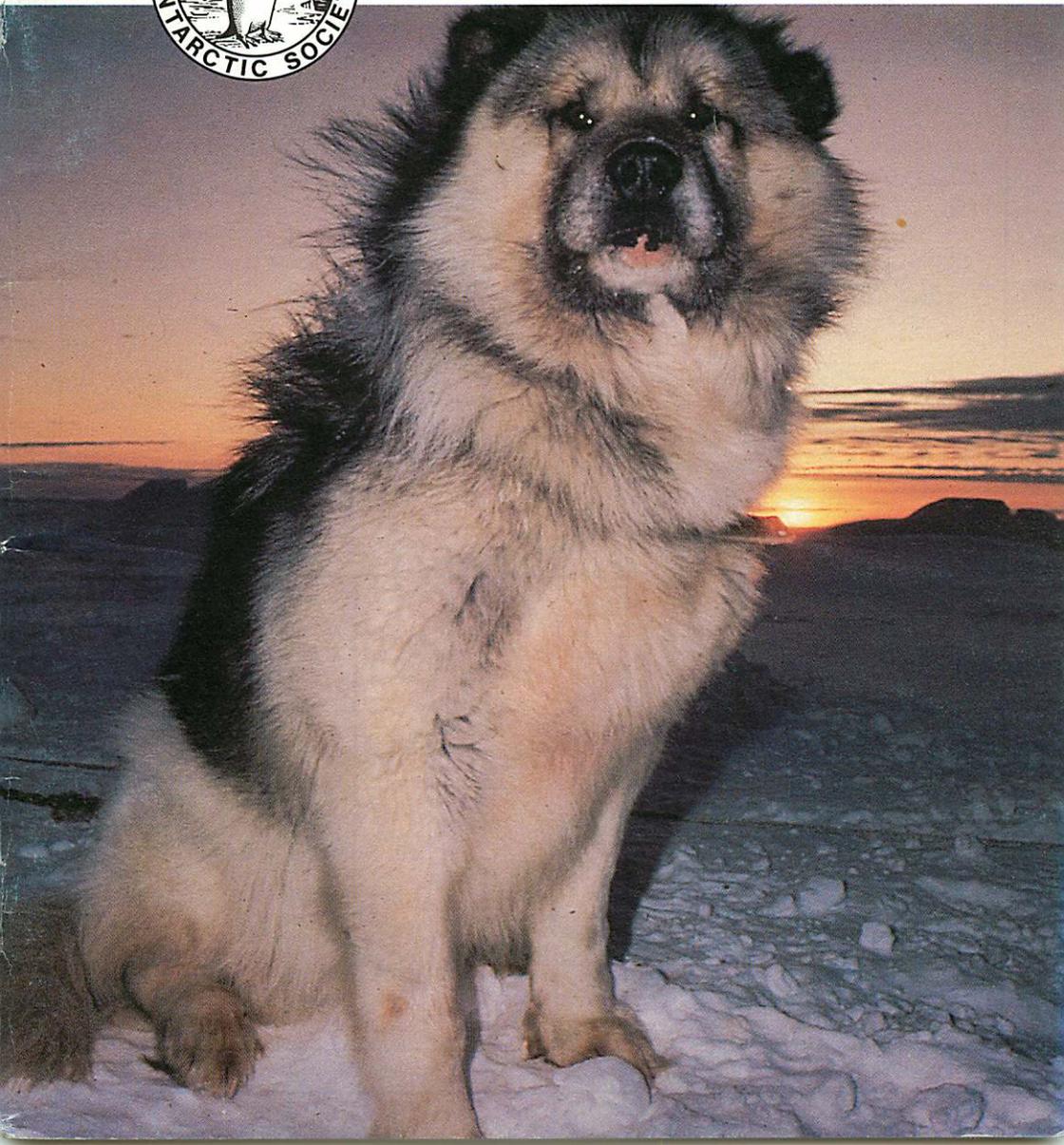


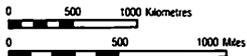
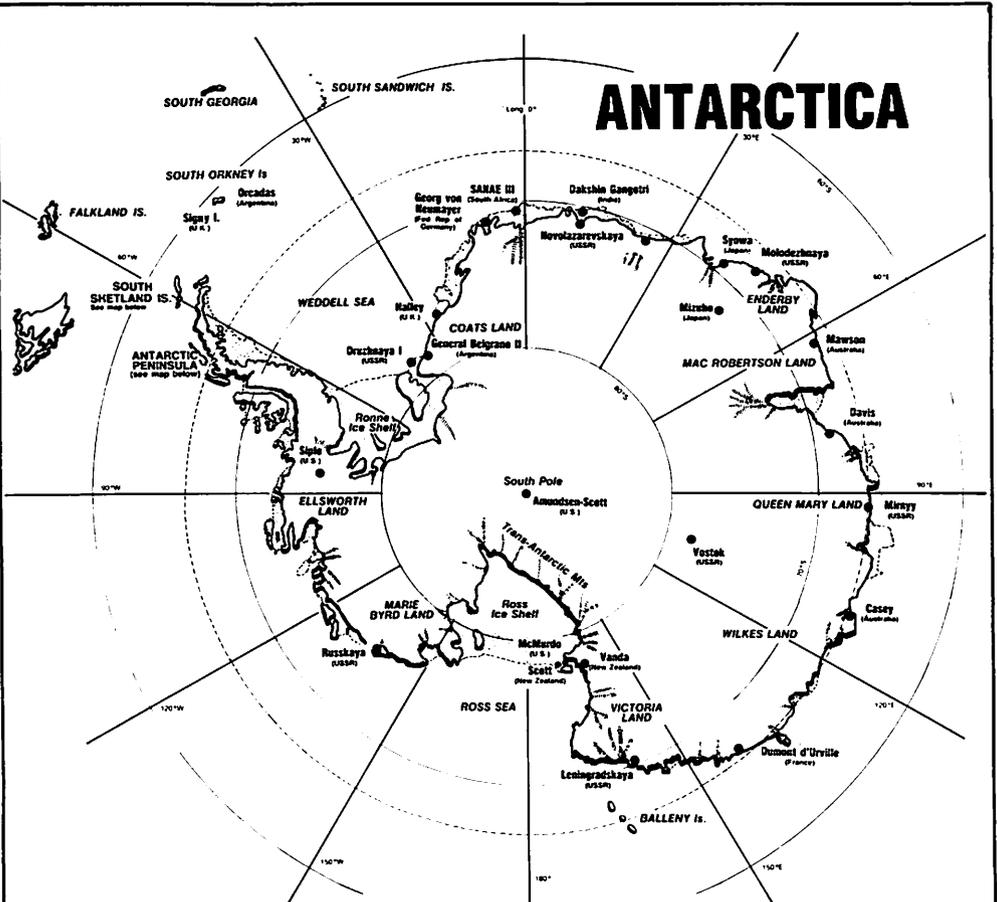
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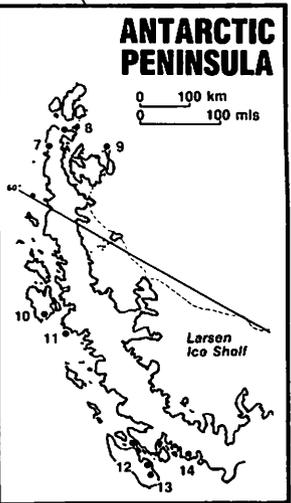
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ANTARCTICA



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- 3 Teniente Jubany ARGENTINA
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- 11 Faraday UK
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- 14 General San Martin ARGENTINA



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Cover: The departure of the dogs marks the end of an era at Scott Base. "Muff", photographed in 1983 by Colin Monteath. Story, page 148.

NZARP

Wide ranging penguin studies conducted at Cape Bird

Nine separate aspects of Adelie penguin behaviour varying from the recording of calls to determining genetic differences, and from monitoring changes in melatonin to assaying changes in body water were undertaken by a team of New Zealand, American and Australian scientists at Cape Bird this summer. All the projects were designed to help scientists understand more clearly the factors that influence the breeding success of Adelie penguins.

The programme began with the opening of the hut at Cape Bird on November 1 by Dr Gary Miller (University of New Mexico) and Dave Lambert (University of Auckland). They were subsequently joined by Dr Lloyd Davis (University of Otago). This season the scientists found less snow than previously and the penguins were a little earlier in their breeding. The ice had already broken out and open water was available to the penguins right up to the edge of the rookery.

Genetic variation

Dave Lambert's work involved measuring the amount of genetic variation apparent within colonies and between colonies. To do this he took blood samples from penguins to be analysed later using electrophoretic techniques. All research conducted by the members of K121 adhered to Ecology Division/University of Otago guidelines designed to minimise the disturbance to the penguins, and for this reason blood samples were taken from non-breeders or birds that were not incubating at the time. As a preliminary investigation into genetic variation between rookeries, Lambert collected a few blood samples from the rookeries at Cape Crozier and Cape Royds on his return to Scott Base.

Lloyd Davis observed the patterns of courtship in a colony of banded penguins. Recent research has shown that Adelie penguins are not as faithful to their partners

as was previously believed and he sought to identify causes for mate-swapping. He also worked with Gary Miller to establish a series of experiments designed to measure factors that influence the duration of the foraging trips taken by penguins during the incubation period, and measured the turnover rates of body water and salt in courting Adelies. The latter is part of a study being conducted in association with Dr Brian Green (C.S.I.R.O.) that is aimed at describing the energetic requirements of the penguins. Brian Green went to Cape Bird in early January, and established water and sodium turnover rates for chicks and adults during the creche stage. The samples are currently being analysed in his laboratory in Canberra.

Penguin calls

Dave Lambert left Cape Bird on November 18 and the team was joined by Beth Speirs (University of Otago) who remained there until the conclusion of the studies at the end of January. Her project involved recording the calls of penguins in the study colony used by Lloyd Davis. Penguins rely on vocalisations for individual recognition and Beth Speirs was interested in determining how calls differed between partners and how penguins would react to calls of their previous mates. She sought recordings of the calls made by each bird in the colony. At first progress was slow as the birds were especially quiet during incubation but with

the noise associated with chick rearing she obtained good recordings from all birds. Initial playback trials produced good responses from the penguins and the work is to be continued.

No mates

On site for the whole programme was Gary Miller. From earlier work the scientists knew that penguins change mates, and sometimes even colonies, from year to year. Miller marked and followed birds from when they came ashore until they settled on a nest site, or later in the season, until they returned to their established nest. The object was to determine how penguins find their way around the rookery and how much they experience other parts of it.

From the 30 birds he followed, four never managed to attract a mate. They would try in one colony for a few days before moving to another up to four or five colonies away. If still unsuccessful they would return to their original spot. These birds took circuitous routes to their chosen sites which contrasted with pairs which had nests with eggs or chicks and never dawdled in the rookery and even if they had to travel the entire length the route was direct.

Banded 200

As part of the ongoing study Miller and Speirs banded nearly 200 grown chicks in the last week of the season. In two or three years time the team estimate that they will be able to determine how difficult it is for inexperienced birds to establish nest sites.

The experiments of Miller and Davis stem from previous findings at Cape Bird when it was observed that successful pairs are able to adjust their foraging trips so that one of them returns from feeding within a day or two of the eggs hatching. If the female stays out longer than usual on her first foraging trip, the male must shorten his trip. Once set up, Miller monitored the attendance of adults at 57 nests throughout the season to determine their pattern of nest relief and their eventual success at raising chicks to the creche stage.

For three weeks from mid-December Dr Richard Sadlier and Kevin Lay (Ecology Division, DSIR) undertook a programme of

radio-tracking foraging penguins during the guard stage. They glued small radios to feathers on the backs of 19 penguins and set up tracking antennas on New College and Inclusion Hills. Both sites command spectacular (if sometimes cold and windy) views of McMurdo Sound. Each day for two weeks, Sadlier and Lay returned to the stations and tracked the penguins. Most birds stayed within McMurdo Sound in range of the antennas, but a few disappeared around the north end of Ross Island. They obtained half a dozen complete tracks of 8 hours or more from the time the bird left the rookery until it returned. They were able to recapture all but 4 of the birds and remove the transmitters from them. The remaining transmitters will fall off when the penguins moult.

From early January Dr John Cockrem and Don Waddington (Ecology Division, DSIR) ran several experiments to investigate the levels of melatonin in penguin's blood. Melatonin is a hormone that is important to

Antarctic Heritage Trust Executive Officer

A Trust has been established with the objectives of restoring and conserving the historic huts and their artefacts in the Ross Dependency. Applications are invited for the position of Executive Officer to provide executive support for the Trust Board including fundraising, publicity and planning and administration of the annual work programmes.

Good experience of the physical and operational environment of Antarctica, an ability to generate publicity and raise funds and experience in building or artefact conservation would be desirable.

The post would be in Christchurch and the salary in the range \$24000 – \$29000. Applications should be made by May 15 to the Chairman, Antarctic Heritage Trust, C/o Antarctic Division, DSIR, P.O. Box 13247, Christchurch.

the timing of reproduction. In temperate birds the normal day/night cycle controls melatonin secretion which, in turn, controls most circadian rhythms. Penguins don't experience typical light and dark cycles. Cockrem and Waddington took blood samples from groups of birds in constant light, constant dark, and a few combinations of light and dark to determine how melatonin levels in penguins are controlled by light and dark cycles. The samples are being analysed in Cockrem's lab in Wellington.

The 86-87 season at Cape Bird came to a close on 23 January when Miller, Speirs, Green, Cockrem and Waddington all returned to Scott Base. The weather had been mild and there were only two days with high winds (50 knots). On one a helicopter was

stranded with its crew and passengers. The highest temperature for the season was 9.5 degrees C in mid January. The generally warm, sunny days caused an extra heavy melt off the Mount Bird ice cap and the streams that flowed through the rookery caused considerable erosion. No colonies were damaged however although the chicks from a couple of colonies had to crowd onto high ground. By the time the team left Cape Bird, most of the chicks were well on their way to moulting into black and white and preparing for a winter at sea.

"Antarctic thanks Dr's Lloyd Davis and Gary Miller for their assistance with this article.

Botanists have unexpected visitors

Scientists from Canterbury University engaged in a series of studies of Antarctic plant life had some unexpected visitors during the summer. Two Adelie penguins passed close to their camp. While this is not unusual in some parts of Antarctica, the camp was some 500 metres above sea level and 12 kilometers from the sea in the dry Garwood Valley of Southern Victoria Land. Like many of their predecessors now mummified in the valleys, the penguins were likely to die. Fresh seal tracks were also found.

Led by Dr Paul Broady the team of Dr Laurie Greenfield and Andrew Kibblewhite were engaged in a series of studies designed to contribute to fundamental knowledge of Antarctic plant life and provide information which can be used for making decisions regarding the conservation of the flora. Working firstly at Cape Royds and subsequently in the dry valleys of southern Victoria Land they focussed on aspects of the ecology, taxonomy and physiology of the algae as well as mapping vegetation.

Laurence Greenfield sought a clarification of the little understood significance of nitrogen fixing capability; the removal of gaseous nitrogen from the atmosphere for use in making protein of certain "blue-

green" algae in ponds, lakes and soils. Working in a dome tent with a gas chromatograph to separate the gas mixtures and analyse their abundance, he experimented with a wide variety of vegetation samples. The common nitrogen fixing "blue-green" algae called Nostoc was particularly abundant in the Garwood Valley. It thickly coated meltwater flushed soils, formed crusts over mosses and was abundant in ponds on the surface of the Joyce Glacier. Analysis revealed Nostoc to have an extremely high rate of nitrogen fixation, especially as the water temperature in the ice surrounded pools rarely rises above freezing.

In a second series of experiments Paul Broady and Andrew Kibblewhite began the first detailed study of the most abundant components of Antarctic vegetation,

The finding of "mummified" carcasses of penguins and seals in the dry valleys is not particularly unusual but the actual sighting of live birds is thought to be considerably less common. It is not known why penguins and seals do this, although the tendency may be similar to the stranding of whales on beaches.

"Antarctic" thanks Dr Paul Broady for assistance with this article.

Oscillatoriaceae, also a blue-green algae. They are filamentous organisms found in streams, ponds, lakes and on wet soils and grow in their billions to form leathery textured felt-like growths, usually a rich red-brown colour. Although they have been known since the early years of the century this is the first study to try and characterise them in detail and work out the various species which might be present. The field work is to be followed up in the University laboratory in Christchurch using cultures of the different species, the various characteristics of which have yet to be identified.

In a second project the pair attempted to describe the range of habitats, types of growth and manner of reproduction of a green alga *Prasiola calophylla*, abundant in the streams of the area. Attached to the undersurfaces of stones it is not immediately visible although it appeared to be abundant and widespread, even growing on the sloping ice walls of the border of the Joyce

Glacier. Its appearance was found to vary in different habitats, forming long microscopic filaments or wider, ribbon like plants or small crumpled sheetlike structures, all of them a vivid green.

Through a general survey and mapping of vegetation the team was able to recognise areas which are regarded as being of particular botanical value. Three are to be recommended for protected status under the Antarctic treaty; an area north of Cape Royds rich in colourful lichens around the summits of knolls and sides of boulders; another below the terminal ice cliffs of a lobe of the Joyce Glacier which supports the largest and richest growth of *Nostoc* and lastly the diverse and abundant vegetation including mosses, lichens and algae in the Garwood Valley.

Physico-chemical studies of the pond environment at Cape Royds and floristic and ecological studies of the algae in the ponds were also carried out by the team during their two months in the field.

Scott Base rebuilding programme

Stage six of the reconstruction of Scott Base was completed during the summer with the finishing of the interior of the light maintenance workshop. It has been occupied since January. Construction of stage seven, the largest building in the new complex, also began. Materials for this were taken south last season.

The newly completed building accommodates the standby generators, the carpenter's, electrician's, Base engineer's and fitting shop. A toilet and washup area have been installed. The exterior of the building was completed to shell stage last season but a small amount of additional work will be required next season in the areas leading to stage seven of the complex. This will accommodate the vehicle maintenance and building shops. Because of the need to support heavy loads the foundations and floor are of concrete although an air gap

has been left under the building to reduce snow buildup. Work on the shell has been completed and much of the interior framing for storage and offices is in place. Construction work was undertaken as usual by a team of New Zealand Army Engineers supervised by staff from the Ministry of Works and Development.

Materials for the new incinerator block were flown south in time for work to begin in January. By mid-February the incinerator was fully operational. It was specially selected to ensure that pollution is at the absolute minimum and was installed by the manufacturers and Scott Base Staff. The building in which it is accommodated is privately designed and was erected in New Zealand by the Army Engineers.

All the generators throughout the base were also replaced or upgraded during the season from 135 to 180 KVA.

Atmospheric mercury checked

Two scientists spent three weeks at Scott Base measuring the concentration of mercury in the atmosphere in and around the base. It is a particularly suitable location for such measurements as the low levels of atmospheric mercury in Antarctica provide baseline data with which levels at other sites can be compared.

This was the second season that Dr Stephen de Mora of the Chemistry Department at the University of Auckland has measured atmospheric mercury in Antarctica. Last year volatile mercury was found to be in the atmosphere at Lake Vanda at levels less than a quarter of New Zealand values.

John Patterson of the Chemistry Division, DSIR, joined Dr de Mora this season. Samples were taken at the transmitter site at the western end of the base and on the ice shelf on the eastern boundary of the whiteout zone at Williams field. They were obtained

in air drawn through a series of collectors mounted in pairs. The first collector consisted of silver-coated sand and concentrated inorganic forms of mercury such as elemental mercury vapour, while the second collectors contained gold coated sand and collected mercuric species which passed through the silver sampler. This, as expected, was organomercury, predominantly dimethyl mercury.

