California.

A graduate of the University of California, Santa Cruz, Mr MacMillan was a certified diver with experience off the northern California coast. He was flown to McMurdo Station by helicopter for emergency treatment after the accident but was found to be dead on arrival.

Mr MacMillan was a member of a research team headed by Dr William L. Stockton, Marine Biology Research Division, Scripps Institution of Oceanography, University of California, San Diego. He was taking part in scuba operations from a portable laboratory/diving hut placed on the sea ice to complement the field camp on shore at New Harbour which was established last season and opened again early this summer.

Dr Stockton's team was engaged in study of the growth, predation and mortality in Antarctic foraminifera and the effects on community structure. Foraminifera, minute single-celled organisms, are a numerically important component of the shallow-water benthos of Explorers' Cove.

When he arrived Louis Roode was able to walk. After it had been decided that his condition was stable enough for him to join the Starlifter flight he was able to make a short tour of the station. The 2085nm flight to Christchurch took only 5hrs 36min and soon after 11 p.m. the South African was in another country.

Another Naval Support Force medical of-

ficer, Lieutenant Harry Koerner, and a medical corpsman, had accompanied Louis Roode on the Starlifter to monitor his condition and treat any necessary rapid change. In hospital he was examined by an urologist and certified fit to fly home. He left Christchurch for Johannesburg on the night of November 6.

Sub-Antarctic

Nella Dan sinks at Macquarie Island

Australia's chartered Antarctic resupply vessel Nella Dan ran aground at Buckle's Bay on Macquarie Island, 1535 km south east of Tasmania, on December 3. In spite of severe damage she was refloated on December 23, but immediately began to take water. She was towed into deep water and sank after exploding in flames on December 24, only 24 hours after her owners and salvagers had announced their decision to scuttle her. There was no injury or loss of life among the 49 passengers and crew. The Canadian ship Lady Franklin has been chartered to replace the Nella Dan for this season only. With the exception of the marine science cruises she is expected to be able to complete the planned programme with a revised schedule.

High seas and strong winds had greeted the Nella Dan as she arrived off Buckle's Bay on the north west side of Macquarie Island and began unloading fuel. She dragged anchor and by 8 p.m. local time was hard aground on the rocks in the Bay, badly holed and having suffered considerable damage. The crew secured her ropes to the rocks and she was stabilised by opening the sea cocks and filling the ballast tanks. The vessel was without power, lighting or radio and at risk of capsizing. With the exception of Captain Arne Sorensen, three officers and the bosun all passengers and crew were taken off using amphibious army-operated vehicles. Over the next few days several tonnes of cargo and scientific gear were offloaded.

Accommodation on the Island was fully stretched with only 32 sleeping berths available at the remote weather station. Last winter's team and their replacements

were already at the meteorological base along with a summer party. Personnel from the Nella Dan and the crew of 32 brought the Island's population to 107. The extras slept in the dining and stores rooms.

The Nella Dan was making her second visit to Macquarie Island as part of the third of her four cruises for the season, in which eight were scheduled. During the sea legs of the journey, which was to take her to Macquarie Island, Commonwealth Bay and back to Macquarie, marine science programmes were to have been carried out.

En route from Davis to Hobart on her first voyage of the season, Icebird was diverted at news of Nella's grounding and arrived at Macquarie on December 8.

In ideal conditions the passengers and crew were transferred from shore to ship by Icebird's two Squirrel helicopters and

army amphibious craft. She also took on board ten tonnes of stores and scientific equipment. The expeditioners arrived back in Hobart on Saturday, December 11. Icebird was already running late having been delayed by ice conditions during resupply of Antarctic continental stations on voyage three.

Divers, experts from the salvage company Australian offshore services and the representatives of the Nella Dan's owner, the Danish Lauritzen Line, arrived at Macquarie on board the P & O oil rig supply vessel Lady Lorraine on Thursday December 17. In addition to salvage equipment the Lady Lorraine carried gear for removing the last of the oil from the Nella Dan and mopping up spills. The

ships task was to examine the Nella Dan and determine whether she should be towed back to a shipyard for repairs or scuttled.

At high tide on December 18 the salvage team placed ballast into the stern and pumped air into the ships hull and the crew inspected her for the first time to see if she would survive the long tow back to Melbourne. Subsequently it was decided to try and pull her off the rocks for a full inspection by divers. Expeditioners from the Island assisted the remaining crew and personnel from the Lady Lorraine in

Nella Dan hard aground on rocks, N.W. corner of Macquarie Island.



removing several tonnes of equipment and supplies to lighten the Nella Dan.

