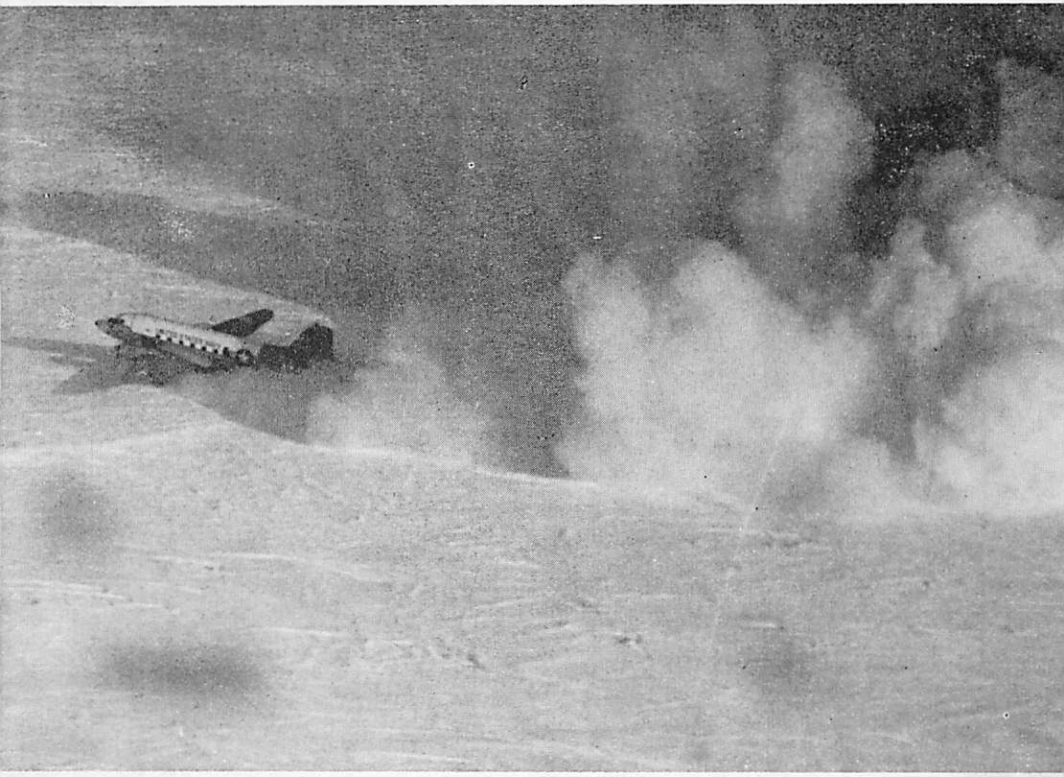
ANTARCTIC

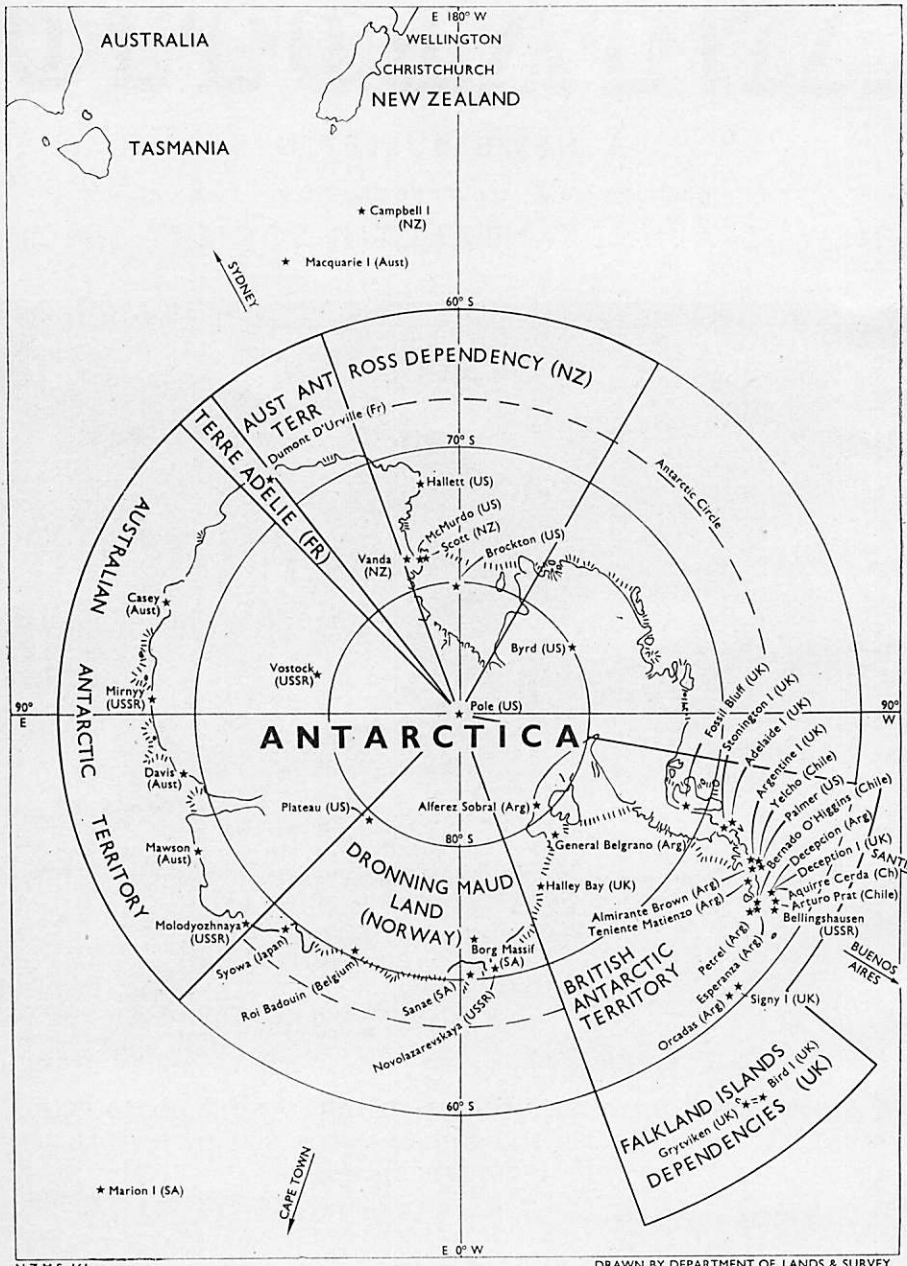
A NEWS BULLETIN
published quarterly by the
NEW ZEALAND ANTARCTIC SOCIETY (INC)