Following collection the silver and mercury amalgam samplers are placed independently into a gas line which is heated and the trapped mercury is subsequently quantified by photoacoustic spectroscopy or measurements of the sound produced when mercury vapour is illuminated

Levels of mercury inside Scott Base were checked to evaluate possible contamination, and like those around the base, on the iceshelf and at Lake Vanda, are lower than those recorded in New Zealand. Equipment has been left at Scott Base for continued measurements during the winter.

Erebus under television surveillance

Continuing the search for the reasons for seismic activity on Mt. Erebus scientists this summer have installed a television camera near the crater rim. Sixty eruptions of the Erebus lava lake were recorded at Scott base on video between December 16, 1986 and January 7, 1987. Greater scientific understanding is required because Erebus has an active lava lake, lies in a high latitude within a tectonic plate in an aseismic region yet volcanic earthquakes occur sometimes more than 100 times a day.

Times of the visible explosions were compared with the data collected from a nine station seismic network around the crater and a preliminary analysis of the best 25 recordings proved that explosions are causing the earthquakes. The new results are contrary to those previously indicated by the seismic network alone from which it was thought that earthquakes triggered the explosions.

Regularly observed during the summer

since 1974, Erebus became the subject of the International Mount Erebus Seismic Study in 1980 when radio telemetry geophones, microphones and a magnetic induction loop were established to locate the foci of the earthquakes and so that the eruptions in the crater could be studied from data being recorded at Scott Base throughout the year.

Lava and gaseous explosions have occurred in the lake and an active vent above it and have changed from season to season but the continuous seismic recordings have shown bigger changes during mid year.

Until last summer scientists could only observe activity and determine correlation with instrumental recordings while they were on the crater rim. From this summer with the placement of the television transmitter on the rim direct observations should be available until mid-winter.

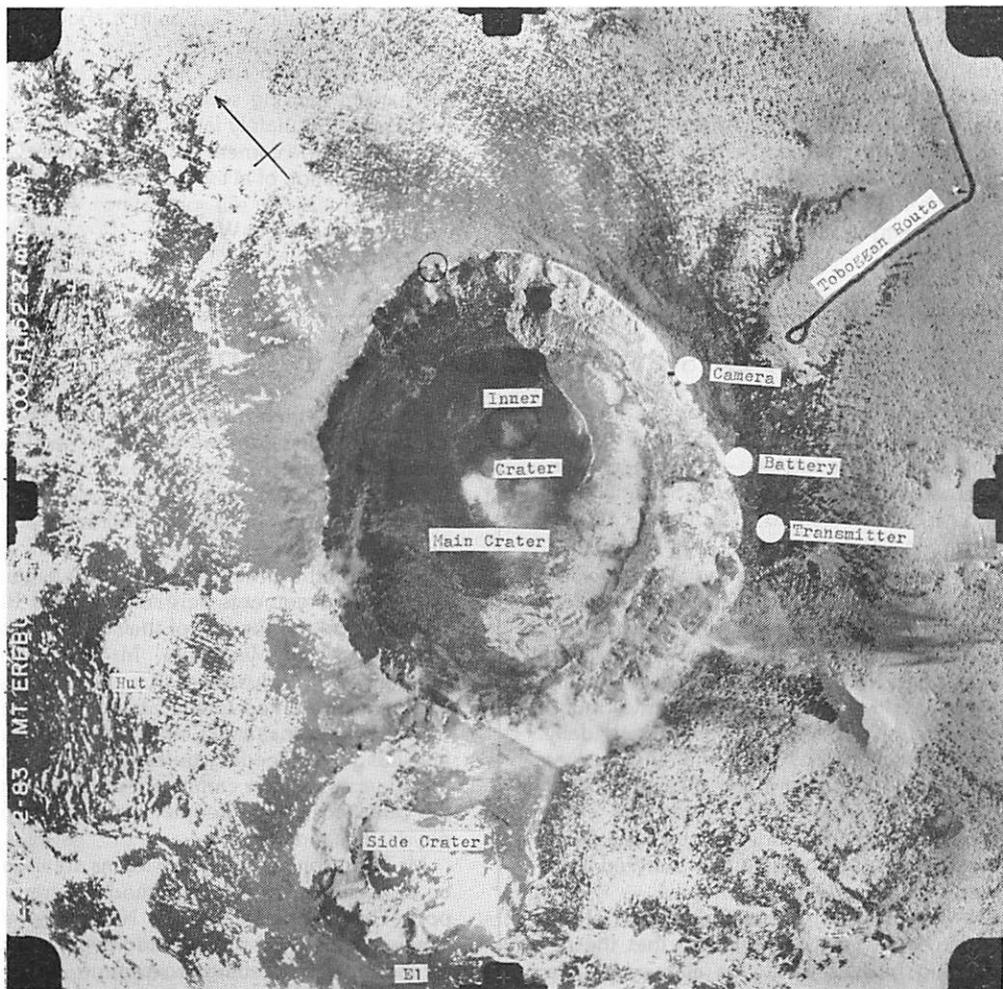
With the objective of determining whether

the origination times of earthquakes were earlier or equal to the times of visible eruption and trying to obtain winter data a combined New Zealand Japanese team added television surveillance and an LPH geophone to the existing IMESS telemetry net from which the onset times of signals from each eruption could be read.

Led by Dr Ray Dibble of Victoria University the party comprised Simon Barrett also from the University, an Antarctic Division field assistant Max Wendon of Wanaka and

Tetsu Miura from Tohoku University, Sendai in Japan who was seconded to the National Institute of Polar Research (NIPR) in Tokyo. The work was carried out in conjunction with an American programme of erupted gas analysis.

The craters of Mt Erebus. The new equipment overlooks the main crater. From the film and other data being collected, scientists are seeking to clarify the eruptive mechanisms causing seismic activity.



The team flew to the acclimatisation area on the Fang Glacier and transferred 365 kilograms of equipment by toboggan to within 130 metres of the east rim of the crater from where the television camera was installed on December 10 in an insulated housing on a tripod to protect it from lava bombs. After technical difficulties it became operational on December 16 and Professor Katsu Kaminuna of NIPR, Tokyo, who remained at Scott Base was able to monitor the signals and play back the seismic tapes.

Such detailed monitoring is important because earthquakes accompanying the eruption had been located as deep as 4km but the infrasonic signals were more consistent with a surface origin. There were several possible explanations. Was there a time error in picking emergent seismic onsets? Was the velocity structure inadequately modelled or were the eruptions in the vents triggered by deep earthquakes?

Data on occurrence, tidal effects, spectra, energy, time are collected from the seismic network. Studies of the wave frequency relationship between earthquakes and eruptions revealed the occurrence of two types of eruptions, one of high frequency from an exploding vent and the other of low frequency which was assumed to be from the lava lake. Infrasonic traces of the low frequency eruptions showed a gradual onset of pressure believed to be caused by a ballooning of the lava lake before it erupted.

With the addition of the television network to the existing equipment it should be possible to read the onset times of each eruption and from this clarify the eruptive mechanism causing seismic activity on Mt. Erebus. Unfortunately latest reports indicate that ice over the camera lens is precluding a clear observation of activity at Scott Base but the equipment is still operating. Further results are due out at Winfly.

Scott Base huskies to live in Minnesota

Scott Base is without huskies for the first time in 30 years. The remaining 14 — 11 males and three bitches — have been presented by the Department of Scientific and Industrial Research to the Steger Outdoor Centre in Ely, Minnesota.

In the 1985-86 season the DSIR decided to phase out the huskies over the next few years, the main reason being growing opposition by conservationists and United States and New Zealand biologists to the killing of Weddell seals in the McMurdo Sound area to provide part of the huskies' daily diet. Other reasons were that the huskies had been displaced from their traditional role by motor toboggans, over the years many had become unhealthy because of inbreeding, and with age others suffered from osteo-arthritis and gastro-enteritis.

When Mr R. B. Thomson, director of the Antarctic Division, announced that the remaining huskies would be allowed to live out their natural lives as far as possible, there were 18 — enough for two teams — at Scott

Base. Since then four have died. Their health and condition had been checked last year by a Christchurch veterinary surgeon. One was put down because of age, one died in June after an operation in February, and two were put down because of bad health.

After months of negotiations which began last year arrangements were made for the 14 huskies to spend the rest of their lives in the winter snow of Minnesota. Mr Thomson announced in November that the huskies had been presented to the Steger Outdoor Centre which maintains big kennels at Ely and has been breeding polar huskies there for 20 years. Winter camps are organised at the centre for young people, many of them physically handicapped.

Mr Thomson says that dog teams are used by the centre as a principle mode of transport. This will mean that the New Zealand huskies, which will provide additional stock for the centre's breeding programme, will be introduced to a new environment. At Ely, population slightly more than 5000, snow

lies for a minimum of seven months a year, making the climate suitable for breeding and training huskies.

Huskies at the Ely kennels have regular veterinary checks and usually take part in one extensive expedition a year. In the northern summer of last year centre huskies were used in an expedition led by Will Steger and Paul Schurke which reached the North Pole with dog sledge teams. A New Zealander, Bob McKerrow, now director of the New Zealand Outward Bound School, who wintered at Vanda Station in 1970, was also on the expedition. He did not reach the Pole, being injured when a sledge rolled on him before the last stage.

A trans-Antarctic expedition in 1989 is now being planned by the Steger Outdoor Centre. Some of the New Zealand huskies

could take part in the crossing but would not return to Scott Base. The journey will start from the other side of the continent and end in Australia's Antarctic territory.

Of the 14 huskies at Scott Base four will be more than eight years old by the end of January, three will be more than seven, six, and five years old, respectively, and one will be more than four years old. Three huskies will be more than three years old, and the youngest trio will be two years and one month old. Early in February the 14 were brought to Lyttelton aboard the United States cargo ship Green Wave. Then they were flown from Christchurch to Minnesota.

Reference: "Antarctic", Autumn, 1986. Pages 11-12.

N.Z. Governor-General visits Ross Dependency

New Zealand's Governor-General (Sir Paul Reeves) visited the Ross Dependency for the first time in early December. This was the fourth visit by a Governor-General in 23 years. Sir Bernard Ferguson was the first in 1963. In 1969 Sir Arthur Porritt was accompanied by his sons, Jonathan (18) and Jeremy (15), and Sir David Beattie, who went south in 1983 was accompanied by one of his sons, Mr John Beattie.

Sir Paul Reeves flew from Christchurch on December 2 in a Royal New Zealand Air Force Hercules and spent more than a week at Scott Base as the guest of the Antarctic Division, Department of Scientific and Industrial Research. He was accompanied by his two aides, Lieutenant Brian Tunui, Royal New Zealand Navy, and Captain Timothy Gall, New Zealand Army, and was escorted by Mr R. B. Thomson, director of the Antarctic Division.

During his stay which ended when he returned to Christchurch on December 9 the Governor-General flew to the Amundsen-Scott South Pole Station, travelled to Scott Base by dog sledge, visited the historic huts of Scott and Shackleton, and met New Zealand scientists and support staff at Vanda Station, Cape Bird, Cape Royds, and Arrival Heights. Sir Paul also spent some time

at McMurdo Station where he was briefed on all aspects of the United States research programme by the National Science Foundation and the U.S. Navy.

Poor weather at McMurdo Station forced postponement of the flight on December 1, and strong southerly winds, blowing snow, and reduced visibility at the ice runway delayed the departure of the Hercules until the afternoon of December 2. With Sir Paul on the aircraft were the United States Ambassadors to New Zealand and Australia, Messrs Paul Cleveland and William Lane. The party arrived at McMurdo Station at 8.30 p.m. local time and the Governor-General rode behind the husky team to Scott Base.

A visit to the Amundsen-Scott South Pole Station in company with Messrs Cleveland

and Lane occupied the whole of the Governor-General's first full day in Antarctica. He flew there as a guest of the NSF in a United States ski-equipped Hercules. Mr Stewart Guy, Officer-in-Charge at Scott Base was the only New Zealand official to accompany him.

After lunch at Pole Station the Governor-General talked to American scientists and support staff, was briefed on the research projects in progress, and inspected the station facilities. He returned to Scott Base early on the morning of December 4 and began a busy day after breakfast with a visit by dog team to a fish hut on the McMurdo Sound sea ice near the base. There he met Auckland University zoologists who have been fishing through holes in the ice for several seasons to study

Ecuador to Butter Point

Ecuador, known to most New Zealanders as a source of bananas which are shipped here, had a representative in Antarctica last season. Lieutenant-Commander Hernan Moreano Andrade, of the Ecuadorian Navy, was a guest scientist with the New Zealand Antarctic Research Programme for two weeks in November.

Lieutenant-Commander Andrade, who is stationed at Ecuador's main seaport, Guayaquil, is a marine geophysicist with the Navy's Oceanographic Institute. While in the Ross Dependency he spent all his time in the Butter Point area with Dr Brian Davy, of the Geophysics Division, DSIR, and Graham Alder, of Victoria University of Wellington. They were engaged in a project planned to link the geological structures determined from CIROS borehole data with seismic stratigraphy results obtained from marine geophysical surveys in the Western Ross Sea.

Ecuador's Navy has two research vessels used for oceanographic, hydrographic, and meteorological work in the Pacific. They are the Japanese-built Orion (1105 grt), formerly the Dometer, which carries a crew of 45, and the 50-tonne survey launch Regel, which has a crew of 10.

the effect of extremely low temperatures on Antarctic fishes.

Later in the morning Sir Paul left Scott Base by U.S. Navy helicopter for Cape Bird where New Zealand maintains a summer biological research station. There he met scientists from the Ecology Division, DSIR and the University of Otago engaged in studies affecting the population size and breeding success of Adelie penguins.

Historic huts

After lunch with the New Zealanders Sir Paul continued on the Cape Royds where he visited Shackleton's hut. A biological laboratory erected at Cape Royds in 1963 is used each summer for projects in the New Zealand programme, and Sir Paul talked to University of Canterbury biologists engaged in ecological studies of plants and microbes in the melt pool environment of Cape Royds. His day ended with a visit to Cape Evans to see the hut which was Scott's headquarters for his last expedition in 1910-13.

On his fourth day (December 5) the Governor-General spent the morning with the New Zealanders' close neighbours at McMurdo Station. He was briefed on the U.S. programme at the National Science Foundation chalet, and before lunch saw Navy and New Zealand facilities at the station, and met New Zealanders working with the Americans, among them cargo handlers and support staff.

Buffet dinner

In the evening the Governor-General was the guest of honour at a buffet dinner arranged by Scott Base. His host was Mr Thomson, and the function was attended by Scott Base staff, and invited guests, among them the two American ambassadors and their military attaches, and other distinguished visitors. Commanders of New Zealand defence detachments were also present.

United States staff from McMurdo Station included Mr Ron La Count, senior American representative in Antarctica, Mr David Bresnahan, senior NSF representative, Mr Art Brown, resident manager in Antarctica

for I.T.T. Antarctic Services which provides support services under contract to the NSF.

A distinguished naval visitor was Rear-Admiral J.B. Mooney, Director of Naval Research, U.S. Navy. The Naval Support Force, Antarctica, was represented by its commander, Captain David Srite and his deputy, Commander Ralph Perry. There was one Australian guest, Mr James Bleasel, director of the Australian Antarctic Division.

On his fifth day, after making a tour of the Scott Base facilities, Sir Paul flew west on the morning of December 6 across McMurdo Sound to visit the dry valleys of what is popularly known as the McMurdo Oasis. The U.S. Navy helicopter's route followed the Taylor Valley/Beacon Valley/VXE-6 Ice Falls to Vanda Station, near the shores of Lake Vanda in the Wright Valley. There he had lunch, met the station staff, and toured the base and points of interest in the local area. He returned to Scott Base in the afternoon by way of Bull Pass and the Wright Valley.

Sunday, December 7, was Sir Paul's sixth day on Ross Island. After a quiet morning he went to McMurdo Station again to see Navy facilities and the Eklund Biological Laboratory. In the afternoon he travelled to the

Erebus Glacier Tongue, the seaward extension of the Erebus Glacier which drains the lower southern slopes of Mt Erebus. The 17km ice tongue projects into Erebus Bay between Cape Evans and Hut Point, and part of it is floating. This seaward end was first observed to calve in March, 1911, during Scott's last expedition, and again in the 1940s. Since 1983 New Zealand scientists have been recording the ice tongue's movement to obtain information relevant to its next calving.

Mechanical problems in the RNZAF Hercules which was to have brought Sir Paul back on December 8 gave him an extra day in Antarctica. In the morning he visited the Discovery Hut erected at Hut Point for Scott's 1901-04 expedition, and then travelled to Arrival Heights 4km from Scott

Sir Paul Reeves (left) with New Zealand scientists at Cape Royds. With him from left to right are Dr Paul Broady, of the University of Canterbury's plant and microbial sciences department, the Governor-General's host Mr R. B. Thomson, director, Antarctic Division, DSIR and one of the Vice-Regal aides, Lieutenant Brian Tunui, Royal New Zealand Navy.

Photograph: Antarctic Division, DSIR



Base. Arrival Heights is designated a site of special scientific interest under the Antarctic Treaty, and provides an electrically quiet area to monitor and record changes in the upper atmosphere.

In the early hours of December 9 the Governor-General left Scott Base for Christchurch where he arrived early in the afternoon. Scott Base departed from the

formal programme for the Vice-Regal visit on December 6, the day of Sir Paul's 54th birthday. A buffet dinner for another New Zealand visitor — the Minister of Conservation (Mr Russell Marshall) — was combined with a surprise party for the Governor-General which was also a birthday party with gifts and a cake.

ANARE

Heavy pack postpones Bunger Hills programme

Heavy pack ice off the Shackleton Ice shelf this season resulted in the temporary besetment of the Nella Dan and a postponement of the second year of the multidisciplinary science programme in the Bunger Hills. Although it prevented occupation of Australia's newest summer station at Edgeworth David in the Bunger Hills most of the science projects were able to be conducted in the Larseman Hills where another new summer station, Law Base, was established.

It is the second consecutive summer that the Nella Dan has been trapped. Last year after 52 days the Japanese icebreaker Shirase assisted her out of heavy pack off Enderby Land, some 2,000 km west of this season's position (101deg E/64deg 30min S or 110 nm north of her destination) when the Mikhail Somov, flagship of the Soviet polar fleet north of the Nella Dan, offered to enter the pack and assist.

On January 13 the rescue operation began. Working through the night into the following day, the Mikhail Somov was able to break a path through 35 kilometres of ice to the Nella Dan and escort her out of the pack.

Assistance from the Somov came a day after Australia's other chartered ship, Icebird, had been diverted from its course to Heard Island to the Nella Dan's position in an effort to take the summer science party off the trapped ship to allow them to work in another location. When assistance from Icebird proved unnecessary she was able to proceed without loss of time to Heard Island

to collect the summer party before moving to Davis and Mawson for the annual resupply of the stations. She also supported a 10 day multinational bird study programme at Scullin Monolith on the coast between the two stations.

The Nella Dan, which had left Hobart on December 18, was on her third voyage of the season during which she was to visit Commonwealth Bay and conduct a brief marine science cruise, take the party to Edgeworth David and collect the Macquarie Island team. Her fourth voyage was to have included a 45 day marine science cruise in the Mawson/Prydz Bay/Davis region. This was reduced by six days because of her besetment.

The scientific programme in the Bunger Hills area surrounding Edgeworth David was to have been conducted in two parts but the first team of scientists on board Icebird in December were also unable to land. The Nella Dan was beyond helicopter range when she became trapped with the summer team, some of whom were involved in their

second attempt of the season to reach the new station.

With the exception of the glaciologists, dependent on access to the Scott and Denman Glaciers, most of the proposed scientific work included studies of terrestrial ecosystems and lakes and geological work was able to be undertaken from Law Base, the building of which was announced only a week earlier by Australia's Minister of

Science Barry Jones. Materials intended for Edgeworth David were used at Law Base which lies west of Davis in an area where Australian scientists have previously only conducted limited research.