Early in the morning of December 21 the first of three attempts to refloat the vessel was abandoned after she had pulled round so that the bow pointed towards open water instead of parallel to the shoreline. The ship moved with the swell. A second attempt was frustrated by 40 knot winds and heavy seas. The third attempt at high tide on Wednesday 23 December was successful and she was anchored in deep waters several hundred metres from the shore on the north east tip of the Island.

Following a diving inspection it was decided to abandon salvage attempts as damage to the ship was worse than expected and she could not be safely towed back to Melbourne. Expeditioners, the crew from the Lady Lorraine and those who had remained on the island from the Nella Dan were removing all salvageable equipment when at 5 p.m. on December 23 the engineer noticed the ship sinking faster than was expected and raised the alarm. The Nella Dan was abandoned, along with about \$500,000 of salvage equipment, and towed out to sea for scuttling. The ship survived the night, but next morning a fire broke out on board,

possibly caused by an over-heated pump. The fire continued until the ship eventually sank in about 5000 metres of water at 7.42 p.m. local time on Christmas Eve in sight of Macquarie Island. The last of her crew arrived in Hobart early in the evening of December 28 on board the Lady Lorraine.

The 27 year old Nella Dan is believed to have made more Antarctic voyages than any other polar ship. During the 26 years that she was chartered by Anare she completed 93 voyages and sailed more than 910,000 kilometres. Her temporary replacement, the 4500 tonne Canadian-owned Lady Franklin was previously chartered by ANARE for its Antarctic operations in 1982-83 and 1983-84 before the newly built Icebird came into service. She was due to arrive in Hobart on January 25 and leave on the final voyage of the season on January 27. The Lady Franklin will complete resupply of Mawson, Davis and Casey and visit Heard Island, to take off scientists studying the island marine ecology in a three-year summer programme ending this season. Although this final voyage has been delayed by four weeks it is well within the operating window for ice conditions.

Sixth expedition to Snares

Monitoring programmes which can be operated by any scientific party visiting the sub-Antarctic Snares Islands, 181 nautical miles south-west of Bluff, have been initiated by the University of Canterbury zoology department which sent its sixth expedition to the remote group this summer. The purpose of the project, which will be expanded in the next two years, is to obtain descriptive information on a variety of key species of bird life each year. This will help scientists to detect sudden changes in population or structure which may indicate a disaster in the making.

As in previous years the zoology department received a Government grant to assist its biological research this summer.

The primary purpose has been to provide surveillance of the main island — North East Island — to check that no rodents reach it from fishing boats.

This year the Department of Conservation paid the cost of transport to and from the islands. Because fishermen have almost ceased using the Snares for mooring purposes transport has become more difficult and costly. (Only one fishing boat visited the group last summer.)

To charter the former research vessel Acheron, now the Stewart Island ferry, cost \$10,000. But when the vessel took the University of Canterbury team from Bluff on November 7 it brought back two members of the Invercargill staff of the

DOC who had been on the islands for a month, and there was a DOC botanist with the five scientists from Christchurch.

Leader of this year's expedition was Dr Ian McLean, a senior lecturer in zoology, who co-ordinated the 1986-87 programme. Research projects in 1987-88 included completion of research on parent/chick recognition in crested penguins started in 1986, and the continuation of work on seabirds and the New Zealand snipe which has extended over several seasons.

One scientist, Paul Sagar, of the Fisheries Research Division, Ministry of Agriculture and Fisheries, worked for a fifth summer studying Antarctic terns. It was his third year of work on Cape pigeons. Colin Miskelly made his sixth visit to the Snares to tidy up his field study of the biology and breeding behaviour of the New Zealand snipe which is confined to only a few sub-Antarctic islands. He went back this summer to establish how the birds had survived the winter and to determine the time of breeding.

Three members of the party were engaged in studies of the crested penguin. The parent/chick recognition project was conducted by Dr McLean and a B.Sc. honours student, Fiona Proffitt. The other

penguin investigation was made by Joe Waas, who is completing a Ph.D. He is a Canadian graduate from Ontario. In addition to penguin studies Dr McLean investigated the indigenous tomtits and fern-birds to see if they can recognise predators.

During their stay from October 10 to November 7 Rhys Buckingham and Peter Willemse were engaged on work related to DOC rodent control contingency planning. This is designed to guard against the risk of rodents reaching those sub-Antarctic islands which are nature reserves. The risk exists with any parties visiting the Snares or Adams Island in the Auckland Islands nature reserve whether they are scientists or not.