The moving of some of the scientific programmes from Davis, Mawson and Casey to these summer stations is part of a new Australian policy to increase knowledge of more areas of their territory.

Satellite communications for Australian bases

Satellite communications providing for a 24 hour voice and data links between Australia's Antarctic Division and the four main bases at Casey, Davis, Mawson and Macquarie Island are to be installed during the next three years. Work on the first of the links was completed at Davis during the last week of February and the inaugural call made at 4 pm Australian summer time on Friday, March 6 by Paul Butler, Officer in charge at Davis, to Mr Barry Jones, Minister of Science in Melbourne. The link is now fully operational.

The project is expected to cost \$3.5 million to install and \$422,000 per year to maintain. As this is \$.7 million in excess of the Government's 1985 commitment to spend \$2.8 million, the excess will be met from Antarctic Division's operational costs. Installation is being undertaken by the OTC, Overseas Telecommunications Service.

The new communications system comprising telephone, telex and data links will extend and gradually replace the older HF high frequency radio system now in use. The HF service, also operated by OTC, provides voice communications for two and a half hours per day and a telegraph channel to Casey and Macquarie. It is not completely reliable because HF communications are affected by ionospheric disturbance due to solar activity. OTC's point to point system is also gradually being phased out although communication will be possible through the coastal radio service.

ANARESAT (Australian National Antarctic Research Expeditions Satellite) will use

two INTELSAT VISTA satellite links leased by Antarctic Division from OTC, who won the contract because they could provide full standardised cover for all Antarctic stations and Macquarie Island.

An INTELSAT V-F5 satellite operating at 63 degrees East over the Indian ocean will service Mawson, Davis and Casey and an INTELSAT V-F2 will provide communications to Macquarie from 173 degrees East over the Pacific Ocean. Both are in a geostationary orbit some 36,000 km above the earth. At each station dishes of approximately 7.3 metres in diameter will be housed in radomes (dome like covers) of approximately 12 metres in diameter. They will transmit and receive to the satellites, which will in turn transmit to ground stations at Sydney and at Ceduna in South Australia.

ANARESAT is coupled with an automatic telex link switching system which will improve the flow of telex information. Data channels will allow scientists to bring up Antarctic data on their screens. High speed

transmission operates at 4.8 kilobits per second which is 48 times faster than the current system. At present VISTA is analogue but it is expected to be converted to a faster digital system in future.

INMARSAT (the international marine satellite system) now operating at the stations will be used to back up the VISTA system but was unsuitable as a long term

limited capacity and high operational costs.

A trial erection of the new satellite earth station system was undertaken in October at Bringelly in Sydney. The components were shipped south on Icebird in six containers and assembled by eight riggers and technicians from OTC on site in at the north east corner of the new operations building at Davis during January and February.

Italian summer station in Terra Nova Bay

Italy's first major Antarctic Expedition has set up a summer station in Terra Nova Bay on the east coast of North Victoria Land. The expedition of 70 scientists, support staff, construction workers, and mountain guides left Lyttelton aboard the chartered Finnish cargo ship Finnpolaris on December 5 and set up the base in the middle of the month at the south-east point of Gerlache Inlet (74deg 41min 37sec S/164deg 06min 09sec E).

This base will be maintained each summer until 1991 when the Antarctic Treaty comes up for review. Italy, which acceded to the treaty in 1981, allocated about US\$165 million for Antarctic research between 1985 and 1991. A small expedition which assessed sites for a summer station in the Ross Dependency in the 1985-86 season and conducted seven research projects, cost about US\$5.3 million. The present programme, including charter of the Finnpolaris and two helicopters, is expected to cost US\$15 million.

Italian Antarctic research is the responsibility of the Minister of Scientific and Technological Development. He is the chairman of the National Scientific Commission for Antarctica which drafts the national programme and the relative seasonal programmes, and co-ordinates the Italian activity with that of other nations operating in Antarctica. The Minister is also chairman of the Interministerial Consultative Committee for Antarctica which includes representatives of 10 other ministries, among them Foreign Affairs, Treasury, Defence, Industry, Merchant Marine, Education, and also the deputy-chairman of the Science Commission and the director of the research programme.

ENEA, the Italian Agency for Development and Conservation of Alternative Energy Sources, has set up the Antarctic Project to carry out the research programme and manage the funds allocated for it. Representatives of the National Research Council (CNR) which agrees on the scientific content and contributes scientific staff to the programme are associated with ENEA as are representatives of the Ministry of Defence and the Department of Protection of the Environment and Human Welfare.

Manager of the Antarctic Project and leader of this season's expedition was Dr Celio Vallone, an engineer with ENEA. Last season he was responsible for the organisation of the reconnaissance expedition which was led by an Italian Army officer, Colonel Elio Sterpone. Mr R. B. Thomson, director of New Zealand's Antarctic Division, joined the expedition in Terra Nova Bay later in the season and advised on possible sites in the area. Selection of the site in Gerlache Inlet was based on his recommendations. Fixed-wing aircraft can land on the sea ice in the inlet from early to mid-season and in the nearby Browning Pass until late summer.

This season's research programme covers projects concerned with cosmophysics, meteorology and atmospheric physics, earth

sciences, physical oceanography, biology, and environmental impact studies. Meteorologists were to instal four automatic weather stations, geologists made a geological survey of central Victoria Land, and the earth sciences project included the first phase of setting up a geomagnetic observatory.

Biologists made biochemical studies of the low temperature of polar fishes and the oceanographers made bathymetric and hydrological surveys and current measurements in Terra Nova Bay. Environmental studies concentrated on the collection of airborne particulates and atmospheric precipitation (snow) with automatic instruments, sampling surface waters, thermal springs, snow, and sediments, and the impact on the environment of organisms of the marine food chain.

Universities involved

Leaders and co-ordinators of the field projects came from ENEA, CNR, the National Geophysics Institute, the Institute for Applied Research on Fisheries, and the University of Milan. Other universities and scientific organisations represented in the field teams were Rome, Pisa, and Genoa, the Italian Navy's Hydrographic Institute, and the Brescia Municipal Museum of Natural Science.

Women scientists

There were two women scientists in the programme. Luana Testa was the co-ordinator and leader of the ENEA environmental impact team, and Giulia Abbate was a member of the ENEA team responsible for technological research and telecommunications. The Ministry of Defence provided three officers from the Navy's Hydrographic Institute for the CNR oceanographic team led by Dr Carlo Stocchino, and Andrea Pellegrini's ENEA meteorological and atmospheric physics team had two Air Force officers, a lieutenant-colonel and a lieutenant.

Rear-Admiral Albert Tarantini, the Ministry of Defence representative on the inter-ministerial committee, headed the ENEA management staff in the expedition. Three

ENEA staff members were responsible for general operations, administration, and planning, which included a film record of the whole operation.

General support services were operated by an ENEA unit led by Robert Buccolini, who was also responsible for field equipment. The medical officer was Lieutenant Andrea Tortora, of the Italian Navy. Naval non-commissioned officers were responsible for radio electrical services, and mechanical services were provided by an Air Force NCO. The cook was a civilian.

Alpine guides

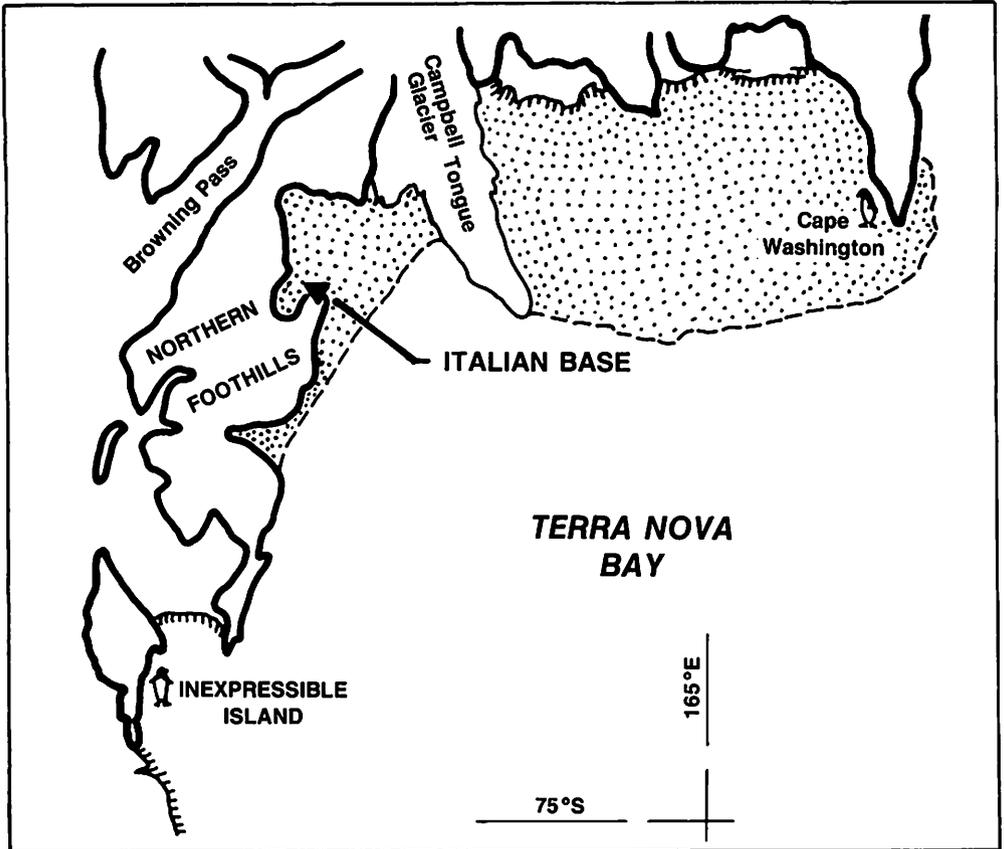
A team of field guides with mountain rescue experience was assigned to the expedition by the Ministry of Defence. They were from the Corpo d'Alpini, the mountain troops. Their leader was Lieutenant-Colonel Mauro Spreafico, who held the same position in last season's expedition. With him were Lieutenant-Colonel Italo Bonvicini, Major Simone Baschiera, Staff Sergeants Pietro Amadio, Lorenzo Boi (1985-86) and Gianna Bonetti.

Two Norwegian field guides with Arctic experience who served with the 1985-86 expedition returned to Antarctica again. They were Captain Ola van der Eynden and Lieutenant Jostein Helgestad, of the Norwegian army. Both were serving in a private capacity.

New Zealand pilots

New Zealand pilots were flying the expedition's two chartered Aerospatiale Squirrel 350B helicopters on ice reconnaissance, ship to shore operations, and support for field teams. The helicopters were chartered from Helicopters (NZ) Ltd, of Nelson, which provided similar equipment last season. Trevor McGowan (1985-86), Donald McLeod, and Robin McPhail were the pilots; the engineer was Steve Power.

A civilian construction firm, Snamaprogretti, of Milan, had the contract for the scientific station and associated buildings. Three containers of building materials for the station were unloaded at the selected site from the Norwegian Arctic research ship Polar Queen chartered last season.



This season the *Finnpolaris* took south a team of 17 headed by the construction manager, Giorgio Mongardi. His team included plant operators, pipe fitters, welders, electricians, and experts in the erection of prefabricated buildings.

Master of the *Finnpolaris* which was chartered from Finnlines Ltd, of Helsinki, was Captain Lasse Kulju, who had a crew of 22. He has made two previous voyages to Antarctica when his ship was chartered for the 1983-84 and 1984-85 Indian research expeditions to Queen Maud Land.

Built in 1981 the 14,900-tonne *Finnpolaris* is 159m long and has a normal speed of 13 knots. She has two decks and has been ice-strengthened for her usual task of carrying newsprint and other paper products. For her present voyage she carried a

The location of the new Italian summer station.

10-tonne tugboat and a landing pontoon for ship to shore transport of supplies and equipment, a pilot boat, and an oceanographic boat for survey work in Terra Nova Bay.

Eight Grizzly skidoos (motor toboggans) and two Kassbohrer tracked vehicles were taken south for field operations and work round the base. Two heavy ski-mounted Tundra sledges which can carry up to 10 tonnes were designed and built in three weeks by two Christchurch firms to Italian specifications. They were completed by the time the *Finnpolaris* was ready to sail.

In the second week of October the *Finnpolaris* sailed from Genoa for Lyttelton where she arrived on November 28. She

was to have left on December 1 but her departure was delayed until December 5 by the late arrival of essential cargo and ice conditions in the Ross Sea.

When the Finnpolaris sailed for Terra Nova Bay she carried extra cargo — 70 tonnes of additional marine fuel for the 90 Degrees South expedition's support ship Aurora which had used more than expected on her voyage to the Bay of Whales. Fresh food, fruit and vegetables, and mail were added to the cargo for the crew which had left Lyttelton on October 27.

Although the Finnpolaris encountered a concentration of thick ice near Coulman Island her voyage was relatively uneventful after she passed 60 deg. south. She entered Terra Nova Bay on December 17 and moored alongside the sea ice in Gerlache Inlet. Unloading operations began almost

immediately and the construction team began the first stage of the new station.

On December 21 the Aurora arrived in Terra Nova Bay from the Bay of Whales. The two ships joined company in Gerlache Inlet, the fuel was pumped to the Aurora, and the captain and crew welcomed their first fresh food and mail for two months.

Earlier in the month the Finnpolaris encountered trouble with her engineroom turbo-charger, and had to operate at half speed. A call was made to Lyttelton for spare parts and other electrical equipment needed to make the ship fully operational for the return voyage to Lyttelton where she was expected late in February. Arrangements were made for about half a tonne of necessary equipment to be taken south by the United States cargo ship Green Wave which left Lyttelton in late January.

SASCAR

Sarie Marais base used for summer operations

An emergency base named Sarie Marais about 820km north-west of Sanae IV in western Queen Maud Land which was built by the South African National Antarctic Expedition in the 1984-85 season was used for summer operations last season. Geologists and surveyors also used the field base at Grunehogna (72deg 3min S/2deg 49min W) built in the 1982-83 season to extend their research in the Ahlmann Ridge mountain range, the Borga Massif, and the Kirwan Escarpment.

Sanae IV, the permanent base on the Fimbul Ice Shelf at 70deg 18min 36sec S/2deg 24min 10sec W, had a summer team of 74 last season. This included 22 construction workers, 10 physicists, and the seven men of the South African Air Force detachment headed by Commandant G. L. Theron, which provided air support with two Puma SA 330J helicopters for Sanae IV and Sarie Marais between December 12 and January 20.

Officer-in-charge at Sanae IV for the summer was Mr D. J. van Schalkwyk. This

winter Mr S. Comfort heads a team of 15 at the station, including five physicists, three meteorologists, a medical officer, two radio operators, two diesel mechanics, and a radio technician.

Eight geologists and four surveyors worked from Sarie Marais during the summer with helicopter support. The long-range Pumas enabled the scientists to expand their geological studies and mapping beyond areas reasonably accessible by snow vehicles from Sanae and Grunehogna. Their projects were part of SANAE's continuing earth sciences programme.

Research conducted at Sanae IV and other bases by South African scientists covers airglow, aurora, cosmic rays, cartography, geodesy, geology, geomagnetism, ionospheric, VLF emissions, meteorology, and seismology. Marine research, including meteorology and oceanography, is carried out aboard the SANAE research and supply ship Agulhas.

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NORWAY

Mapping and science on Peter I Island

Preliminary results of the work of a small Norwegian expedition to Peter I Island about 240 nautical miles off the Eights Coast in Western Antarctica last summer found it to lie six kilometres further south than previously thought. The purpose of the expedition was to carry out a detailed mapping and a limited science programme.

The island, (approx. 68deg 50min S/ 90deg 35min W) is thought to have had few visits from ships since its discovery by Bellingshausen on January 22, 1821. Then, unable to land because of fog, expedition members from the ships *Vostock* and *Mirny* estimated the island to be 15 kilometres or 9.6 miles in length, seven kilometres or 4 miles wide and to rise some 1200 metres or 4,000 ft. It was, at that time, the southern most land known in the world. Bellingshausen called it *Ostrov Peter I* or *Peter I Island* after Peter the Great, founder of the Russian Navy. A party from the Norwegian research ship *Norvegia* made the first recorded landing in 1929 and it was claimed for Norway in 1931.

Few visits

Between 1948 and 1960 heavy pack ice prevented Norwegian, United States, Chilean and Soviet ships from putting parties ashore for any length of time and the last reported landing was on January 29, 1982 by crew members of the cruise ship *World Discoverer*. This summer it was again visited by the *World Discoverer* which anchored alongside the *Aurora* and landed a party of 130 while the Norwegians were in residence. The *Aurora*, bought by the 90 Degrees South expedition was available for charter and used by Peter I expedition while its owners were tracing Amundsen's route to the Pole.

The Norwegian expedition comprising topographers, a scientist and two amateur radio operators, was organised by the Norwegian Polarinstitut in Oslo. Its member flew to Christchurch and left from Lyttelton on January 10 returning to Norway via the Falklands where the *Aurora* refuelled before returning to the Bay of Whales.

Arriving on January 20 the Norwegian (Peter I Island) expedition led by Knut Svendsen used the *Aurora's* chartered Jet Bellranger helicopter to photograph the island in colour and black and white and carry out associated geodetic and survey work. Svendsen was a member of expeditions to Spitzbergen in the northern summer and has worked in Queen Maud Land and on Bouvet Island with the 1984-85 Norwegian Antarctic expedition. Trond Eiken, who was on the same expedition, was responsible for the geodetic work on Peter I Island. They were assisted by surveyors Erik Svendsen and Kristin Tveit, the only woman in the party.

Krill specialist

A marine biologist from the University of Oslo, Sven Fevolden, a krill specialist who has made numerous visits to Antarctica studied krill at the island and took samples at sea. Other scientific work carried out by the team included magnetic measurements and others relating to azimuth, tide water and snow volume. Geological and vegetational samples were collected from the island and observations made of the animal life included sightings of Antarctic fulmars, a small colony of Chinstrap and Adelie penguins and a number of seals.

Two Norwegian amateur radio operators paid their passage on the expedition. One, Einar Enderud from Trondheim is a specialist in electronic communications who spent two years with an expedition to Spitzbergen as station chief on one of the islands in the Svalbard Archipelago. The other was Kaare Pedersen. The pair made nearly 2000 radio contacts all over the world.

During their 10 day stay on the island the expedition established an automatic weather

station on Tvisteinen, a small rock off the northwestern part of the island. Reports in mid-February indicate that it was functioning perfectly having transmitted information on temperatures and air pressure over the International Meteorological Network.

The results of the mapping work, during

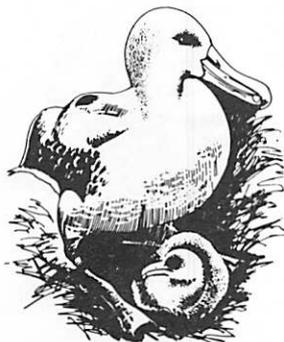
which they found the highest point of the island to be 1695 metres, should be available towards the end of this year. It will be the first detailed map of the island and replaces earlier versions made by a Norwegian sailing captain in 1931 and by the Americans in 1960.

BAS

Diverse summer programme for British Antarctic Survey

The summer scientific programme was preceded by spring journeys for the British Antarctic Survey winterers at Rothera, Faraday and Halley. In October three new colonies of Emperor penguins were found by members of the multi-disciplinary winter Weddell Sea project. Station relief and placement of field parties were well underway by mid-November, the offshore biological programme resumed in late December and building supplies for Rothera delivered by late January as part of the 1986/87 BAS programme.

A number of recreational journeys using dogs and vehicles were undertaken by the 1986 winterers before the arrival of the ships and aircraft. At Rothera station, Adelaide Island, these commenced in July, much to the delight of the three dog teams. One party reached the north of the island in 3 days but was then delayed there by bad weather for a week. Later, another party in the south-west of the island was tent-bound for 3 weeks.



“Drum roll”

Rothera's preparations for the summer commenced in September with the annual “drum roll”, during which 1200 45-gallon drums of fuel were moved up to the airstrip 5 km away at a height of 300 m. Work on the thirty Skidoo motor toboggans was also completed.

Parties from Faraday station, Galindez Island, made good use of solid sea ice, from August to October, to travel 8 km to the Antarctic Peninsula mainland and to several islands. Some also stayed at the old British hut on nearby Winter Island. Further short journeys were undertaken in mid-November and early December, taking advantage of unusually persistent sea ice. In the South Orkney Islands, parties from Signy were able to sledge the 6 km over to Coronation Island, from the end of July onwards, and had an enjoyable time camping and climbing local peaks. At Signy, biological diving was resumed and field-work recommenced from various field huts around the island.

The Halley (Brunt Ice Shelf) winterers also ventured out from the end of July onwards, visiting the nearby emperor penguin

colony, making sea ice observations, inspecting the ice front for possible unloading sites, and several groups later travelled to the crevassed area of the ice-shelf hinge-zone in an attempt to re-establish a route to the inland ice.

Three other colonies

In October, Dr Bernard Stonehouse and other members of the international, multi-disciplinary Winter Weddell Sea Project, aboard the West German ship *Polarstern*, counted 15,600 chicks at the well-known emperor penguin colony near Halley. They also discovered three other colonies on the east coast of the Weddell Sea — on the Stancomb Wills Promontory and Russer-Larsenisen to the north of Halley on the Dawson-Lambton Galcier to the south.

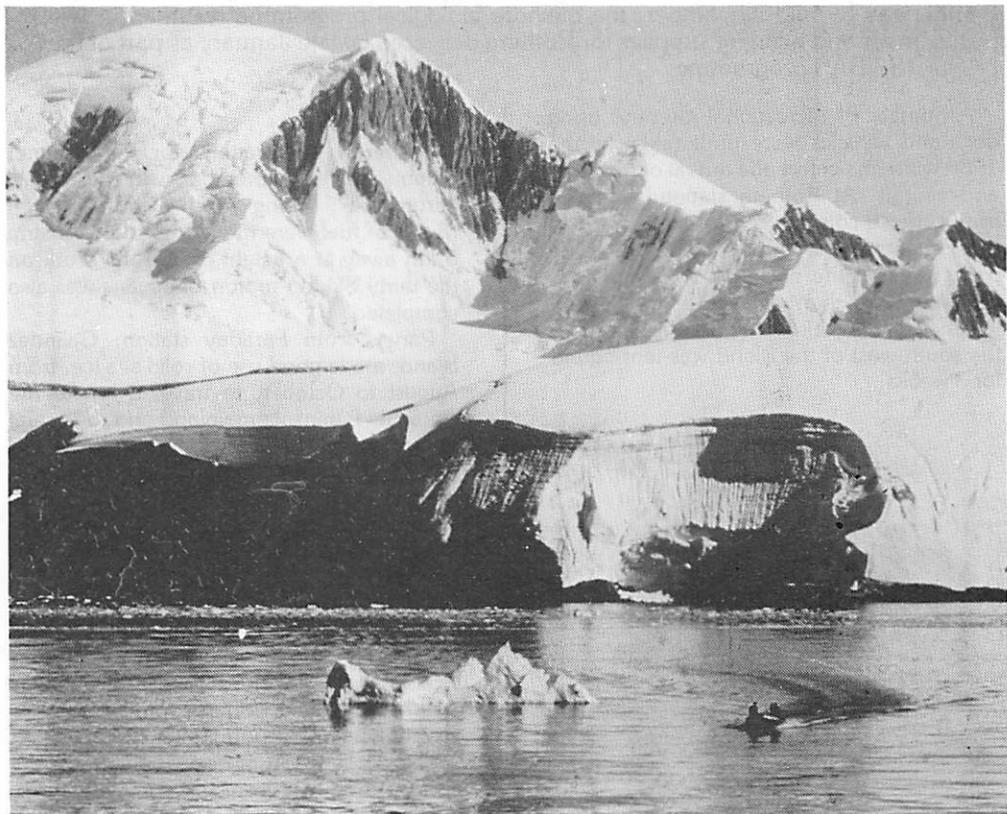
Dr Stonehouse was one of four members of the Falkland Islands Dependencies

Survey (now BAS) who discovered an emperor penguin rookery on the Dion Islands, Marguerite Bay, in October 1948. It was, at that time, only the third emperor colony known. Dr Stonehouse continued his Antarctic research while Reader in Zoology at the University of Canterbury, New Zealand, and is currently on the staff of the Scott Polar Research Institute, Cambridge.

Polarstern arrived off Halley on October 29 and visits were made between the ship and station by helicopter.

RRS *John Biscoe* sailed from Grimsby in mid-September and arrived off Bird Island station, South Georgia, on October 21. Some men and stores were taken ashore,

Geologists returning to ship after examining rock outcrop on West Coast of Anvers Island. — Photo: B. Thomas, BAS



but the ship was then hove-to in bad weather for a week, unable to complete the relief. Mail and urgent stores were taken to Grytviken from where they were later picked up by the chartered French yacht *Damien II* and delivered to Bird Island. *Damien* also took supplies from Bird Island to a four-man BAS/Sea Mammal Research Unit group at Husvik, South Georgia. The group had been established there by a Royal Fleet Auxiliary in mid-October, conditions having been too rough for them to land at the end of September, as planned. They remained in the area for 7 weeks, working on elephant seals, and were then picked up by *Damien* and taken to Bird Island.

The *John Biscoe* proceeded to the Falkland Islands to collect more men and stores, and then sailed south to take field parties to Hope Bay (at the tip of the Antarctic Peninsula), Livingston Island (South Shetland Islands) and Damoy air facility (Wiencke Island, off the west coast of the Antarctic Peninsula). Damoy is a staging-post from which earth scientists are flown to southern work-sites.

On November 5 the ship reported that she

was in heavy pack ice 200 nautical miles north of King George Island and making only slow progress (*Signy* also reported dense pack ice around the South Orkney Islands) and, although she reached Hope Bay the following day, was unable to land a geological field party because of very strong winds. She then took a party to Livingston Island, South Shetland Islands, to commence work on the geochemical characteristics of late Cenozoic volcanism, but they too were unable to land because of heavy pack ice. Conditions were better at Damoy which was reached four days later and personnel and stores were landed there without difficulty.

The ship returned to the South Shetlands and landed the geologists at Admiralty Bay, King George Island, and on the next day succeeded in putting the Hope Bay party ashore. She was then (on November 14)

A member of the USARP-BAS earth sciences field programme, 1984-85, coring granite for palaeomagnetic studies, near Hale Glacier, Thurston Island. One of the BAS twin otter aircraft is in the background.



able to reach Signy station and landed biologists and cargo before heading back to Stanley. Ten days later, the ship was again in dense pack ice north of the South Shetland Islands. Admiralty Bay was found to be jammed with ice so it was not possible to pick up the field party, and the ship therefore turned south to Damoy, making a brief visit to Deception Island en route.

Men and cargo going to Rothera were landed at Damoy on November 26. The ship continued the short distance to Faraday via a shore lead and unloaded urgent cargo on to fast ice. On the following day she was again in pack ice off the South Shetland Islands and was still unable to reach the Admiralty Bay party until a change of wind relieved the pressure. The tourist ship Society Explorer was also in the area and visits were exchanged.

Once more on the move, the field party was landed at Byers Peninsula, Livingston

Island, on December 1, and worked there until they were picked up by Damien and taken to Deception Island 5 weeks later. They were then taken to other work sites in the Bransfield Strait area.

The John Biscoe, meanwhile, headed for Montevideo via Stanley to collect personnel and stores. By December 22 the ship was again off South Georgia attempting to complete the relief of Bird Island, and then proceeded via Stromness to spend Christmas Day at Grytviken.

On December 26, the John Biscoe resumed work on the long-term Offshore Biological Programme, commencing this season in the Cumberland Bay area, South Georgia. Conditions were initially reported to be stormy and restricting operations, but this project was completed by mid-January. Water column profiles, salinity and phytoplankton samples and information about zooplankton/ichthyoplankton

New British Antarctic Survey director

After 17 years with the British Antarctic Survey the director, Dr Richard Laws, will retire in May this year. His successor will be Dr David Drewry, who joined Scott Polar Research Institute in 1973 and has been director since 1984.

Dr Drewry, who is 39, graduated from London University in 1969, and after two seasons work in Antarctica was awarded a Ph.D. in polar geophysics by Cambridge University in 1973. He has been involved in polar research for 15 years, particularly the collection and interpretation of Antarctic ice-depth-sounding and geomagnetic data which was published in 1983 as a *Glaciological and Geophysical Folio*. In 1986 he published a University textbook — *Glacial Geologic Processes*. He has worked in Greenland, Svalbard, Southern Africa and Australia and has also been concerned with the application of satellite remote sensing to polar studies and is involved in the planning of future European Space Agency missions.

Dr Laws, appointed director of BAS after the retirement of Sir Vivian Fuchs in September, 1973, was then head of its life sciences division. He graduated from Cambridge in 1947 with first-class honours in zoology, and spent 1948 and 1949 at the Falkland Islands Dependencies Survey (now BAS) base on Signy Island, South Orkneys, and 1951 on South Georgia, studying the elephant seal. Then for two years he worked on his material gaining his Ph.D. degree from Cambridge in 1953.

After a season on South Georgia as a whaling inspector, Dr Laws joined the National Institute of Oceanography in 1954 and continued to work on whales. In 1961 he became director of the Nuffield Unit of Tropical Animal Ecology in Uganda, and for eight years worked particularly on the ecology and behaviour of large mammals.

While head of the BAS life sciences division Dr Laws became internationally known for his research on Antarctic seals and whales. He has published a number of

distribution were obtained. Work also progressed on a histology/histochemistry programme. A reconnaissance of Stromness and Husvik harbours was then carried out and the cruise ended with squid and fish sampling. At the end of January the ship called again at Bird Island and returned to Stanley after spending some time hove-to in storm-force winds.

RRS Bransfield

RRS Bransfield left Grimsby at the end of October and sailed south via Montevideo and Stanley. Among those on board for the first half of the season was BAS Director Dr Laws. He was accompanied by Professor J. Nelson Norman of Aberdeen who wintered at Halley in 1960 and is now responsible for BAS medical services and research.

The ship's first task was to take more personnel and stores to Signy and then head south to Halley. (Dr Laws who had wintered

at Signy in 1948 and 1949 was able to visit his old work-sites in the area.) The Bransfield skirted the edge of the pack ice eastwards to the South Sandwich Islands and by December 16 was proceeding slowly south through ice on the eastern side of the Weddell Sea. Two days later she arrived off Halley and found 3 km of fast ice off the ice shelf. After cutting back rotten ice to provide a good working edge, cargo handling commenced and was completed in 3 days. Among items delivered was a caboose (mobile hut) containing an interferometer for measuring neutral winds in the ionosphere. The Advanced Ionospheric Sounder (also in a caboose), which had been operating at Halley for 6 years, was brought out for servicing.

Ice cores and snow samples collected by glaciologists working on the Coats Land plateau were also loaded. Finally, a

papers on both, and for a number of years has been convenor of the group of specialists on seals appointed by the Scientific Committee on Antarctic Research. During this period he was an alternative British delegate to SCAR, and has been the permanent delegate since his appointment as director of BAS.

Other staff changes

Another long-serving senior member of BAS staff, glaciologist Dr Charles Swithinbank, retired in November. His retirement has coincided with general reorganisation and expansion of the Scientific Divisions. In Earth Sciences, Dr Michael Thomson continues as Chief Geologist, Dr Peter Barker of the University of Birmingham becomes Chief Geophysicist (covering terrestrial as well as marine Geophysics) and Dr Elizabeth Morris of NERC's Institute of Hydrology becomes Head of Ice and Climate.

Dr Swithinbank had joined the Scott Polar Research Institute, Cambridge, as a Research Fellow in 1955, but moved in 1959 to the University of Michigan from which he participated in three expeditions to the Ross Ice Shelf. He returned to Cambridge in 1963 to take up a research appointment at the SPRI to develop BAS

glaciological programmes. From late 1963 to 1965 he was the first British Exchange Scientist with the Soviet Antarctic Expedition and wintered at Novolazarevskaya while studying movement of the inland ice sheet in that area.

In 1966-72 he took part in three expeditions to Antarctica, using radio-echo ice-depth sounding equipment developed by the SPRI under its Director Dr Gordon Robin. Two of the expeditions concentrated on the Antarctic Peninsula, where Dr Swithinbank developed airborne sounding carried out from an altitude of 10 m!

In 1974 he became Head of BAS Earth Sciences, and during the following 12 years was responsible for many developments in the scale and techniques of BAS programmes. These included productive co-operation with USA and the US Geological Survey, in the Antarctic and in the production of reconnaissance maps from satellite imagery.

He continues to be closely associated with the International Glaciological Society of which he was President in 1963-66.

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thorough inspection was made of all buildings and installations to decide on maintenance procedures in order to ensure that the station continues to be usable for as long as possible. (As it is on moving ice it has to be replaced every 7-10 years. The present station was constructed in 1983.) All activities were filmed by an Anglia Television unit travelling on the ship. The Bransfield departed on December 27 leaving 17 winterers at the station and after an uneventful voyage north, rendezvoused with the John Biscoe at Gritvikyn, called at Bird Island and returned to the Falkland Islands.

South again

Sailing south again, the Bransfield went to Livingston Island to move the geologists working there to a different locality, and then headed for the Antarctic Peninsula. Cargo was delivered to Faraday on January 13, after which the ship encountered heavy pack ice but managed to reach Rothera within two days. Unloading of building materials and prefabricated hut sections was delayed by high winds but was then completed quickly and the ship left the area on January 22. After brief calls at Faraday and Signy she entered Prince Gustav Channel via Antarctic Sound to pick up the Hope Bay field party, and then went north to Stanley and Montevideo for the mid-season change-over of senior ship's officers.

Twin Otters

The three Twin Otter aircraft left the UK on October 13 and arrived at Punta Arenas two weeks later. They were delayed there by bad weather over the Antarctic Peninsula but eventually arrived at Rothera station on November 7. They were not the first arrivals of the summer: two Chilean aircraft had succeeded in reopening their Adelaide Island station, Teniente Carvajal, on October 18 and had called at Rothera en route.

The BAS aircraft reopened Fossil Bluff field station, George VI Sound, on November 8 and, a week later, made their first flight north to Damoy to collect the men and stores from the John Biscoe.

All three aircraft were engaged throughout December in transporting and supplying

groups of earth scientists working on Alexander Island, George VI Ice Shelf and Eklund Islands, the English Coast (south of the Sound), Sweeney Mountains (where a fuel tank was located but found to be empty), the Black Coast (on the eastern side of the Antarctic Peninsula where there were three parties — two BAS and one USAP), the Ellsworth Mountains and Rutford Ice Stream. Glaciologists also continued borehole logging on Dolleman Island, Larsen Ice Shelf, and collected ice cores and pit samples on the Coats Land plateau, 190 km south of Halley. The latter party was flown to Coats Land from Rothera, via Fossil Bluff, Ronne Ice Shelf and Halley in early December; the aircraft returned to collect them later in the month, ferried the samples to the Bransfield and left again for Rothera on December 28.

Marooned

Two other groups spent some time at the US summer station Sky-Hi. Glaciologists were marooned there for a while in December (and later, in January, on the Ronne Ice Shelf) by bad weather which grounded the aircraft and prevented resumption of work on the Rutford Ice Stream. In early January a geophysics team arrived at Sky-Hi, having completed a traverse from the English Coast. An aeromagnetics team commenced work in mid-January using fuel depoted at the US Siple Station, but these flights were also restricted by bad weather.

An automatic weather station set up on Dolleman Island in February 1986 was checked in mid-December and found to be functioning well.

New Rothera building

A three-man building team was among the early arrivals at Rothera, where they were to complete foundations for a new building and clear a site for new fuel pillow-tanks. They had to begin by clearing away 3 m of snow. (There has been more snow and sea ice this season than in the previous 4 years.) When completed, the new building will provide accommodation and working facilities for 72 men. This is the final stage of Rothera's development.

USARP

Snow-buried plane dug out after 15 years

Buried in the snow and ice of East Antarctica for 15 years since it crashed in Wilkes Land on December 4, 1971, a United States ski-equipped Hercules was brought to the surface on December 25 last year. Six Americans and one Frenchman recovered BUNO148321 (call sign Juliet Delta 321) in 23 days, moving 55,000 yards of snow with a bulldozer, two front-end loaders, and shovels. They worked 10 to 12 hours a day for seven days a week to complete the first stage of a recovery operation which began early in November and ended on January 21 this year.

A team of electrical and structural engineers from the Lockheed-Georgia Company, makers of the Hercules, and a US Naval Air Rework Facility in North Carolina examined the aircraft on January 21. Their preliminary findings indicate that Juliet Delta is still airworthy and could be repaired and flown from the site next year.

A decision to fly the aircraft first to McMurdo Station and then to the United States will not be made until next season. The National Science Foundation which organises and finances the Antarctic research programme, the Navy's VXE-6 Squadron, and the Naval Rework Facility will consider the experts' preliminary findings and a final decision will be made after another inspection lasting four to six weeks.

Juliet Delta is worth recovering and returning to full operational service. A new Hercules with spare parts now costs US\$38 million. To put into service again would cost US\$7 to 9 million. The engines which were removed by a VXE-6 Squadron team early in January are worth US\$1 million each. They and the three undamaged propellers are now at McMurdo Station. Last season's recovery project cost US\$300,000.

Hercules No. 321 was badly damaged on takeoff after it had resupplied a French geological traverse party heading across Wilkes Land from Dumont d'Urville Station towards the Soviet Vostok Station. Because of the altitude (1828m) JATO (jet-assisted

takeoff) bottles had to be used. One broke loose on firing, hit the No. 2 port engine, destroying its propeller and gearbox; flying metal then damaged No. 1 engine. The nose landing gear collapsed when the aircraft hit the ice and radar dome was damaged. When the accident occurred the traverse party was at 68deg 20min S/137deg 31min E, and was on its way to a staging point D59 at 68deg 20min S/137deg 21min E.

Recovery of Juliet Delta was first considered in the 1977-78 season when an inspection team found that damage was less than originally thought and recovery was feasible. At that time the aircraft was covered by .9m to 1.2m of drifted snow. Plans for the first stage of a recovery operation in the 1985-86 season had to be deferred because of snow conditions and lack of heavier equipment to prepare a skiway at D59 near the buried aircraft.

Field parties and recovery teams from the United States and France took part in last season's operation, which was sponsored by the NSF Division of Polar Programmes. Air support was given by VXE-6 Squadron which flew the recovery team and its heavy equipment to Wilkes Land, and Expeditions Polaires Francaises provided a highly experienced traverse party from the journey from D21, a staging point at 66deg 44min S/139deg 39min E about 4.5 nautical miles from Dumont d'Urville.

All the excavation and snow shovelling was done by a team of six contract employees of ITT Antarctic Services, a support contractor to DVP. It was led by the project manager, Jim Mathews, who has done contract jobs for NSF since 1974. Others in the team were George Cameron (engineer), Roger Biery and Dan Check (heavy equipment operators), Russ Magsig (heavy equipment mechanic) and Michael Brashears (cook/medical orderly/radio operator and weatherman). Didier Simon, an EPF meteorologist, made the traverse from D21 to D59 and remained with the Americans as an observer, assisting with hand shovelling of snow from around the aircraft. Michael Brashears did the same when he had time to spare from his other duties.