Strict quarantine procedures are now being arranged for parties visiting the nature reserve islands. A full set of rodent poison bait stations will be based in Invercargill for immediate use if rodents reach the reserves.

Messrs Buckingham and Willemse spent some time evaluating the most ideal design of rodent bait station which could be used without endangering endemic fauna by the use of poison. They also put permanent bait stations in areas where there was the greatest risk of rodents coming ashore.

Greenpeace III

Resupply, base extensions, environmental monitoring in 5 month programme

Greenpeace, the international environmental organisation, which sent its third expedition to Antarctica in January, plans to continue its programme of environmental monitoring of scientific stations in the Ross Dependency, on the coast of East Antarctica and also in the Antarctic Peninsula region. This year's voyage will be in two legs, the first to the Ross Sea area in January and February and the second to the Antarctic Peninsula Region in March and April but the final programme, with its budget of US\$1 million, will depend on ice conditions.

The first priority is the resupply of the World Park Base at Cape Evans on Ross Island established in January 1987. Four new volunteers will replace those who have been at the Base since February 14.

The new team will be led by Keith Swenson, an American mountaineer with Antarctic winter and climbing experience. In October last year he trained the other members of his team in basic mountaineering skills and Antarctic survival techniques at Mt Cook. Dr Lynn Horton (35), the base doctor, was born in New York, qualified in Pennsylvania, and was in private practice in California. Base scientist is a 30-year-old West German geologist, Dr Sabine Schmidt,

whose interest in northern and Arctic regions led to extensive travel in Canada and Alaska.

Communications will be the responsibility of a 37-year-old radio engineer with considerable Antarctic experience. Sjoerd Jongens was born in Holland and migrated to Australia in 1976, later joining ANARE.

They will replace the present team of three New Zealanders, Kevin Conaglen (leader), Justin Farrelly (radio operator), Dr Cornelius van Dorp (doctor) and a West German woman biologist Dr Gudrun Gaudian.

Greenpeace III is headed by 41-year-old Peter Wilkinson, who was also campaign co-ordinator aboard Greenpeace on the first two expeditions. His assistant is Dr Margriet de Poorter, a 30-year-old Belgian biologist who held the same position on the second expedition. Henk Haazen, an assistant engineer from Holland, withdrew from the position of logistics organiser for family reasons. Some of his duties will be undertaken by the second helicopter pilot, Peter Malcolm. An American carpenter, Marc de Fourneax, a Polish scientist and Wojciech Moskal, an oceanographer from Gdansk, are also part of the summer team.

Master of the Greenpeace is Captain James Cottier who took the ship south in the summer of 1986-87. Born on the Isle of Man he now lives in New Zealand. His first and second mates, Kenneth Ballard and Robert Graham (Christchurch), sailed with him on the second expedition. The third mate, Bernadette Clarke, is Welsh.

Seven countries are represented in the crew of 10 men and four women. In addition to the second mate they include three New Zealanders — the second engineer Nolan Loveridge, comes from New Plymouth; the electrician, Stephen Miller, is an Auckland and Garry Baldwin, one of the two assistant engineers, is from Christchurch. In the engine room the Greenpeace has a West German chief engineer, Egon Wadle, an Australian third engineer, Edwin Addicott (Sydney) and a Swedish assistant engineer, Torbjorn Ericson. The ship's radio operator, David Woollan, is British and held the same position in the second expedition. Deckhands are American Margaret McCaw and Austrian Werner Stachl. One cook, Barbara Breuer is a West German and the other, Victoria Carpenter, is a Californian.

For ice reconnaissance and aerial photography the team has Hughes 500D and 300 helicopters which will also provide support for work at the Cape Evans Base, operations on Ross Island and visits to other bases. Chief pilot

Garry Dukes, an Australian, was in charge of the unit in the 1986-87 season. Second pilot Peter Malcolm is an Englishman who has flown helicopters in the Royal Navy's Fleet Air Arm between 1979 and 1981, was watch leader on the brigantine Eye of the Wind on her voyage to Australia in 1981, joined the Footsteps of Scott expedition in 1983 and was aboard the Southern Quest when the ship sank near Beaufort Island in January 1986. Engineer is Roger Maisey from Taupo.

With 32 men and women on board Greenpeace headed south at 9 a.m. on January 23 after being delayed at Lyttelton for nearly two weeks with trouble to her two engines. She sailed from Auckland on December 28, called at Wellington over the New Year and arrived at Lyttelton on the morning of January 4. On January 8 the ship departed for Ross Island but was back in port on the morning of January 10 after slightly more than 36 hours at sea, having covered 43 nautical miles. Late on the night of January 8 the starboard engine failed because of damage to the cylinder linings. Back in Lyttelton the engineers also found evidence of wear in two cylinders and parts were ordered from West Germany for repairs and from the Netherlands as spares for the voyages.

MV Greenpeace is now expected to reach Cape Evans in late January, early February and in addition to resupply will provide additional working space at their own base hut with the reassembling of the Footsteps of Scott's hut and a covered way between them and improve communications with the building of a 10 metre high satellite tower.

As well as monitoring other Antarctic bases Greenpeace will assess and monitor the impact of human occupation around the site of its own base. Soil, ice and snow samples within a three-mile radius will be taken and examined for possible pollution. Nearby melt lakes and the impact of dust on snowdrifts will be monitored and the behaviour and nesting activities of skuas near the base will be studied. Environmental effects of a new wind generator to be installed and support facilities will also be monitored.

Conditions permitting expedition mem-

bers will visit Scott Base, McMurdo Station, the Italians at Terra Nova Bay, the small West German station, Soviet and French Bases before returning to Lyttelton for two days in port to refuel and make crew changes in preparation for the second leg of the voyage.

If the decision to continue is favourable MV Greenpeace is expected to head for the Argentinian port of Ushuaia, Tierra del Fuego. Additional crew and supplies will be taken on during the three or four days the ship is in port and she will then head for the Antarctic Peninsula region where the programme will concentrate on King George Island in South Shetlands, which is one of the most accessible areas in Antarctica by sea and air.

Argentina, Brazil, Chile, China, Poland, Soviet Union and Uruguay now have stations on the Island which is 69 km long and 25 km wide at its broadest point. South Korea has established a base there this summer and Peru and Ecuador sent expeditions in January to do the same.

Greenpeace claims that the island is overcrowded and research being done is largely replicative. The expedition proposes to examine each base in terms of its impact on the surrounding environment, and the cumulative effects of all the bases on the island ecology.

(Full details of the science and environmental monitoring programmes and the second voyage will appear in the next issue of "Antarctic".)

Scott-Amundsen descendents shelve South Pole reunion

Ten descendants of Scott and Amundsen and the teams they led to the South Pole have shelved plans for an expedition by air which would have retraced the routes followed by their forebears. Scott's grandson, R. Falcon Scott, and Amundsen's great-niece, Anne-Christine Jacobsen (nee Amundsen) met the other descendents for the first time in London on July 31 when proposals for a commemorative reunion at the Pole were announced.

Three months later Paul Lynch, a 23-year-old former supermarket manager, who spent more than two years organising the project — estimated to cost £250,000 — announced that lack of funds had forced its postponement for a year. "People offered moral support but not open cheque books," he said in London on November 3.

New efforts will be made to raise the necessary money. If funds are not available a smaller expedition may be mounted in 1988 with just Falcon Scott, Anne-Christine Jacobsen, Patrick Lynch and Vernon Cooper, of Kentucky, who has already indicated he would put up £100,000 for the new venture and wishes to be included in the party.

Originally the expedition, which included Mr Lynch and a documentary TV crew of three, planned to fly to Chile in November and begin its Antarctic journey from Punta Arenas, Tierra del Fuego, aboard Adventure Network's two Twin Otter aircraft which are fitted with both skis and wheels for polar operations. The route planned was first to a base camp in the Patriot Hills (80deg 20min S/81deg 25min W) which are in the Heritage Range of the Ellsworth Mountains. Fuelling stops were to be made at Chilean Air Force bases on King George Island and Adelaide Island off the Antarctic Peninsula.

From the Patriot Hills the Twin Otters were to have flown the party to another base in the Hart Hills (85deg S/90deg W) area near the Thiel Mountains about 556km from the Pole. After reaching 90 degrees south and visting the Amundsen-Scott South Pole Station the party intended to fly north to Cape Evans and land on the sea ice so the descendants could visit Scott's hut.

Then the return flights was designed to take the 14 men and women across the Ross Ice Shelf to the Bay of Whales where Amundsen put his base camp and back to

the Pole by way of the Axel Heiberg Glacier. The round trip of 12874km was expected to take two weeks, weather permitting.

Descendants of Scott and Amundsen and their teams brought together for the proposed reunion are:

Scott's Team

R. Falcon Scott. Grandson (35). Civil engineer living now Leeds.

Christopher Wilson. Great-nephew (42) of Dr Edward Wilson. Hotel manager, Cashel, County Tipperary.