Taxi-way and camp

After preparing its equipment and supplies at McMurdo Station the team was flown about 650nm by VXE-6 Squadron to D21 where the French had prepared a skiway, taxiway, and camp. Because of the rough surface at D59 aircraft could not land there until a skiway was built. So the recovery team had to travel 104nm towing skiway construction and other supplies behind its tractors.

Eight flights

Eight flights from McMurdo Station were needed to transfer the American and French parties, two tractors, a 10-tonne sledge, a prefabricated skid-mounted camp module, equipment and other supplies to D21. Then the Americans joined the experienced

French traverse team of five led by Pierre Laffont with its pre-staged vehicles, sledges, and caravans, and departed for D59 on November 19. The French knew the way; all had made the trip at least once, and Pierre Laffont had been over the route 10 times before.

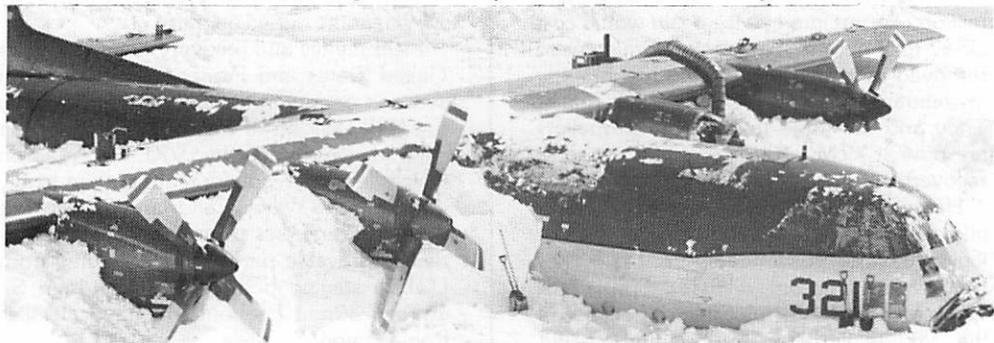
Because of favourable weather and the French knowledge of the route the trip was completed in four days and the combined party arrived late at night on November 23. The American camp was quickly established and a 2438m skiway was built, enabling the first Hercules from McMurdo Station to land on November 27. The flight was the first of 14 resupply and return flights needed to support the operation. The third and fourth flights brought the third piece of heavy equipment, the Caterpillar loader with blade and bucket attachment.

Little visible

When the team arrived at D59 only the top 1.2m of the aircraft's vertical stabiliser was still visible; the wings carried a 6m burden of snow, and the depth of coverage to the base of the landing gear was 10m.

Experimental excavation around No. 321 began on November 26 and serious work began on November 29. The French team started its return trip to Dumont d'Urville on December 1 to begin its own work for the season, leaving Didier Simon behind for the rest of the summer.

Juliet Delta in the early stages of its emergence from its covering of 10m of snow. Photo — US Navy





Good weather at the site allowed the team to make rapid progress on the excavation. Roger Biery and Russ Magsig did the heavy equipment excavation close in around the aircraft with Caterpillar 955 and 931 low-ground pressure tracked loaders. Dan Check then removed the excavated snow with a low-ground pressure Caterpillar D-6 bulldozer.

Before an actual component was uncovered its dimension was surveyed with flags placed on the surface and then the end points, wing tip, stabiliser tip, propeller blade tip were exposed by hand shovelling. George Cameron and Jim Mathews did the survey and a large amount of the hand shovelling around the aircraft, assisted by Michael Brashears and Didier Simon.

As the excavators worked deeper into the accumulated snow, using a Herman Nelson heater to blow warm air into the fuselage, they found that there was ice around the fuselage but, as a French glaciologist had predicted, it had not exerted pressure on the airframe.

By December 24 the aircraft was ready to be moved from its 10m deep excavation pit up a ramp scraped with the heavy equipment. Bad wather, however, stopped all work on that day.

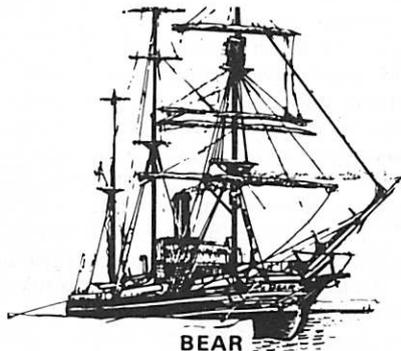
But on Christmas Day Juliet Delta was towed slowly and carefully up the ramp by the tractors from its 15-year prison, looking like BUNO148321 again but not quite. Work did not stop once the Hercules was

Out of the pit at last. Juliet Delta looks almost like an aircraft again 23 days after the recovery team had removed the accumulated snow of 15 years and brought the Hercules to the surface. Photo — US Navy

out of the pit and almost ready for another winter on the Polar Plateau.

Early in January the VXE-6 Squadron team arrived to collect the engines and propellers. The recovery team carried on preparing its equipment and other materials for return to McMurdo Station. The last flight to D59 arrived on January 21 and the team said goodbye to the site where it had lived and worked for nearly two months.

If the same six Americans return next summer there will not be so much snow to shift. Only 3.8m is expected this winter.



Filchner Ice-shelf and Weddell Sea work continues

Fifty two scientists from West Germany, Austria, Belgium, Norway and the United States left Cape Town on December 26 on board the West German research ship *Polarstern* to carry out further glaciological work as part of the Filchner Iceshelf programme and to conduct oceanographic, marine geophysics and geological work in the Weddell Sea.

Led by Professor H. Miller of the Alfred Wegener Institute for Polar and Marine Research in Bremerhaven, the expedition will use two Dorniers, a 228 and a 100, for transport to various sites and to carry out photogrametric work on the Filchner and Ekstrom iceshelves. The *Polarstern* will also resupply the West German Von Neumeyer station where scientists and technicians from the Federal Republic of Germany will spend the winter. The station will serve as a logistical base for the expedition and provide meteorological information. The *Polarstern* was due to return to Bremerhaven on April 18.

Pilot study

This is the third year of the project which began after a pilot study in 1979/80 and concentrated in 1983/84 on an area west of Berkner Island. The field work that year involved scientists from Argentina, the Federal Republic of Germany, Great Britain, Norway, USA and USSR working on projects to determine accumulation, absolute movement, strain rate, and temperature. Tides and conductivity studies were made at various grid points, an ice core obtained from a depth of 100 metres, airborne radio-echo and magnetic soundings were carried out and climatological and geophysical investigations made in the frontal zone at Filchner Station which served as a co-ordination centre for logistical operations on the ice shelf and provided meteorological information.

During the 1985/86 season marine geophysics and geology programmes were conducted in the Weddell Sea from the

Polarstern, a glaciological investigation involved a traverse on the Filchner Iceshelf, the Filchner Station was resupplied and a geological and geophysics programme was conducted in the Meimel Front Fjella, mountains south west of the Von Neumeyer station.

Three legs

On her latest voyage *FS Polarstern* left Cape Town twelve days after completing the third leg of her first winter cruise which began in May 1986 and in total involved 140 scientists and technicians. It is believed to be the first time a research vessel has weathered the long Antarctic winter from May to November in the ice covered South polar sea without being locked in by pack ice.

Divided into three legs the first, from May to June 18, 1986 was mainly an extension of the second Biomass (Sibex) cruise of October/November 1983 and November/December 1984 and February to April of 1985 into the early winter season of 1986. It was organised by the Federal Institution for Fisheries Research in Hamburg and led by Dr Dietrich Sahrager.

Operating in the waters around Elephant Island, the Bransfield Strait, and west of the Antarctic Peninsula as far as Adelaide Island the scientists and technicians used a dense network of oceanographic sampling stations over a large sampling grid to determine the distribution, abundance and composition of krill populations in relation to the physical environment. The region off Elephant Island is of particular interest as it is characterised by high variability of the water masses created by its topographical peculiarities and

currents governed by the Weddell Scotia confluence. Scientists were interested to determine whether the features were as persistent in the winter as they appear in summer as they influence biological activity.

Because fish stocks around the Island depend on high krill zooplankton biomass, the influence of the sea ice was investigated with bottom trawling and fishing with plankton nets to determine relationships between the biomass and fish.

Several biomass standard stations were repeated to detect seasonal and year to year changes of the environmental conditions, the observations extending the summer data into winter conditions.

Working in the waters west of the Antarctic Peninsula scientists also sought to determine overwintering areas and collect data on winter growth of krill. The objectives were to test theories that krill stocks in the area may be low in winter and, if this was so, whether they relate to dispersal or different swarming behaviour.

Experiments on board and biochemical studies focussed on energy metabolism, sensory physiology, feeding and moulting of krill. Investigations on the hibernation of marine animals and growth experiments on the krill which were started on the first segment of the journey were continued on the next two using the krill cooling tanks on the ship.

Second leg

The second and third segments of the expedition together formed the Winter Weddell Sea Project (WWSP) 86 in which American, British and Dutch scientists participated.

The effect of marine ice on the circulation of the ocean and atmosphere was the main objective of the work done in the mid-winter from July to September. This section of the expedition which departed from Bahia Blanca in Argentina on June 24 and ended in Cape Town in mid-September was led by Professor Ernst Augstein of Bremmerhaven.

In polar regions sea ice critically controls the thermal and dynamic air-sea interactions and the biological processes in the ocean which can be better understood with comprehensive observations, measurements

and sampling of sea ice quantities.

Measurements and observations at various distances from the ice shelf were made from the helicopters carried by the Polarstern. Satellite bouys and markers on ice floes were also used to obtain data.

Third leg

Operating approximately on the Greenwich meridian between July and December the Polar Star cruised the 1500 km wide winter pack ice belt enabling its scientists to study the formation of the sea ice and its dynamics. Almost daily measuring teams were dropped on the marine ice to take measurements for ground truth interpretation of satellite pictures and to drill for samples often in temperatures of -32 deg C. The ice free area along the coasts of the continent was also studied to understand more of the physical properties and their effects on climate and biological processes.

The third segment, led by Professor Gotthilf Hempel, extended the oceanographic and meteorological work into the inner Weddell Sea where biologists followed the living processes in the winter ice covered polar sea through to spring development.

Preliminary results indicated pure water close to the coast; that life in late winter occurs, not in the water column as expected but on the ocean floor and on the underside of the ice floes, where krill was found in big colonies feeding on algal mats which develop prolifically without radiation. Samples of algae were collected and subjected to various degrees of light in containers on board the Polarstern to assess production. Sediment samples were collected from the sea floor and atmospheric tests conducted from a walkway extended from the front of the ship. Early results indicate the presence of industrial lead and thalium.

The food of the Emperor penguin and seals was investigated by German and Dutch scientists from the newly built Drescher station, who carried out a population count of seals and penguins in the eastern Weddell Sea using the helicopter from the Polarstern and found 1200 Weddell seals and 130,000 Emperor penguins in a 1300 km stretch of coast.

Ice breakup

Scientists were able to observe the breakup of the Filchner ice shelf into three segments. They located a table ice berg estimated to be between 100 to 200 kilometres long and 200-300 km wide drifting north into the Weddell Sea, an event believed to occur approximately every 30 years.

Prompted by a Soviet request and in the interests of its own future expeditions the Polarstern cruised as far as possible towards the south into the vicinity of the ice islands whose positions until then were only known through pictures of the weather satellites.

With three long helicopter flights the islands were geographically located and the Soviet station Druzhnaya 1 was found in the breakup area. It has been drifting since 1984.

At the end of the journey the Polarstern celebrated its fourth birthday, having been put into use on December 9, 1982. Since this time Polarstern has covered a distance of 190,000 nautical miles, carried out 3,741 measuring stations, and 1,143 scientists and technicians have worked on board. The standard usage was 302 sea days per year but in 1986 it was 334 sea days.

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Cream cake and melons for young Antarctic visitors

A 12-year-old schoolgirl from Beijing and a 13-year-old boy from Shanghai accompanied the second Chinese research expedition to Antarctica last season. Yan Hailan, a sixth grade student from Beijing University's primary school and Wu Hong, a first-year student at Shanghai's Datong Middle School, took with them to King George Island, South Shetlands, a bronze plaque for the Great Wall Station from China's Young Pioneer organisation.

When Great Wall Station was established last year some pupils at Yang Hailan's school thought there should be a token from the Young Pioneers at the station. They proposed that all Chinese children send in ideas for a plaque.

As a result a plaque was designed with a torch, the Great Wall, a panda, and a penguin. The inscription expressed the hopes of Chinese children for the peaceful development of Antarctica. Yang Hailan and Wu Hong were selected by the Chinese Antarctic Research Committee to represent their country's 170 million Young Pioneers and accompany the plaque to King George Island where it was placed outside the station.

When she returned Yang Hailan wrote an article for "China Reconstructs" in which

she recorded her impressions of Antarctica and King George Island. She was impressed by the extremely blue sky, fresh air, and lack of pollution.

"The human relationships also seemed purified," she wrote. "People were very friendly towards one another. Soviet scientists sent Wu Hong and me a big cream cake with the word 'Friendship' on it. Chileans brought us watermelons in their ship."

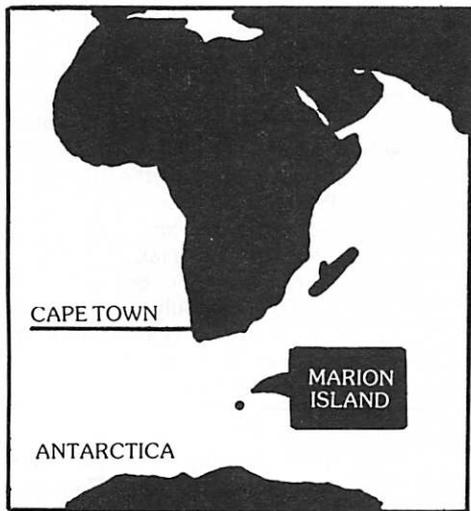


Sub-Antarctic

South Africa plans airstrip on Marion Island

South Africa has decided to build an airstrip on sub-Antarctic Marion Island (46deg 53min S/37deg 52min E) in the South Indian Ocean 1241 nautical miles south-east of Cape Town. The plan to build a 1400m runway and a helicopter hangar at a cost of £4 million, announced in December last year, has been criticised by scientists and conservation groups as a threat to the island's unique wildlife, and one English Sunday newspaper has suggested that the runway will provide a site for testing missiles now being developed for conventional and probably nuclear warheads.

Marion Island, one of the Prince Edward Islands group, was annexed in 1947 by South Africa, which has maintained a permanent meteorological station there for nearly 40 years. It is also the centre of a comprehensive biological research programme. Marion Island and Prince Edward Island 30km to the north are two of very few places in the Southern Ocean where ocean birds can nest and breed.



The location of Marion Island in relation to South Africa and Antarctica.

Formal protection for the birds of both islands is provided under South Africa's Sea Birds and Seals Protection Act, 1973, and a permanent team of scientists monitors the islands' wildlife. In addition South Africa, as a consultative member of the Antarctic Treaty, has been a member of the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR) since it was signed in 1980. The convention covers the conservation of all living organisms in the Southern Ocean, including the waters around Marion Island.

More than two million seabirds breed on Marion Island, including four species of penguins, four of albatrosses, and two of giant petrels. It is the breeding ground for 15 percent of the world's Wandering albatrosses, and has a breeding colony of two million pairs of Macaroni penguins. Thousands of elephant seals live on the island's beaches.

When the South African Minister of Environment Affairs and Fisheries (Mr John Wiley) confirmed his government's decision to build the airstrip he said that it would facilitate evacuation in the event of a medical emergency, provide a landing site in the area for search and rescue operations, ease the provisioning of the weather station, improve South Africa's control of the exclusive

economic zone around the island, and enable it to obtain more information on the area's fishing potential.

Because of the sensitive environment of Marion Island Mr Wiley has approved as a first step a thorough ecological evaluation of the likely impact of construction of an airstrip on the island. A panel of six scientists, four from the Council of Scientific and Industrial Research, will make the investigation.

In addition the government has appointed Dr W. N. Bonner, deputy-director of the British Antarctic Survey and head of its Life Sciences Division to review the panel's report. But it has been criticised for not informing CCAMLR and its scientific committee of the airstrip plans beforehand.

Unlikely

Dr Bonner, who is internationally recognised for his contributions to Antarctic biological research, told the "New Scientist" early in January that he thinks a covert military interest in Marion Island is unlikely, and believes the airstrip is for scientists working there. Like other Antarctic scientists, particularly geologists and vulcanologists, he is aware that Marion Island has about 130 small volcanoes scattered throughout its 290 square kilometres.

Eruption

In November, 1980, a long-dormant volcano on Marion Island erupted. The eruption, the first reported since the island was discovered in 1772, did not cause any injuries to staff or damage to equipment and buildings. But a special investigation made by a team of South African geologists in April, 1981, revealed that the eruption had been far more extensive than at first supposed.

An area of about 10 hectares on the west coast had been affected. Lava had flowed from at least four places along a straight line extending 9km from coast to coast. Temperatures up to 235deg Celsius were recorded less than a metre below the surface and steaming carbon dioxide and sulphur were still escaping from fissures.

Marion Island, like Prince Edward Island,

is a volcanic island formed about a quarter of a million years ago. But its volcanoes differ considerably from large cone-shaped volcanoes like Mt St Helens and Vesuvius. There is no central crater but rather many small "chimneys" which have shot out hot fragments or from which lava has flowed from time to time.

Fissure eruptions of the kind reported from Marion Island have been relatively rare in historical times but have been known in Iceland and Hawaii. There has never been any indication of a destructive eruption having taken place on the island.

Disputed

Some scientists have disputed the need for an airstrip to facilitate evacuation in the event of a medical emergency. They say there should be an operating theatre at the weather station and a doctor should be employed instead of a medical orderly. But in June, 1985, there was a call for medical aid for Mr Graham Clarke, the station leader and medical orderly, who was seriously ill with meningitis.

As the research and relief ship *Agulhas*, which visits the island twice a year, was out of commission, South African Air Force Hercules aircraft and the South African Navy's hydrographic survey ship *Protea* were called on. A Hercules dropped medical supplies at the station on July 11 after another had to turn back with engine trouble when only an hour away from the island.

Then the *Protea* steamed at high speed to the island and after three attempts in sub-zero weather Mr Clarke was taken off by the ship's Wasp helicopter and brought back safely to Cape Town on July 17. This was the fourth mission in five years to pick up sick or injured men at South African sub-Antarctic and Antarctic bases.

References: "New Scientist", January 8, 1987; London "Sunday Observer" and Reuter reports (London and Pretoria), December 29 and 30, 1986; "Antarctic" June, 1981, December, 1982 and 1985; "Scientiae" geological report, reprinted by "South African Digest", October 8, 1982.

90 Degrees South

Pole team turns back 243nm short of goal

Dr Monica Kristensen, 36-year-old leader of the private Norwegian/British 90 Degrees South Expedition, and three companions, abandoned their attempt to retrace Amundsen's journey to the South Pole on January 29. With the Swedish-born glaciologist were a British glaciologist, Dr Neil McIntyre (28) and two Danish dog drivers, Jan Almqvist (27) and Jacob Meisner Larsen (27).

With 22 Greenland huskies drawing two sledges the team left its camp in the Bay of Whales at 4.25 a.m. (GMT) 4.25 p.m. (NZST) on December 17. It reached the Polar Plateau and its fourth supply depot at 85 deg 57min 65sec S on January 25. Amundsen and his four companions reached the Pole on December 14, 1911, in 57 days and covered 870 nautical miles from their base, Framheim, in the Bay of Whales, which they left on October 20.

Dr Kristensen's team was 243nm from the Pole when the decision to turn back was made. The party's base camp was at 78deg 21min S and it covered, at the least, nearly 462nm in about 39.5 days. Although the expedition failed to reach its goal Dr Kristensen and her companions gained some satisfaction from pushing on another three nautical miles from Depot 4. This small advance to 86deg S/172deg W was made on January 27, two days before the decision to return.