William Oates-Blenkinsop. Great-nephew (48) of Captain Lawrence Oates. Retired accountant, Putney.

Edward Evans. Grandson (48) of Petty Officer Edgar Evans. Self-employed electrician, Swansea.

John Ranwell. Cousin (42) of Lieutenant Henry Bowers. Prison officer, Parkhurst, Isle of Wight.

Amundsen's Team

Anne-Christine Jacobsen (nee Amundsen). Great-niece (42.) European travel courier.

Ellen E. Hassel. Daughter (65) of Sverre Hassel. Employed at Tonsberg water works 80km from Oslo.

Tor Wisting. Grandson (43) of Oscar Wisting. Runs communications business in Oslo.

Helmer Hanssen. Grandson (41) of Helmer Hanssen. Danish shipping line superintendent, Aarhus, Denmark.

Margit Bjaaland. Sister-in-law (48) of Olav Bjaaland. Social worker. Lives near Oslo.

Footnote: Amundsen's great-niece will see Antarctica before the other descendants. In January she will lecture about her great-uncle to tourists aboard the Argentine supply ship Bahia Paraiso which will make six cruises in the Antarctic Peninsula area between December 6 and January 31 during its Antarctic support programme.

Erebus chalice given to Chapel of Snows

A William IV silver gilt chalice carried aboard H.M.S. Erebus by Sir James Clark Ross on his "Voyage of Discovery and Research in the Southern and Antarctic Regions during the years 1839-43" has been given to the United States National Science Foundation for use in Antarctica's first church — the tiny Chapel of the Snows on Ross Island where thousands of Americans from McMurdo Station and nearby Scott base have worshipped since 1956.

The chalice and two sets of the original communion linen were a gift from Miss Betty Bird, of Auckland, to commemorate the 75th anniversary of Scott's expedition to the South Pole which started from Ross Island.

It is appropriate that the chalice will be used in the Ross Island community's church because Miss Bird's great-great-grandfather, Lieutenant Edward Joseph Bird, was senior lieutenant of the Erebus

which, with H.M.S. Terror, first sighted Mt Erebus on January 28, 1841. Ross named the western promontory at the foot of the volcano "Cape Bird". McMurdo Sound, first named McMurdo Bay, bears the name of Bird's opposite number in the Terror, Lieutenant Archibald McMurdo.

Miss Bird's ancestor was a lifelong friend of Ross and one of this two right-hand men on the great voyage. The other was Commander Francis R. M. Crozier whose name was given to Cape Crozier. Ross, Crozier, and Bird had all served on the second, third, and fourth Arctic voyages led by Sir William Edward Parry. Bird was a midshipman in the Hecla on the second voyage and in the Fury on the third voyage.

After the third voyage Bird was promoted to lieutenant. In 1827 Parry attempted to reach the North Pole from Spitzbergen with the Hecla. On this voyage Bird was second-in-command of Ross's

boat Endeavour, one of two ship's boats hauled across the Arctic ice to within 435 nautical miles of the Pole.

Ross held Bird in high regard. When the Admiralty received his report of the first Antarctic voyage Bird was promoted to commander on his recommendation, and

to captain when the expedition returned in 1843. In 1848-49 he went as captain of the Investigator and second-in-command to Ross in the first expedition of two ships sent to search for the lost Franklin expedition. He reached the rank of vice-admiral on the retired list.

Obituaries

Sir Charles Fleming and New Zealand's Antarctic interests

Sir Charles Fleming (KCB, 1977), one of the leading scientists in New Zealand this century, who died in Wellington on September 11, aged 71, was closely associated with sub-Antarctic and Antarctic affairs during his long and distinguished career in geology and biology. He began his scientific life as an ornithologist in 1939, producing a book on birds of the Chatham Islands, served with the wartime Cape Expedition as a geologist and coastwatcher on the Auckland Islands, and as a member of the New Zealand Antarctic Society in 1950 was on the sub-committee which produced a plan for New Zealand participation in Antarctic research.

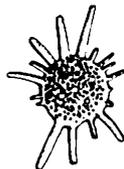
Born and educated in Auckland Sir Charles, who joined the New Zealand Geological Survey in 1940, was chief paleontologist from 1952 until his retirement in 1977. He was internationally recognised as a geologist, particularly for his work on molluscs, as a biologist for his studies of birds, insects, and the evolution and distribution of animals and plants, and as a science historian. His services to science and conservation were recognised by a knighthood in 1977. He was elected a fellow of the Royal Society (NZ) in 1951, was president from 1962 to 1966, and became a fellow of the Royal Society (London) in 1967.