Time was the main cause of the expedition's failure to reach the Pole. A heavy ice concentration in the Ross Sea meant that the support ship Aurora reached the Bay of Whales early in December instead of mid-November, and bad weather at various stages delayed the flight from New Zealand of the Twin Otter aircraft chartered to lay supply depots as far as 88deg 03min. As a result of these delays it became apparent that even in the best of conditions the Pole team would arrive late in the season and close to February 14, the date set for the last

flight out from the Amundsen-Scott South Pole Station before the approach of winter.

Before the expedition left Lyttelton Drs Kristensen and McIntyre were told by United States and New Zealand Antarctic authorities that they could not provide any help to the Pole team except in an emergency which might endanger lives or for humanitarian reasons. Concern at the slow progress of the team in the middle of January and lack of communication caused Dr Peter Wilkniss, director of the National Science Foundation's Division of Polar Programmes, which is responsible for the US Antarctic programme, to advise the Norwegian, British, and Danish Ambassadors in Washington of the situation and strongly recommend that they should ask their governments to urge the expedition to turn back.

United States and New Zealand concern was increased by a report from Oslo which suggested Dr Kristensen estimated that she would reach the Pole between February 5 and 10. At that stage the party had still not reached the Polar Plateau. Then, three days after reaching Depot 4 Dr Kristensen advised the Norwegian Polar Institute that the expedition had made no decision about its plans.

Finally, when the Norwegian Government had emphasised that the United States would be unable to fly her team and its huskies out from Pole Station, accommodate them for the winter or maintain any rescue operation so late in the season, Dr Kristensen decided to head back to the Bay

of Whales. The return journey began on January 29.

By February 4 the team was reported to have completed the descent of the Axel Heiberg Glacier and reached Depot 3 at 84deg 03min S/165deg 10min W. The Aurora is expected to arrive at the Bay of Whales on February 26 to pick up the Pole team. Captain Brent Steinsland, master of the ship, is prepared to wait until February 28, the date set by Dr Kristensen, but depending on the ice situation and the weather, he has indicated that he could stay for some part of the first week of March.

From Depot 3 Dr Kristensen and her companions have, at the least, 342nm to cover across the Ross Ice Shelf back to the base camp. If they can maintain an average daily run of 22.5nm like Amundsen in January, 1912, they could reach the Bay of Whales by February 20 or 21. This is assuming ideal conditions all the way with the dog teams, the weather, and the condition of the ice surface. If the average was between 15 and 18nm the party could end the return journey between February 23 and 27.

Base camp

Late on the afternoon of December 6 the Aurora reached the Bay of Whales and moored alongside the sea ice 168m from the Ross Ice Shelf at 78deg 21min S/165deg 07min W. A base camp was set up on the shelf 2.69nm from the ship at a height of 45m on firm snow 30m to 40m deep. All the stores for the Pole team were unloaded from the ship on to the sea ice within 24 hours and then the transfer of fuel, stores, equipment, and the 22 huskies began in earnest.

Hardest worked in the time between the arrival of the Aurora and the Pole team's departure were the Bell Jetranger helicopter chartered from Helicopters (NZ) Ltd and flown by the company's chief pilot, Jim Wilson, with Nick Marwick (engineer), and the Twin Otter flown by two Swedish pilots, Captains Sven-Olof Ahlqvist and Jan Freden, and maintained by a Danish flight engineer, Allan Laugesen. Jim Wilson, who had already flown many hours on ice reconnaissance to guide the Aurora through the pack ice, made 240 trips between ship

and shore with everything needed to set the Pole team on its way.

On each seven-minute flight the Jetranger carried stores, fuel, equipment, and the most important cargo of all — 22 huskies eager to feel snow under their paws again after six weeks aboard ship. They arrived at the base in their boxes, three at a time accompanied by their Danish drivers, who were assisted in the operation by a 19-year-old Norwegian dog handler, Erlend Moe.

Air strip

When the Aurora was in position on December 6 and a suitable strip on the sea ice had been found the Twin Otter took off on its 360nm flight from Cape Evans where the crew had been camped since November 14. The crew's first task was to load drums of fuel from the ship into the aircraft for transfer to the strip on the ice shelf, and then begin the laying of five supply depots along the route to the Pole, the last only 90nm from the expedition's goal.

With no onset of darkness to check operations the Twin Otter crew was able to put in Depot 1 at 79deg 58.1min S/166deg 48min 65sec W late on December 6. The aircraft returned to the base camp and was loaded for the flight to Depot 2 but had to remain at the Bay of Whales because of fog and blowing snow.

Second depot

Depot 2 was put in at 82deg 09min 34sec S/165deg 10min 49sec W on December 7, late in the afternoon. Two flights were made to Depot 3 at 84deg 03min 65sec S/165deg 10min 49sec W with drums of fuel to build up stocks for the flights over the Queen Maud Mountains to place the last two depots on the Polar Plateau. A third fuel flight was made to Depot 3 on December 8.

On the same day a fourth flight was made with food for the depot. Then the aircraft returned to the Bay of Whales where all the food for the last depot was loaded and then flown to Depot 3. The next day the Twin Otter left the base camp to put in Depot 4 high on the Polar Plateau at 85deg 57min 65sec S/173deg 13min 37sec W.

To lay this depot Captain Ahlqvist flew up the 34nm-long Liv Glacier, following the route taken by Byrd on his flight to the Pole in 1929. The depot lies several degrees west of the head of the Axel Heiberg Glacier which the 90 Degree South team had to ascend like Amundsen and his men in 1911.

Captain Ahlqvist put his aircraft down on the plateau at a height of 3169nm above sea level in blowing snow whipped up to a height of 60m. The temperature was minus 32deg Celsius but the depot was laid in the most difficult conditions and the Twin Otter flew back to Depot 3.

Precise fixes

Precise fixes were made by satellite of all the depot positions on the Ross Ice Shelf, at the base of the Transantarctic Mountains, and on the Polar Plateau except for the Titan Dome (88deg S/165min E), an ice dome about 120nm from the Pole. Because of the aircraft's closeness to the Pole and the position of the orbiting polar satellite the depot had to be laid at 88deg 30min S/167deg 05min E which is 90nm from the Pole.

But the weather was kinder this time although the Twin Otter was 3322m above sea level and the temperature was minus 30deg C. There was almost no wind and the snow surface was half a metre thick and very hard.

More depots

Captain Ahlqvist and his crew did not have to lay the depots unaided. One of the two dog drivers, Jan Almquist, was on all the flights south. Dr McIntyre also flew to Depot 3 to study a crevassed area near the approaches to the Axel Heiberg Glacier.

Each depot consisted of two large cases painted red and black for better visibility on the white expanse of the Ross Ice Shelf and the Polar Plateau. As an additional aid to navigation the depots were marked by rows of bamboo stakes and trail flags running east and west to a distance of 122m. Supplies and equipment at each depot included a pair of skis and a 200-litre drum of fuel.

After the Titan Dome depot was put in and finished the Twin Otter flew back to

Depot 3 to pick up fuel for the return flight to the Bay of Whales. Before heading north the depot laying party flew into the lower reaches of the Axel Heiberg Glacier and photographed the area to give the Pole team some indication of conditions likely to be encountered on the ascent.

Back at the base camp Dr Kristensen was waiting anxiously for the return of the Twin Otter and Jan Almquist. But on December 14 when the aircraft was on its way back, base camp and landing strip were both completely hidden by fog and a whiteout.

Captain Ahlqvist had passed Depot 2 when he was advised that a landing at the Bay of Whales was impossible. He put the Twin Otter down on the Ross Ice Shelf at 81deg 50min S/166deg W. Emergency equipment was unloaded, and the four men set up camp and prepared to wait for the weather to clear.

After two nights and three days in their

Position up-dated

Dr Kristensen and her companions, Dr Neil McIntyre, Jan Almquist, and Jacob Larsen, reached their base camp in the Bay of Whales early on the morning of February 27. The Aurora arrived about 3 a.m. on the morning of March 1. Two hours and 12 minutes later the Helicopters (N.Z.) Jetranger crew, Cranleigh Lee and Christopher Nelson, had ferried the party and its 22 huskies to the ship. The temperature was minus 30deg Celsius and the pilot had to battle poor visibility and a 15-knot wind. Towards the end of the day the Aurora, heading north to New Zealand, had put the Bay of Whales nearly 180 nautical miles behind her.

The ship arrived in Auckland on approximately March 9. Her departure for Oslo was delayed by a shipping strike but Monica Kristensen, her companions and the dogs flew home on March 23. We hope to complete our coverage of the expedition in the next issue of "Antarctic".

emergency tents the men were advised that the weather had cleared. The Twin Otter took off again and returned to the Bay of Whales on the evening of December 16.

About 10 hours later the Pole team with two dog handlers, not one, was ready to depart. Some time earlier Dr Kristensen had sent a message to the expedition's agent in Christchurch: Off within hour for South Pole. Many thanks for help and Merry Christmas.

As the impatient huskies headed south the historic occasion was recorded by a British freelance film unit for a National Geographic Society film. Filming was done from the New Zealand helicopter and a motor toboggan. Newspaper coverage was provided by a reporter and photographer from the Oslo evening newspaper "Verdens Gang", which had exclusive news rights in Norway from the expedition.

First to leave the Bay of Whales after the Pole team had departed was the Twin Otter which took off on the 470nm flight to Terra Nova Bay at 2 a.m. (NZST) on December 18. Two hours later, after the base camp had been cleared up, the Aurora also began the first stage of the voyage back to Lyttelton. On the way to Terra Nova Bay Jim

Wilson flew the Jetranger two or three nautical miles inland on the Ross Ice Shelf to a site half-way between the Bay of Whales and McMurdo Station where an emergency depot was put in.

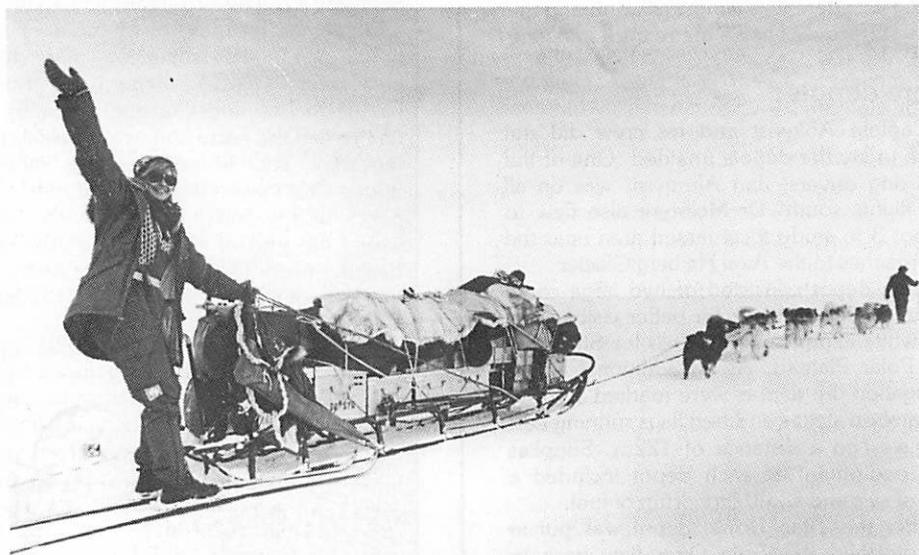
Communications between the Aurora and the Pole team which carried Danish military radios on each sledge, were intermittent. But by December 23 the team had covered 92nm and expected to reach Depot 1, 5nm away, by Christmas Day.

In the first week the huskies took some time to settle down and the average daily run was only 10.79nm. Two frozen Norwegian salmon had been left at Depot 2 for the team's Christmas dinner as Dr Kristensen and her companions had expected to be there by December 25. But the salmon were eaten in the New Year as by December 31 the team was at 81deg 23min S instead of 82deg 09min S.

Between Depots 1 and 2 the Pole team did not keep to Amundsen's original route over the Ross Ice Shelf. After leaving the

Dr Kristensen waves goodbye as the Pole teams heads south from the Bay of Whales.

— Photo: Olav Hasseknippe, courtesy of "Verdens Gang", Oslo.



Bay of Whales it headed south-west to the 170W meridian which was then followed to 82deg S. This was to avoid the heavily crevassed area now known as Steer's Head where Amundsen and his companions were trapped only a few days after leaving Framheim. From Depot 2 Amundsen's route was then followed direct to the Axel Heiberg Glacier.

With the huskies running well the team was able to travel faster in the New Year after leaving Depot 2. The average daily run was increased in the next two weeks to 18.88nm and by January 14 the team was reported to have reached Depot 3 at 84deg 03min S, but it did have some trouble locating the depot. Because of rising summer temperatures the dog teams were being run at night when the snow surface was harder.

Axel Heiburg

By January 18 the team was reported to have reached 85deg 19min S and started its ascent of the Axel Heiberg which is 42nm long and rises to more than 3048m on the way to the Polar Plateau. From nearly 19nm a day the first day's run dropped to 7nm when the dog teams started climbing like their drivers.

A report from Oslo put the team still on the glacier at 85deg 26min S on January 20. Dr Kristensen was expecting to reach the plateau in six days and complete the journey to the Pole in 10 to 15 days. This estimate would have brought the team to the Amundsen-Scott South Pole Station between February 5 and 10.

Dr Kristensen's estimate was partly correct. On January 25 the team was reported to have reached Depot 4 at 85deg 57min 65sec S on the Polar Plateau. Two days later the team had advanced another three nautical miles to 86deg S or 240nm from the Pole.

Depot 5 in the Titan Dome area was put in at 88deg 30min S just 90nm from Pole Station. But when Dr Kristensen decided on January 29 to abandon her journey newspaper reports from Oslo claimed that she had been at Depot 4 for nearly a week making up her mind whether to return to the

Bay of Whales. There was no reference to the short journey on January 27.

While the Pole team was heading across the Ross Ice Shelf to the Transantarctic Mountains the support team which had placed it at the Bay of Whales was well on the way back to civilisation. The Twin Otter arrived at Christchurch on Christmas Day and left for Greenland on January 2; the Aurora berthed at Lyttelton the next day.

Italian support

On the first flight to Terra Nova Bay the Twin Otter landed on the sea ice in the Cape Washington area at 74deg 30min 38sec S/165deg 12min E about 20nm from the Italian expedition which was establishing its summer station in Gerlache Inlet. There the crew camped in cold and snowy weather to await the arrival of the Aurora which had a rendezvous arranged with the Italian support ship Finnpolaris for the transfer of 70 tonnes of light marine fuel to the Norwegians.

In the afternoon of December 19 the Aurora arrived in Terra Nova Bay. There was open water in the bay but a belt of sea ice in Gerlache Inlet. Because of ice movement both ships had to move out beyond the ice edge to open water in the Campbell Ice Tongue area. Later they returned to the ice edge for their rendezvous and fuel, fresh food, and mail, were transferred on December 21.

Next flight

Preparations for the Twin Otter's next flight of 170nm to Cape Hallett began as soon as the Aurora arrived. The JeTranger picked up the crew and brought them back to the ship. Later it took the three men and more drums of fuel back to the ice strip, and the flight north began on the morning of December 21.

Heavy snow squalls down to 152m forced the Twin Otter to return just before it reached Coulman Island. The helicopter picked up the crew again and the trio spent another night on the ship.

Next morning (December 22) the Twin Otter flew to Moubay Bay, Cape Hallett (72deg 11min S/170deg 13min E) and landed on the sea ice of Edisto Inlet (72deg

20min S/170deg 05min E), an arm of Moubray Bay. Once again the crew pitched camp — for the last time — to await the arrival of the Aurora on December 23.

Because of heavy ice the ship had to stand off about 27nm to the east of Cape Hallett. The pattern was repeated, Jim Wilson flying to Edisto Inlet, picking up the crew and returning to the Aurora. There Captain Ahlqvist prepared for the final stage, Cape Hallett — Invercargill, a distance of 1560nm. Eighteen drums of fuel were flown to the aircraft, the skis were removed, and some internal equipment, and plans were made for departure on the evening of December 23. But at 6.40 p.m. (NZST) the flight was delayed 24 hours because of a forecast of head winds.

Forecast

This weather forecast deprived Captain Ahlqvist and his crew of a New Zealand Christmas. While thousands of New Zealanders were preparing their dinners the Twin Otter was heading north over the Southern Ocean. The aircraft left Edisto Inlet at 9.24 p.m. (NZST) on December 24 for Invercargill where it was expected about 10 p.m. (NZST) on Christmas Day.

Meteorological advantage

But this time the Twin Otter and its crew received a meteorological Christmas present — tail winds which help to increase flying speed. As a result Captain Ahlqvist decided to continue on to Christchurch, another 235nm. He landed at 10.13 p.m. (NZST) with still enough fuel for three more hours flying and could have carried on to Auckland where the long flight to the Bay of Whales and back actually began.

Nine days later the Aurora arrived at Lyttelton. The Jetranger remained aboard but Jim Wilson and Nick Marwick returned to Nelson, the British film unit left for London with 25,000ft of film, and the Norwegian newspaper team flew home to Oslo. Then the crew prepared for its second voyage to Antarctica, first to Peter I Island and then back to the Bay of Whales.

On the first voyage south the Aurora left New Zealand before the Twin Otter. Captains Ahlqvist and Frennd, and Allan

Laugesen had been in Christchurch for several days awaiting the arrival of the ship at Lyttelton from Auckland. They had to wait another 17 days before they could fly south.

Two months

After a voyage of nearly two months from Oslo the Aurora reached Auckland in the middle of October to await the 22 huskies which were flown to New Zealand by British Airways. Aboard the aircraft were Drs Kristensen and McIntyre, Jan Ahlqvist, Jacob Larsen, and Erlend Moe. Dog drivers and handler joined the ship, and before she sailed, the expedition leaders flew to Christchurch to discuss their plans with United States and New Zealand Antarctic authorities. The Twin Otter left Auckland on October 24 and was in Christchurch before the Aurora arrived at Lyttelton on October 27 to take on fuel, supplies, and the Helicopters (NZ) Ltd Bell Jetranger.

When 35-year-old Captain Steinsland took his ship out of Lyttelton he carried a crew of 10, and 12 members of the expedition. His crew included two Norwegian mates, Jan Oystein Krane and Audun Billy Gaarden, a Danish chief engineer, Mikkel Vindberg, and his Norwegian assistant, John Johannessen.

There are two women in the Aurora's crew, both cooks. They are 25-year-old Ann Kristin Gilje (Norway) and Helle Raunholt (Denmark) who is also the nurse. There are three Norwegian seamen, Per Ivar Pettersen, Arne Roy Solaas, and Sigve Gilje. The steward, Antony Rudolph De Freitas, is a Norwegian citizen, but was born in Guyana.

Short stay

Nine people joined the Aurora at Lyttelton during her short stay in port — less than four hours. They were the two leaders, the New Zealand helicopter crew, Jim Wilson and Nick Marwick, the Norwegians, Harald Severeid (journalist) and Olav Hasselknippe (photographer) from the Oslo newspaper "Verdens Gang", and the British film unit, Alan Ravenscroft (director), Jan Nicholas Pester (cameraman) and Philip Croal (sound engineer).

Captain Steinsland, who has been at sea for 20 years, most of the time fishing in Arctic waters and also of the coasts of Mexico and Africa, had an early taste of the stormy weather south of New Zealand. On November 2 he reported that after five days of heavy seas which washed several empty dog boxes overboard, the Aurora had been forced to turn north and shelter for a day near Campbell Island.

Pushing south

But by November 5 the ship was pushing south again and was at 63deg S. Captain Steinsland expected to reach the ice edge by November 6. On that day a helicopter reconnaissance was made to locate an iceberg suitable for the Twin Otter to use on its flight from Invercargill. A berg 6.4km by 4.8km was located at 65deg S/175deg E but a survey revealed that the gradient was too steep for takeoff.

Between November 8 and 9 the Aurora found a suitable flat-topped berg 800m by 800m at 66 deg 46min S/169deg 4min E. The Twin Otter which had been delayed a Christchurch for several hours on November 6 because of trouble with its satellite navigation equipment, flew to Invercargill late in the afternoon and was ready to fly south on November 11. However, its departure was delayed by strong winds up to 40 knots and drifting snow on the route south.

On November 12 the Twin Otter with a fuel load of 2500 litres left Invercargill at 11.01 a.m. (NZST) on its 1212nm flight to the berg which was surrounded by open water and one-year sea ice between 50.8cm and 63.5cm thick. It landed safely at 7.45 p.m. (NZST). The crew was flown to the ship and spent the night there.

Snow

Bad weather with high winds which brought snow delayed the 660nm flight to Cape Evans which was planned for November 13. The Twin Otter made several attempts to take off in the layer of snow which covered the flat top of the berg and stuck to the skis. Some drums of fuel were removed and the skis were de-iced but finally the flight

was postponed and the crew spent another night on the Aurora.

Next morning the weather had improved and also the surface of the berg. The Twin Otter took off at 4.25 a.m. (NZST) and reached Cape Evans at 8.34 a.m. (NZST). It landed on a 500m strip of sea ice marked out with plastic bags by the three members of the Footsteps of Scott Expedition, Gareth Wood, Steve Broni and Tim Lovejoy, who had spent the winter at their base near Scott's hut.

Not long after the arrival of the Twin Otter at Cape Evans the Aurora ran into heavy pack ice which barred her way to the Bay of Whales. She made almost no progress for 10 days and had to divert more than 250nm off her planned course to break through into open water. Progress was slow but by November 25 the ship was at 66deg 40min S/168deg 40min E and on November 28 she had advanced to 69deg 09min S/178deg E.

By the end of the month Jim Wilson, who had spent about 30 hours in the air seeking a way through the obstinate pack was rewarded. The ship encountered heavy local ice at 70deg 20min S/178deg 26min E but beyond it was open water leading south. A later report gave the ship's position as 71deg S/179deg E.

Open water

Then at midnight on December 4 came a report that the Aurora had been in open water since 70deg S. Her position was 75deg 02min S/177deg W, and Captain Steinsland expected to enter the Bay of Whales by December 6. With less than 200nm to go 90 Degrees South was almost at its starting point.

When the Aurora came back to Lyttelton and sailed on January 10 after a week in port she carried another expedition organised by the Norwegian Polar Institute which planned a mapping and marine research programme on Peter I Island (68deg 50min S/90deg 35min W). The island, about 240nm off the Eights Coast, has had few visits from ships since its discovery by Bellingshausen in 1821.

New crew

A new helicopter crew joined the Aurora to replace Jim Wilson and Nick Marwick. They are Cranleigh Lee (Nelson), who is the pilot, and Christopher Nelson, from Hobart, who is the engineer.

Captain Steinsland expected the voyage from Lyttelton to Peter I Island to take up to 15 days but he arrived on February 23. After the expedition's work was completed the ship headed for Ushaia, the Argentine port on Tierra del Fuego. She arrived there on February 7 and left on February 8 to pick up fuel at the Argentine mainland port. From there she departed for the Bay of Whales to pick up Dr Kristensen's team. Her estimated time of arrival is February 26 but she will wait at least until February 28.

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Last summer six marine scientists and three meteorologists were aboard the Agulhas which did oceanographic research in the Maud Rise area between late December and the middle of January after the re-supply of Sanae IV and the opening of Sarie Marais.

Under the command of Captain W. McD. Leith the Agulhas sailed from Cape Town early in December and was off the Fimbul Ice Shelf on December 12. She departed on December 26 for the West German Georg von Neumayer Station in Atka Bay where she arrived on December 28. The next day she departed for Sanae IV, arriving on December 31. On January 20 she ended her Antarctic operations and sailed for Cape Town, arriving on January 28.

Expedition to climb Antarctic island peaks

Six New Zealand and British mountaineers left Auckland on November 21 aboard the 14.9m steel ketch Northanger for the Antarctic Peninsula where they plan to climb peaks on islands in the area. Three members of the expedition have worked in Antarctica before and all are experienced mountaineers and skiers.

Leader of the expedition is Rick Thomas, owner of the Northanger, who worked with the British Antarctic Survey in 1976-77. In 1984 he and a colleague sailed the ketch from England to Alaska where they climbed Mt St. Elias (5486m) after ski-ing inland about 128km from Ice Bay.

There are four New Zealanders in the party, Rex and Joelle Hendry, who work at an outdoor pursuits centre in the North Island, Greg Landreth of Christchurch, and Vince Scully, a ship's officer and mountaineer from the North Island. An Englishwoman, Marguerite Tierney, has worked as a ski patrol in Australia.

Rex Hendry has wintered twice in Antarctica. He was a fitter/electrician at Scott Base in the 1979-80 season, wintered there in 1980, and then served at the BAS station Rothera on Adelaide Island in 1982 and 1983. Greg Landreth has worked with the United States research programme in

McMurdo Sound.

Built in Britain three years ago the Northanger was designed for ice work. She has a 65 h.p. diesel engine, and a lifting keel and rudder give her a draught of only 90cm when they are retracted.

Rick Thomas expected the Northanger to complete her 4168-nautical mile voyage to Antarctica in early January, heading first for Anvers Island. After about two months climbing and sailing in the Antarctic Peninsula area the expedition will return to New Zealand early in March by way of the Falkland Islands and South America.

First on the climbing programme is an ascent of Mt Foster (2103m) on Smith Island in the South Shetlands. This ice-capped peak dominates an island only 28.9km long by 8km wide which is distinguished by its rugged coast with sheer black cliffs rising 609m to 914m.

A British expedition which planned to climb peaks in the Antarctic Peninsula and on South Georgia was lost at sea in 1977-78 between Rio de Janeiro and the Falkland Islands where two New Zealand climbers, David Kilcullen and Gary Ball, were to have joined five Englishmen and one American. The expedition's main objective was to climb Smith Island's three ice-capped peaks,

Mts Foster, Pisgah (1859m) and Cristi (1280m).

Next year's expedition hopes to climb other peaks besides Mt Foster, depending on ice conditions. They are Mt Francais

(2760m) on Anvers Island, climbed previously by Chilean scientists, Mt Gaudry (2315m) on Adelaide Island, and possibly Mt Parry (2520m) on Brabant Island.

Greenpeace seeks base at Cape Evans

Greenpeace, the international environment organisation, sent a second expedition to Antarctica in January to establish a permanent base at Cape Evans on Ross Island and maintain it for two years. Last season's expedition aboard the 887-tonne converted ocean-going tug Greenpeace had to turn back when heavy ice blocked its approach to Ross Island.

This summer the expedition has a Hughes 500D helicopter which will be able to lift base materials and equipment 20 nautical miles to the base site if the ship is blocked by ice again. Three men, a leader/mechanic, doctor, radio operator, and a woman scientist, will occupy the base this year and will be replaced by a second team which will winter in 1988. The cost of the two-year operation is expected to be US\$1.3 million.

With 35 men and women aboard, the 60m Greenpeace, which now has a

strengthened bow and ice fins, sailed from Auckland on December 29, called at Wellington to take on fuel and supplies, and arrived at Lyttelton on January 5. She headed south at 5 p.m. on January 6 and is expected to reach the Ross Island area about January 17 if the ice conditions are favourable.

A base site was surveyed by helicopter in January last year. Construction of the base hut about 100m north of the Footsteps of Scott expedition's base (77deg 38min S/166deg 38min E) is expected to take three weeks. Greenpeace will have to leave the Ross Island area no later than February 28.

Two New Zealanders, a West German, and a Dutchman who is now a naturalised New Zealander, will occupy the base in the coming winter. The leader and mechanic is a 26-year-old New Zealander, Kevin Conglen, who was dog handler at Scott Base in the 1984-85 season and wintered in 1985. He has 14 years' mountaineering experience and works as a mountain guide at Mt Cook. Dr Gudrun Gaudian is a 25-year-old marine biologist. She will make pilot studies of fish and krill in the Ross Island area during her stay at Cape Evans and will also monitor the seal, penguin and skua population.

Thirty-year-old Dr Cornelius van Dorp, the base doctor, is of Dutch parentage but was born in Gisborne and is now a New Zealand citizen. He will carry out scientific projects in addition to his medical duties, studying heat loss from the body, and the reaction of the team to its environment.

Peninsula cruise

Three Americans, two New Zealanders, two Canadians, and one Frenchwoman, sailed from Lyttelton on the morning of December 24 aboard the 18.2m schooner Anne to cruise in the Antarctic Peninsula area. The Anne, which arrived on December 16, is registered in Anguilla, one of the Leeward Islands in the West Indies.

William Reid Stowe, the American leader of the expedition, plans to head first for Adelaide Island, and then call at the United States Palmer Station on Anvers Island. There are two women in his crew — a Canadian, Keri-Lee Paschuk, and the Frenchwoman, Sylvie Christine Terree. The other members of the crew are Robert Wesley Broussard and Christopher James McCauley (US), Nigel Blake Allely and Kerry Michael Clarkson (NZ), and Marc Rene Paquet (Canada).

Another New Zealander, 24-year-old Justin Farrelly, will join the winter team as radio operator when he completes his flying duties as second pilot with the helicopter unit. He was born in Wellington, educated in Christchurch and trained with the Royal New Zealand Air Force.

Kevin Conaglen and his companions will live and work in a prefabricated insulated plywood building 13.75m x 6.25m. A second building 5m x 2.5m will house the generator. Both will be enclosed in an outer shell 16m x 7m for better insulation. The buildings were made by the Hamburg firm, Christiani and Nielsen, which provides support services for the West German research programme.

Greenpeace II is headed by Peter Wilkinson, the 40-year-old Londoner who led the first expedition in 1985-86. His assistant is a 29-year-old Belgian biologist, Dr Margriet de Poorter. The logistics organiser is another New Zealander, 41-year-old Graham Woodhead, who was deputy officer-in-charge at Scott Base in the 1982-83 season and in charge of the 1983 winter team.

A Scottish carpenter, Hugh Stirling, and an Australian radio technician, Ian Balmer, are also members of the summer support team. With them is a 35-year-old American, Keith Swenson, of Morristown, New Jersey, who is serving as a base understudy to gain experience for the time when he joins the 1988 winter team.

Ian Balmer went south with the first expedition after service as an engineer with the Australian Broadcasting Commission, and was to have been the winter team's radio operator. This time he is responsible for setting up the communications complex at Cape Evans which includes a 21.3m steel lattice tower for the main high frequency transmitter.

To establish the base Greenpeace carries a landing craft with two outboard motors and a cargo capacity of five tonnes, a Muskeg tractor with a rubber-tyred trailer, a Bombardier Alpine skidoo (motor toboggan) and a Nansen sledge for field travel. All the

Greenpeace seeking a lead through the Ross Sea into McMurdo Sound.



equipment except the landing craft will be left behind at Cape Evans for work around the base and in the field.

On the voyage south the Hughes 500D and 300 helicopters will be used for ice reconnaissance and aerial photography. They will also provide support for the base construction and work on Ross Island until the expedition departs. Garry Dukes, a 34-year-old Australian from Wollongong, New South Wales, who commands the helicopter unit, and Justin Farrelly, expect to do 230 hours flying while Greenpeace is in the Ross Sea. Their mechanic is a 34-year-old Englishman, Alexander Geddes, who now lives in New Zealand.

Master of the 27-year-old Dutch-built Greenpeace is Captain James Cottier (52) of Ramsey, Isle of Man, who now lives in the Bay of Islands. His three mates who come from Britain, New Zealand, and Australia, have all had Antarctic seagoing experience. Twelve countries are represented in the crew of 14 men and three women.

Three of the men are New Zealanders, four are British, and the rest come from

Australia, Wales, Spain, Holland, Denmark, Sweden and Austria. There is an Irish deckhand, Grace O'Sullivan, from Waterford, the chief cook, Irntraud Mussack, was born in Lindau, West Germany, and the second cook, Nathalie Mestre, is a Swiss from the town of Bienne.

Greenpeace International's main objective is to have Antarctica declared a world park to protect it from mineral exploitation. The present expedition intends to carry out scientific research and monitor the impact of human scientific and commercial operations on the Antarctic environment. This research will be done for two years to qualify Greenpeace for observer status at consultative meetings of the Antarctic Treaty nations.

One of the main concerns of Greenpeace II is to obtain international publicity for its aims and objects and to ensure that its activities this summer become widely known. To

Chief pilot Gary Dukes of Australia delivers another load of building materials to the Greenpeace Antarctic Base site at Cape Evans.



do this it will install a satellite communications system at Cape Evans for operation through the international marine satellite INMARSAT. Secondary communications will be by a high frequency radio link to Australia and New Zealand.

A Swedish photographer, Andres Loor, will make an official record of the expedition

for Greenpeace. In addition West German and New Zealand journalists, Jochen Vorfelder (Heidelberg) and Stephen Knight (Auckland) will file newspaper and radio reports. A New Zealand film team is also aboard Greenpeace. The cameraman is John Philpotts and the sound recordist is Bruce Adams.

Twin Otter flies Cape Evans trio to Chile

One of the leaders of the private British Footsteps of Scott Expedition which reached the South Pole on January 11 last year flew across Antarctica from Chile to Ross Island in December to pick up three of his men who had remained at the Cape Evans base camp after the support ship Southern Quest sank in the Ross Sea and the rest of the expedition returned to Christchurch on January 15. Robert Swan arrived from Punta Arenas on December 15 aboard a chartered Twin Otter aircraft flown by Captain Giles Kershaw and took Gareth Wood, Steve Broni, and Tim Lovejoy back to civilisation.

Gareth Wood, the Canadian base commander and radio operator when the expedition's Jack Hayward base was established at Cape Evans early in February, 1985, made the journey to the Pole with Swan and Roger Mear. He had been in Antarctica nearly two years, including two winters on Ross Island when Swan and Kershaw arrived late on the evening of December 15. Steve Broni, a Scottish biologist from Glasgow, and Tim Lovejoy, from London, were members of the support team aboard the Southern Quest. They had been waiting at Cape Evans for more than 11 months.

Wood and his companions volunteered to remain at the base camp to clean up and prepare the stores, equipment, and the ski-equipped Cessna 185 aircraft designed to be used by Kershaw to fly the Pole party back to Cape Evans, for eventual return to New Zealand. Before he left Christchurch Swan announced that a ship would be sent in the 1986-87 summer to pick up the men and remove the prefabricated base hut, aircraft, stores, and equipment.

Two offers to fly the three men back to New Zealand were made by the United States National Science Foundation; the first

when the rest of the expedition was brought back, and the second at the end of last winter. Swan refused both, his reason the second time being that the offer was for only the three men and their personal baggage.

In October Swan then arranged for the 90 Degrees South Expedition's support ship Aurora to pick up Wood, Broni, and Lovejoy, and bring back everything from Cape Evans. The cost of the operation was estimated at US\$57,152. Because the Aurora's voyage south and return to New Zealand were delayed by heavy ice and bad weather Swan then decided to bring his men back by air. The full cost of the mission is estimated at US\$104,000. It will be paid by the expedition.

To pick up the three men Captain Kershaw flew his specially-equipped long-range Twin Otter 2698 nautical miles from Punta Arenas, the Chilean seaport on Magellan Strait. Arrangements were made early in December with a United States-Canadian company, Adventure Network International, set up to operate research vessels, field camps, and services to Antarctica for mountaineering and scientific expeditions. Captain Kershaw's subsidiary company, Antarctic Airways, based in Calgary, is

responsible for ANI's air transport and resupply logistics.

Three stage

On the three-stage flight to Cape Evans the Twin Otter made two refuelling stops and did the same on the return flight. Swan is reported to have said that the refuelling was done at fuel dumps set up by the expedition for emergency use. But they are more likely to be depots set up by the Chilean Government, using its Air Force, to meet the needs of three companies, ANI, Ecosummer (Canadian) and Mountain Travel (Californian) which fly mountaineers to the Ellsworth Mountains so they can climb Antarctica's highest peak, the 4897m Vinson Massif.

ANI's main base at Punta Arenas was established with the support of the Chilean Air Force which has provided air support for the National Tourist Board's Antarctic tours since the summer of 1984. In November of that year the Air Force flew two Twin Otters to the South Pole from Punta Arenas, using supply depots dropped along the route by a Hercules aircraft.

Cape Evans

When the Twin Otter landed at Cape Evans Swan called McMurdo Station and advised the Americans of its arrival. He and Captain Kershaw spent less than 36 hours on Ross Island. They called at Scott Base on December 16 and returned to Cape Evans late in the afternoon. The aircraft was refuelled, Wood, Broni, and Lovejoy crammed themselves into the space left by auxiliary fuel tanks, and Captain Kershaw took off from the sea ice for Punta Arenas at 0900 GMT (8 p.m. N.Z. standard time).

Behind them the five men left the dismantled base hut and radio equipment, stores, and the Cessna 185, all ready to be shipped out by the Aurora on her final voyage back to New Zealand. Whether the mission can be accomplished then depends on weather and ice conditions in the Ross Sea.

On the 2698nm flight back to civilisation Captain Kershaw, who was at the controls for almost 32 hours, was forced to fly high

after encountering stormy weather. At one stage ice building up on the wings and fuselage threatened to become a serious problem.

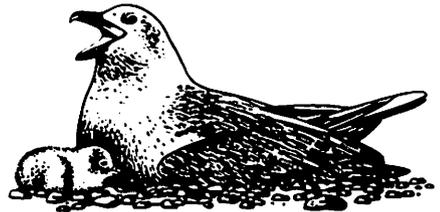
In the early hours of December 17 the Twin Otter was reported to have landed to refuel at an Ellsworth Mountains base camp used by climbing expeditions. From here on Captain Kershaw was in familiar territory. One of the most experienced Antarctic pilots anywhere today, he spent seven summers with the British Antarctic Survey, and since 1982 has been flying climbing expeditions between Punta Arenas and the Vinson Massif by way of Adelaide and King George Islands.

Thirteen hours

Normally flying time for the Twin Otter on the route from the Vinson Massif to Punta Arenas is about 13 hours. The aircraft refuels first at a Chilean base, Teniente Carvajal (67deg 34min S/68deg 08min W) on Adelaide Island, and then at another Chilean Air Force base, Teniente Rodolfo Marsh (62deg 12min S/58deg 54min W) on King George Island, South Shetlands.

Swan spoke by telephone to London on the evening of December 17 but only in general terms about the 5396nm flight from Punta Arenas to Cape Evans and back. But the Twin Otter is reported to have landed at 1700 London time on Wednesday night.

When Captain Kershaw caught up on his sleep he completed his flight plan by flying the Twin Otter back to Calgary. Then he returned to Britain and resumed service with Britannia Airways. In the northern spring he will be in high Arctic latitudes and the North Pole area landing ski-equipped aircraft on sea ice. When winter comes he is expected to resume Antarctic operations in the southern summer.



Obituaries

Ralph Lenton, a TAE radio operator dies at 63

One of the 12 men who made the first crossing of Antarctica in 1957-58 has died in Montreal aged 63. He was Ralph Lenton, the English radio operator with the Commonwealth Trans-Antarctic Expedition's crossing party led by Sir Vivian Fuchs.

Ralph Lenton was known to nearly all the New Zealanders who took part in the Trans-Antarctic Expedition. Some knew him first as a voice on the other side of the continent and also by his distinctive Morse keying which became easily recognisable by radio operators at all Antarctic bases. Others, like Ted Gawn, second radio operator at Scott Base, who talked to him many times, did not know him until Fuchs and his team completed the crossing on March 2, 1958.