As a member of the Antarctic Society Sir Charles not only played a leading part in persuading the Government to establish a scientific station in the Ross Dependency; he also assisted in the production in 1952 of the society's first major publication, "The Ant-

arctic Today", a mid-century survey of some of the problems of polar research. His contribution was an authoritative chapter on the waters of the Southern Ocean encircling Antarctica. That was not the end of his Antarctic interests. In 1956 he was the first chairman of an advisory committee set up by the Royal Society to ensure continuity of research in the Ross Dependency.

Major-General R.A. Smart, who died on November 6 last year, aged 72, was leader of the main party of the Royal Society's International Geophysical Year expedition to Halley Bay where he served from late 1956 to early 1958. Educated at Aberdeen University, he qualified in Medicine and had a distinguished career as an officer with the Royal Army Medical Corps in which he served from 1936 to 1972.

Colonel Robin Smart was appointed to lead the Royal Society expedition because of earlier polar work in Arctic Canada and Alaska between 1948 and 1950. For his work at Halley Bay he was awarded the CBE and the Polar Medal. In 1973 he resided in the Tower of London as medical officer to the Yeoman Warders, and was also chief medical officer to Esso Petroleum, retiring finally in 1979.



New Zealand veteran of two Byrd expeditions

One of only four New Zealanders who took part in Rear-Admiral Richard E. Byrd's first two Antarctic expeditions in 1928-30 and 1933-35, John Harold Morrison, died in Dunedin on May 15 this year. He was 85. The three other men were J.N.F. Newbold, A.B. Robinson, and J. Robinson. H.R. Young, who was in the crew of the *City of New York* on the first expedition and wintered at Little America II in 1934, came from New Zealand but was a former Royal Navy diver.

John Morrison joined the *Eleanor Bolling* as fourth engineer in 1929. She was an 800-tonne cargo vessel, formerly the *Chelsea*, and was renamed *Eleanor Bolling* after Byrd's mother. Her top speed was only nine knots but she was still faster than the 515-tonne wooden auxiliary barque *City of New York*, the primary expedition ship.

When the *Eleanor Bolling* returned from her last voyage to the Bay of Whales and left New Zealand on April 1, 1930, John Morrison was one of seven New Zealanders invited by Byrd to remain with the expedition until it reached New York. At one of the many welcome home functions he impersonated (by mutual consent) one of the ship's radio engineers, Lloyd Grenlie.

Impressed

Although John Morrison said little about his Antarctic experiences during the many years he lived in Dunedin, it is known that he was one of the New Zealanders whose service impressed Byrd, who was happy to take him on the 1933-35 expedition. This time he joined the flagship, an 8000-tonne steel cargo ship named *Jacob Ruppert* which made two voyages to the Bay of Whales. An aging veteran of the Pacific timber trade as the *Pacific Fir*, she was reconditioned and renamed after a New York brewer, Colonel Jacob Ruppert, one of the largest contributors to the expedition.

During his later years in Dunedin John Morrison renewed his interest in Antarctica. He did not join the New Zealand Antarctic Society but enjoyed the Dunedin branch mid-winter reunions to which he was taken by John Darby, deputy director of the Otago Museum, who kept in regular touch with him.

John Morrison spent the last seven months of his life in a home for elderly people outside Dunedin. John Darby, who visited him several times before his death, was impressed by his remarkable recall of events of the first expedition. One memory, accompanied by "quite a wicked chuckle" the night he and Larry Gould spent on the town when the *Eleanor Bolling* called at Papeete.

Dr Laurence Gould, second-in-command of the expedition, and its geologist, is now one of the seven American survivors of the crew and winter party. Recognised as America's most distinguished living polar explorer and scientist, he lives in Arizona and will be 91 this year.

Born in Southland where his father ran an hotel, John Morrison was educated at Otago Boys' High School and spent most of his life in Dunedin. He travelled in the United States early in the 1920s and spent many years in merchant shipping. He also farmed in Southland for some time. In World War II he was on home service with the Army from 1941 to 1945.

Footnote: Of the 56 men from New Zealand listed as having served with Byrd's two expeditions four were actually from other countries. The Englishman, H.R. Young, made only one voyage south in the *City of New York*. P.J. Dymand and B.W. Skinner were Americans who came with the second expedition and stayed in New Zealand. A.C. Brustad, like Young, was on the *City of New York's* last voyage in 1930, and was a Norwegian who became a guide at Mt Cook after his return from C.A. Larsen's pioneer whaling voyage to the Ross Sea in 1923-24.