Two New Zealanders

Two New Zealanders, George Lowe and Flight Lieutenant Gordon Haslop, one of two Royal Air Force pilots with TAE, shared the 1957 winter at Shackleton Base with Ralph Lenton. In 1956 as second-in-command of the advance party he went south aboard the Canadian sealer *Theron* with Haslop and Lowe, and three other New Zealanders, Sir Edmund Hillary, leader of the New Zealand section of TAE, his deputy, Bob Miller, later Sir J. Holmes Miller, and Squadron Leader John Claydon, chief pilot of the Royal New Zealand Air Force Antarctic Flight.

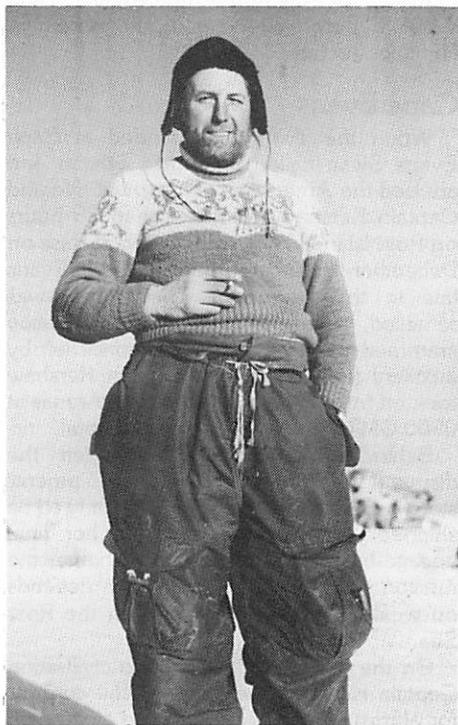
Later Hillary's senior radio operator, Peter Mulgrew, and Ralph Lenton became friends at the South Pole. Before the New Zealanders who reached the Pole on January 4, 1958 returned to Scott Base, Hillary decided to leave Mulgrew behind to operate the radio in the caboose as communications with the crossing party had been spasmodic.

Mulgrew and Lenton who was with Roy Homard, in the Snocat County of Kent talked together until the crossing team reached

the Pole on January 19. Then they handled all the message traffic for TAE until Fuchs and his men left on January 24 to complete the last stage of the crossing to Scott Base.

Born in London Ralph Lenton was educated privately and went directly from school into the Fleet Air Arm, serving as a radio operator in the North Atlantic. After the war he joined the Falkland Islands Dependencies Survey (now British Antarctic Survey). He went south first in 1948 with Sir Vivian Fuchs and spent five winters at various FIDS bases. By the end of 1957 he had spent seven winters in Antarctica — a record at the time.

Ralph Lenton in TAE days



Sixth winter

Ralph Lenton's sixth winter was his worst. Although his main forte in Antarctica was as a radio operator he was selected to join TAE as a carpenter and builder, being primarily responsible for construction of the buildings at Shackleton. This was a task which demanded all his skills and endurance as well of those of his seven companions. The Theron had to battle through heavy ice to avoid entrapment in the Weddell Sea and was forced to depart on February 7 earlier than planned.

As a result the advance party was left behind with no shelter for the winter but a Snocat crate 6m x 3m x 2.5m which Ralph Lenton and the South African meteorologist Hannes La Grange turned into living quarters with a kitchen at one end and a radio station at the other. For the next eight months this was home for the eight men but they still had to sleep outside in two-man tents with temperatures as low as minus 42.7 Celsius.

First fire

Construction of the main hut began as soon as tonnes of stores unloaded from the Theron had been moved from the sea ice up to Shackleton. The work continued day after day in appalling weather, the builders under Ralph Lenton's direction fighting persistent winds which covered the working site with torrents of snow. When the sun set for the last time for four months work continued by the light of Tilley lamps. The next three months were marked by more snow and relentless high winds. Perhaps the worst spell was in June when 80 tonnes of snow were removed from the east end of the hut, and another 40 tonnes filled the west end.

This gruelling work was almost at an end by August 7 when two men slept in the hut for the first time. By the third week of September the whole party was able to abandon the crate and light the first fire in the hut's stove. Before the Magga Dan arrived with the main party the advance party had two vital tasks — building the hut and making a reconnaissance of the first part of the route south to the Pole.

Ralph Lenton's companions who shared his Antarctic experience in two winters remember him not only as a master builder and a skilled radio operator — he shared the radio work with Sergeant Ellis (Taffy) Williams, RAF — but as a gifted handyman. He grew mustard and cress in the warm radio room of the main hut, and he and Gordon Haslop were the undisputed masters of the Shackleton kitchen.

Superb cook

With the chief pilot, Squadron Leader John Lewis, he was regarded as a superb cook. For the first Mid-Winter Day party he produced strawberry shortcake and cream, and managed to bake bread rolls in an oven made from an oil drum insulated with fibreglass which sat on a Primus stove. And it was Lenton who produced cheese straws, sausage rolls, pastries, iced cakes, and cocktail snacks for the second Mid-Winter Day party.

When TAE ended Ralph Lenton, who had married a Canadian girl after the war, returned to the Northern Hemisphere and worked for the Arctic Institute of North America in Washington. He made frequent trips to the Arctic and occasionally to Antarctica. Because of heart trouble he retired to Canada in the early 1970's.

One of his three sons, Anthony, followed his father's footsteps to Antarctica, and worked at the United States Siple Station in Ellsworth Land during the 1985-86 season. This month he flew south again from Christchurch to work at Siple, and to carry out his family's wish that his father's ashes should be scattered in Antarctica from the air.

Footnote: Ralph Lenton is remembered on the map of Antarctica in two places. The first is Lenton Point (60deg 44min S/45deg 37min W) on Signy Island, South Orkneys, where he began his Antarctica career in 1948, and the second is Lenton Bluff (79deg S/28deg 13min W) in the Theron Mountains which he helped to explore in 1956-57).

Generally recognised as the architect of the Antarctic Treaty, **Ambassador Paul Clement Daniels** died in New York on April 6, 1986, aged 82. He was a special adviser on Antarctica for the State Department, and for several years joined representatives of other nations with Antarctic interest in the task of producing a workable and acceptable treaty which he signed for the United States in 1959.

Mr Daniels was educated at Yale, and after post-graduate work at three French universities, joined the United States Foreign Service nearly 60 years ago. He held consular and diplomatic posts in Colombia, Brazil, Honduras, and Ecuador, and also served as Ambassador to the Council of the Organisation of American States.

A founder of the Antarctic Society, Mr Daniels remained one of its strongest supporters. He was an honorary life member, and at the time of his death was also honorary president. Over the years he made several Antarctic visits. Daniels Range (71deg 15min S/160deg E) in the Usarp Mountains honours his memory.

★ ★ ★

New Zealand's expert on tsunamis, **Norman Ridgway**, who died in March this year, was the last scientific leader to winter at Cape Hallett. He was there in 1964 when a disastrous fire on March 6 destroyed the main science building and auroral tower and their contents.

Born in Scunthorpe, Ridgway came to New Zealand in 1951 after service in the Royal Navy and several years as a science teacher. He joined the New Zealand Oceanographic Institute in 1953, made a number of oceanographic cruises, and in the 1962-63 summer spent nearly two months making measurements of Ross Sea currents at Cape Crozier.

In 1963 Ridgway was appointed science leader to winter at the joint U.S./N.Z. Hallett Station. With him were two technicians, London-born Desmond Rowles, who joined the DSIR in 1977, and Neville Green

from the Royal New Zealand Air Force. With the United States scientific and support staff they had to fight a fire which started at 7.25 a.m. on March 6 and was not subdued until 1 p.m.

As a result of the loss of the science buildings and equipment the US and NZ authorities decided to reduce the usual science programme for 1964 by 50 per cent. Green returned to New Zealand as did one American scientist, and in 1956 Hallett became a summer only station. It was closed in 1973.

During his service with the DSIR Ridgway did research on pollution and sewage disposal, and thermal power station outfalls. He worked also on the New Zealand system to warn civil defence authorities of possible tsunami danger. In 1978-79 he went to Hawaii as associate director of the international tsunami investigation committee, and in 1984 was elected chairman of the international body co-ordinating tsunami warnings in the Pacific.

★ ★ ★

A retired United States Navy officer, **Commander David W. Canham, Jr.**, who died on February 5 this year was well-known to every New Zealander associated with the building of Scott Base early in 1957. He was then Lieutenant-Commander Canham, first winter O.I.C. of the Williams Air Operating Facility, now McMurdo Station, in 1956.

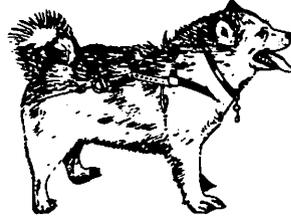
David Canham invited all the New Zealanders to dinner one evening soon after they arrived. He was interested in the plan to put Scott Base at Pram Point and visited it with Lieutenant Richard Bowers who had just returned from 45 days spent building the South Pole station. Dick Bowers showed great interest in the future base and agreed to supervise an American bull-dozing team on the site. Work started early on January 10 and by the end of the day a flat bench sufficient to accommodate the six main buildings of Scott Base had been prepared with a heavy D8 tractor.

When the ships of Deepfreeze I departed

from McMurdo Sound early in 1956 Dave Canham was left on Ross Island with a team of 92 men and 30 huskies, and the task of completing the main camp before the onset of winter. There were also 73 men wintering at Little America.

Dave Canham and his men worked long hours to have everything shipshape before the winter darkness began. On one of his daily inspections the O.I.C. noticed a mysterious pile of timber, nails, planks, and Quonset hut sections on a knoll overlooking the camp. When he was told that the chaplain, Father John Condit, was collecting odds and ends for a church, he approved but said every man must work a 12-hour day to complete the camp on time before the church could be built.

With Dave Canham's blessing and Father Condit's energy and enthusiasm it was not surprising that men just drifted to the site after a hard day's work. The result was that the original Chapel of the Snows was finished before the camp.



Books

A new view on minerals and mining

MINERALS AND MINING IN ANTARCTICA. *Science and Technology, Economics and Politics.* By Maarten de Wit. Published by Clarendon Press, Oxford, 1985. 127 pp.

The reviewer, Dr Malcolm Laird, is a geologist with New Zealand Geological Survey, University of Canterbury, Christchurch. An experienced Antarctic and a specialist in North Victoria Land he is also convenor of the Antarctic Committee of New Zealand Geological Society.

At the present time public interest in Antarctica and its mineral potential is high; negotiations on an Antarctic minerals regime by the Antarctic Treaty consultative nations appear to be reaching a climax; and the environmental organisation Greenpeace, which is opposed to mineral exploitation in the continent, has just established the first non-governmental permanent base in Antarctica. The appearance of this book is well timed.

At the outset the author, a geologist himself, challenges the belief of many of his colleagues that even if large deposits of minerals were found in Antarctica, it would be uneconomic or impractical to exploit them. He presents a closely-argued case that in the specific instance of platinum-group metals mining the Dufek layered intrusion would probably be economic. To support his arguments the author draws on the experience gained in setting up successful mining ventures in the Arctic.

In a separate chapter Dr de Wit explores the strategic role of platinum, pointing out that it is being increasingly used for its catalytic qualities, particularly in pollution control, and in fuel cells, which are likely to become the largest potential user of platinum in the near future. He draws attention

to the fact that South Africa has inherited about 82 percent of the world's reserves of platinum-group metals outside Antarctica, and he argues that it may be in the best interests of the industrial nations to break such a monopoly by utilizing a new source, even if at first it appears only marginally economic, for strategic and political reasons. The author examines the environmental and other political factors involved in Antarctic mineral exploitation in succeeding chapters, and suggests that controlled exploitation may be acceptable if the benefits can form part of the common heritage of mankind.

The thesis of the book is appealing, and the author has mixed an interesting brew of economics, politics, and environmental factors. Nevertheless, a reader is apt to be left only partly satisfied. The economics of exploiting the platinum-group of metals only is studied in any depth, whereas other minerals (oil in particular) surely have potential. The title is therefore somewhat misleading. And of course the whole thrust of the book rests on the assumption that minerals, particularly platinum, will indeed be found in economic quantities. So far this requirement has not been met.

Women on the ice

WOMEN ON THE ICE — A History of Women in the Far South by Elizabeth Chipman, Melbourne University Press, Carlton, Victoria, 1986, 224 pp. ISBN 0 522 843 247.

Dr Eileen McSaveney was one of the first women to be part of the United States research programme on the Continent in 1969. She was in a team of six headed by Dr Lois M. Jones, which carried out a geological programme, for the Ohio State University Institute of Polar Studies. In 1971-72 summer of Dr McSaveney, who now lives in Christchurch, returned to Victoria Land with her husband Maurice who is working at Hydrology Centre, Ministry of Works, Christchurch.

The date when a woman first set foot on the Antarctic continent is well documented — Caroline Mikkelson stepped onto the shore of Princess Elizabeth Land on 20 February 1935. But... when did a woman first see the Antarctic continent?

If you guessed some time in the twentieth century, you would be wrong. In 1839, on a sealing expedition, John Balleney picked up four castaways, one of them a woman, from the bleak Auckland Islands. He then continued south on a voyage on which he would discover the islands which bear his name, and sight the Sabrina Coast of Wilkes Land. The name of that castaway, the first woman to cross the Antarctic Circle and see the continent, is unknown — a frustrating

problem which illustrates the daunting task faced by Elizabeth Chipman in researching her engaging history of "Women on the Ice".

The first section of her book deals with the sub-Antarctic islands. The first women to reach these islands were the wives (or mistresses) of captains of sealing and whaling ships. A few islands eventually housed communities of men, women and children; on other islands many decades separated visits by women during the whaling era and the more recent arrival of women scientists, technicians and documentary film-makers.

The history of women on the continent itself starts well into the twentieth century, with a handful of women who came aboard whaling vessels or with privately-financed groups such as the Ronne Expedition of 1947-48.

The 1950's and 1960's saw more than ten thousand men working at government-sponsored bases set up during and after the International Geophysical Year; women (except at Russian bases!) weren't even considered. Although the official excuses were, at first, the danger, and later, the lack of facilities, a more subtle reason was suggested by US Rear Admiral George Dufek in 1959: "the presence of women would

wreck the illusion of the frontiersman — the illusion of being a hero.”

In the 1970's and 1980's the trickle of women turned into a flood, with women scientists being accepted for summer work, then for wintering-over groups and as station scientific leaders. Their ranks were swelled by women on private expeditions, and by thousands of women tourists.

Elizabeth Chipman's history is not comprehensive — the problems of access to foreign records restrict her to writing about names and events recorded in English-language accounts. A glance at the bibliography reveals that she has drawn upon a

staggering variety of sources — from obscure ship's logs and government reports to books and articles written by women about their Antarctic odyssey and personal interviews with women who have been to the ice. Herself a participant in several expeditions to the sub-Antarctic and the continent, she writes feelingly about the "Antarctic experience". Her book should take a deserving place in the literature of Antarctic history.

*Eileen R. McSaveney
Christchurch, New Zealand*

Beyond the Roaring Forties

Beyond the Roaring Forties: New Zealand's Subantarctic Islands. By Conan Fraser. Government Printing Office, Wellington. 1986. 300 x 240mm. ISBN 0 477 01362 7. 214pp. NZ\$52.00.

Dr Warham, a former reader in zoology at the University of Canterbury, knows New Zealand's sub-Antarctic islands well. He led expeditions to the Snares in 1967, 1968-69, and 1969-70. He has also worked on Campbell Island, the Antipodes Islands, and Australia's Macquarie Island. A nature historian and photographer, he has studied birds and animals in the United Kingdom, Australia, and New Zealand. His special interests include penguins, petrels, and other seabirds.

This is a large-format, profusely illustrated and produced book. It was printed in New Zealand in an attractive layout, though an expensive one due to the current penchant for lots of blank, unused space. Its author is a past producer of documentaries for the New Zealand Broadcasting Corporation and it was while he was producing films for the National Film Unit that he visited the southern islands.

The book is in four parts. In 75 pages of introduction, the birds and mammals, the plants and their communities are described and then follow short descriptions helped by good maps of the Auckland, Snares, Antipodes, Campbell and Bounty Islands.

The second part — "Plunder, Settlement and Failure" — comprises 60 pages on the history of the discovery of the islands and of the Enderby Settlement; on the various wrecks and on the Dundonald story. There is a short history of farming at Campbell Island. Macquarie Island is evidently beyond the ambit of this work, but, presumably because of his association with Invercargill, there is a brief account of Joseph Hatch's penguin oil enterprise.

Part 3, "The Scientists", deals with the early expeditions to the islands such as the wartime "Cape Expeditions". These 10 pages also cover some of the recent expeditions and aspects of their research projects.

Finally 10 more pages are devoted to a nicely balanced assessment of the possible future of the islands and of the New Zealand Exclusive Economic Zone in the face of developments in fisheries, in mineral exploration etc.

I thought this book best on the historical aspects as the author has supplemented much of the familiar and well worked over material with unpublished papers from government files, private diaries and the like. For example, he gives a short account of the trade in penguin skins based on unpublished

notes of Dr J. S. Cumpston, historian of Macquarie Island, and relates this activity to the stack of rolled penguin skins preserved by bird guano that were discovered during the University of Canterbury's 1969 Expedition to Antipodes Island and which he evidently believes were left behind in the 1880's. This was one of the possibilities that Peter Jones and I mooted when reporting the find: the other was that the skins were rolled to fuel the fires of the survivors of *President Felix Faure* wrecked nearby in 1908.

The illustrations form an important feature of the book. The colour photographs, reproductions of paintings in the Turnbull Library, from Hookers *Flora Antarctica* etc are sharp and well printed. There are many well-chosen photographs from the early expeditions including one taken by William Dougall of Invercargill, but Dougall's role as the pioneer photographer of the New Zealand subantarctic gets no mention.

Photographs

The modern photographs are mostly from the author, the others include some underwater studies by Kim Westerskov. I found the aerial shots the most revealing whereas the coverage of the fauna is patchy and almost entirely restricted to large, tame, diurnally-active vertebrates. I counted no less than 26 photographs of seals but the millions of shearwaters and other nocturnally active petrels that inhabit the islands are represented merely by two distant shots of mutton-birds and a day-time close-up of a prion. Indeed, the animal photographs are of the kind that every visitor to the islands takes, that is off-the-cuff studies snatched during hurried visits ashore. The endemic snipe (more interesting zoologically than the seals) isn't figured nor are any of the unusual insects. Perhaps aware of these shortcomings, the author regrets not having photographed the morning departure of the shearwaters. These and other gaps could readily have been filled from other sources and replaced some of the repetitive studies of seals and albatrosses.

The insects and land invertebrates hardly get a mention in the text either, the only modern reference quoted being highly

derivative — the Auckland Islands Draft Management Plan! Linsley Gressitt is mentioned once but publications like his *Insects of Campbell Island*, are not.

I noted few factual errors. The giant petrel on page 21 is the northern, not the southern species as stated; and I did not lead the 1961 Snares Islands Expedition, Professor G. A. Knox did that. Indeed one of the surprises in the part devoted to scientists in the subantarctic was the omission of George Knox's name. Yet he has probably done as much to encourage research in this region as any other New Zealander, and was doing that when such research was not the 'in thing' and with little encouragement from government circles.

Wellington view

In fact the review of past and current research in this book seems very much the view from Wellington. Nowadays politicians have realised the economic importance of these islands in relation to the E.E.Z., and money and resources have become more readily available. Hopefully there will be a corresponding increase in published research compared with that from the 'shoestring' expeditions of the 60's and 70's.

To sum up: this is a very useful book for those wishing to get the feel of New Zealand's subantarctic islands, in the past and the present, and the inclusion of a good index and an extensive, if limited, reference list takes it out of the category of coffee table literature where it would otherwise belong.

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