Books

Antarctic Obsession

A personal narrative of the origins of the British National Antarctic Expedition 1901-4 by Sir Clements Markham.

Sir Clements Markham, Bluntisham Books and the Erskine Press, Alburgh, Harleston, Norfolk IP 20 OBZ, ISBN 0 948285 09 5, hardback 179 pages, price £14.95

The personal narrative of Sir Clements Markham of the origins of the British National Antarctic Expedition of 1901-4 is among Bluntisham Books' latest additions to the libraries of polar buffs.

It provides a previously unpublished personal account of the starting of the expedition, its objects, the abortive campaign of 1885-89 and the effort for a Naval Expedition from 1893-97. In a second section, entitled *An Antarctic Expedition* by two societies, details are given of fund raising, plan of operations, complement and instructions, the appointments, two periods of executive work, the departure, plan of operations, instructions, ship, officers, civilians, idlers and letters. In conclusion the third section contains an, at times stinging, account of the history of the joint committee.

Although the origins and planning of Scott's first expedition are already well-known through the various published accounts and through subsequent interpreters, most recently Huntford, "Antarctic Obsession" provides a new insight both into the extraordinary character of Sir Clements Markham, a remarkable promoter of polar exploration, and into the reasons why the British persisted for so long with substantial naval input and cumbersome planning of such expeditions.

Described by his cousin as "having great personal charm and a lovable disposition and wondrous kindness and sympathy for those in distress" Markham's capacity to be difficult, obstinate and cantankerous is rather more evident from this book. Indeed, as Clive Holland notes in the introduction, Markham believed he had a prescriptive right to control Antarctic exploration and was downright scornful of

others who sought to organise expeditions without his authority.

Born at Stillingfleet in Yorkshire, in 1830, Clements Robert Markham enrolled as a naval cadet at the age of 14 and, hating the discipline, served unhappily for the next seven years. As midshipman on the Assistance during Captain H. T. Austin's 1850-51 abortive search for the Sir John Farnklin's 1845-48 missing North west passage expedition however, he learned the benefits of naval camaraderie and discipline as he participated in plays, lectures and man-hauling sledge search parties.

Although unsuccessful in its primary objective the expedition discovered several hundred miles of new coastline. Perhaps above all it had stimulated Markham's interest in polar exploration and shaped his ideas on how expeditions of the future should be organised.

In 1851 he resigned from the navy and during the following two years conducted an expedition to Peru to study its geography and the Incas. He subsequently joined the India Office in London where, with his attention drawn to the prevalence of malaria, he conceived a plan to carry the seeds and saplings of the cinchona tree from South America to India in order to provide a local source of quinine. This, his ultimately successful campaign to abolish flogging in the Royal Navy, his service as private secretary to the secretary of State for India and engagement as a geographer to a British military expedition to Abyssinia were only part of his activities as during these years he was elected a Fellow of the Royal Geographical Society (RGS), became secretary and subsequently president, a position he retained until his

retirement in 1888.

Through the Society he sought to revitalise British Polar exploration which had lapsed since Ross's pioneering Antarctic expedition of 1839-43 in which Ross and Victoria Land were discovered. Markham's long (and in this case shared) arousal of national and government interest in promoting and funding of a British Arctic Expedition of 1875-76 to attain the north pole and explore northern Greenland and Ellesmere Land was in some respects to parallel his experience with the National Antarctic Expedition of 1901-4. The RGS supported both and was unsuccessful in its approaches to government for financial support; the Arctic expedition was to be funded totally by treasury which through the admiralty ultimately salvaged the forthcoming Antarctic expedition — an episode excluded from the narrative.

Arctic input

Under command of Captain George S. Nares and using HMS Alert and Discovery the Arctic expedition sailed in May 1875. Markham, who had continued to participate in its organisation, was to travel as far as Greenland. The expedition wintered at the northern end of Ellesmere Island and, in spring 1876, sledge parties explored the northern coasts of the Island and Greenland, an attempt to reach the north pole failed badly and afflicted with scurvy the expedition returned home, its success overshadowed by its shortcomings.

The organising influence and restraint of those who had travelled to the Arctic in the 50s and 70s would continue through to 1901. It stamped conservatism on the planning of British expeditions and precluded any real advance in equipment or technique.

In the 1880s Markham had launched plans for the renewal of Antarctic exploration but not until elected president of RGS in 1893 that plans finally took shape. At his first council meeting he appointed a committee to report on matters relating to such an expedition.

The culmination of his efforts detailed in his book was the launching of the National

Antarctic Expedition of 1901-4 and its sequel the British Antarctic Expedition of 1910-13.

Under the command of Captain R. F. the expedition was organised along the lines of the large naval expedition of the 1850's and 1870's. Using the specially built ship Discovery Markham selected the destination of Hut Point on Ross Island and there Scott set up winter quarters in January 1902. Intending to spend one summer only but stuck fast in the ice, Discovery spent a second winter. Members explored to the south west, and to the north, and one expedition led by Scott travelled south over the Ross Ice Shelf to achieve a latitude of 82°/17 mins. Second summer sledge parties explored Victoria Land. In spite of the minimal scientific staff Markham claimed that no polar expedition had ever returned with so great a harvest of results.

Second expedition

Markham resigned from presidency of the Royal Society in 1905 but collaborated with Scott in the preparations of the second expedition of 1910 to 13. He died in 1916 knowing its tragic outcome.

"Antarctic Obsession" gives a tetchy but otherwise straightforward account of the planning and first stages of the National Antarctic expedition, a personal and partially confidential view of the various committees and their members. The coverage of the disagreements between the representatives of the Royal Society and the RGS over the relative roles of the naval and scientific staff of the expedition is naturally somewhat biased. RGS comprised veterans of Arctic exploration who favoured predominance of naval interests; all the sciences associated with exploration were after all part of traditional naval skills. Markham's vision of a primarily naval expedition placed emphasis on tasks for which naval staff were most fitted, such as geographical discovery, surveying, charting and magnetic, meteorological and astronomical observations; such skills to be employed on land as well as sea. The Royal Society's representatives sought scientific control over all facets of science

although conceded overall naval control on board ship.

The Royal Society held that their man Gregory's scientific standing and long experience as an explorer should automatically make him the unfettered leader of the land parties of the expedition, while of course, subordinate to Scott when on board ship. The admirals on the RGS, supported by Markham, would not hear of this; the naval leader must be in absolute command on land as well as at sea and must never be called on to entrust the safety of his naval ratings to any civilian.

Different versions

"Antarctic Obsession" contains both Markham's original and final versions of the instructions and for balance those which were modified and "mangled" appear in an appendix. Had they prevailed the expedition would have been profoundly different and more in keeping with today's practice of landing and wintering of (civilian) scientific staff with the ship retreating and returning the following season.

The bitter wrangling of RGS and RS representatives resulted in resignation of key members and subsequent appointment of committee of six who virtually reinstated Markham's original instructions. Gregory, a scientist and explorer with considerable experience in Africa and among the alps and glaciers of Europe resigned and with the subsequent dominance of RGS thinking, an early opportunity to depart from the unweildy and expensive pattern of naval expeditions, which had dominated British polar expeditions since the 1820s, was lost.

Completely omitted from the narrative but noted in the introduction was the episode in which Markham finally lost control of the expedition to the Government. By winning the battle of the instructions he committed Discovery to wintering in the Antarctic and the two societies to the purchase of another ship.

Short of funds to outfit Morning, his approach to the treasury was rejected and the money found elsewhere. But when its

commander William Colbeck cabled London with the unwelcome news that Discovery was still frozen in and would have to spend another winter in the ice the need for a relief expedition was imperative.

With the two societies needing a further £20,000 the Government reluctantly agreed to assist but on terms which implied a complete loss of confidence in the societies' ability to manage the affair. The absolute ownership of the relief ship Morning was to be transferred to the Admiralty. It ended Markham's role of managing owner and the years of the cumbersome overmanned and inefficient naval polar expeditions.

From then on expeditions were smaller, cheaper, better organised and platforms for science rather than adventure.

Detailed information

The publication provides other information too. Prior to leaving 178 teeth were stopped and 92 pulled out at a total cost of £62.4.5d, or 30s a man. Perhaps who cares but this information which is recorded along with the, at times, very potted biographies of all the ship's complement and other staff, and the correspondence between Markham and expedition members, gives some insight into the detailed effort a remarkable man put into the expedition's planning; he even designed at least some of the sledging flags.

It is believed that the book may initially have been written for Markham's own satisfaction but its discovery in the Scott family archives suggests it may have been intended as a memento for the commander of the expedition.

"Antarctic's" congratulations go to the Bluntisham press on this production; it provides not only a new and detailed account of the planning of a major expedition but also an insight into the thoughts and workings of a remarkable promoter of polar exploration. Although it covers a rather specialised aspect of the National Antarctic Expedition of 1901-4 it is a valuable addition to any polar historian's library. Ed.

The New Zealand Antarctic Society Inc.,



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