QUE SERA SERA, THE FIRST AIRCRAFT TO LAND AT THE SOUTH POLE, TAKES OFF ON THE RETURN FLIGHT TO McMURDO SOUND. THE TIME IS AFTER 9.30 P.M., THE DATE IS OCTOBER 31, 1956.

U.S. Navy Photo

Vol. 7 No. 4 Registered at Post Office Headquarters. Wellington, New Zealand, as a magazine. December, 1974



N.Z.M.S. 161

DRAWN BY DEPARTMENT OF LANDS & SURVEY
WELLINGTON, NEW ZEALAND, AUG 1969
3rd EDITION

"ANTARCTIC"

(Successor to "Antarctic News Bulletin")

Vol. 7 No. 4 76th ISSUE December, 1974

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This is an Antarctic season of remembrance. The dedication of a new scientific station at the South Pole next month will mark 20 years of research in Antarctica by the United States.

Before scientists could live and work at the Pole other men had to risk the unknown as Scott and Amundsen had done.

On October 31, 1956, seven Americans landed at the Pole and stood where no man had been for 44 years. They were there only 49 minutes, but time is no measure of how much they contributed to Antarctic research.

Deepest hole drilled on Commonwealth Glacier

Early this month a New Zealand drilling team working on the Commonwealth Glacier 60 miles west of Scott Base, in the Taylor Valley, drilled to a depth of 1076ft. This was the deepest hole ever drilled on the Antarctic Continent. But soon after the drillers reached this depth the drilling rig collapsed when a welded frame member broke, and was extensively damaged.

Most of the damaged equipment was repaired in the engineering workships at McMurdo Station, and spare parts for the rig were flown from the United States. Drilling was resumed later in the month near an unnamed lake east of Lake Chad. The site is west of Canada Glacier in the Taylor Valley.

Six men were working on the rig when it collapsed. They were removing core barrel in readiness for the move to the new site. Eight hundred and 50ft of barrel were left in the hole when the break occurred.

A helicopter attempted to lift the mast into an upright position so that wreckage at the base could be cleared. But the helicopter had to drop its load at the critical stage to avoid crashing, and more damage was done to the rig.

Earlier in the season winter storms and high tides in the McMurdo Sound area caused the abandonment of one of the major projects of the New Zealand programme — drilling through the sea ice into the bed of the sound.

Eighty per cent of the fast sea ice in McMurdo Sound was broken up by a combination of high winds and high tides in the middle of August. This was the first time there had been such a major breakup for at least 60 years. As a result the plan to drill holes in the central part of the sound was abandoned. Drilling at New Harbour was deliayed until the end of October because it was too difficult and dangerous to transport the drill crew, fuel, and other supplies over the remaining broken ice track across the sound.

In the first two weeks of September an American team led by Dr S. B. Treves, one of the United States scientists associated with the Dry Valley Drilling project, and a New Zealand team led by last season's Scott Base leader, Mr H. W. Jones, made a traverse from McMurdo Station to New Harbour and back.

Dr Treves reported on his return that the drilling shack had not wintered well. the east wall of the building was the only part left standing, and the roof had disappeared. All the lightweight items in the shack had been blown away, and the remaining equipment and stores were in a shambles with large amounts of sand everywhere.

Early in October a party from Scott Base, which included the drilling superintendent, Mr J. Hoffman, and members of his team, visited New Harbour to check the drill rig and its motor and restore the wrecked drilling shack. Drilling began on October 30 at a site one kilometre inland from last season's site.

Drilling was stopped after the first 30ft to check the squipment. It was found to be functioning well, and by November 4 the drill had reached a depth of 205ft. Progress through the overlying sedimentary strata towards the basement rock was checked on November 17. The drill was at 608ft when salt water penetrated the hole and froze the casing.

International scientific study of Mount Erebus

New Zealand, French and United States scientists began last month the world's first major scientific assault on Mount Erebus, one of Antarctica's two known active volcanoes. They will make a hazardous descent into the volcano's inner crater to collect samples of gas and lava, suspended above a lava lake by a winch, facing high temperatures, choking gases, and minor eruptions and protected by special heat-resistant clothing, helmets, and gas masks.

One of the world's eminent vulcanologists, Dr H. Tazieff, who is leading the French party, has described the expedition as the greatest challenge he has ever faced. Mr R. B. Thomson, superintendent of the Antarctic Division, Department of Scientific and Industrial Research, says the project is possibly the most exciting Antarctic event in which New Zealand has been involved since Sir Edmund Hillary's dash to the South Pole.

Early in November the field leader of the Erebus project, Mr Shaun M. Norman, and Dr S. B. Treves, the American geologist in the joint New Zealand-French-American expedition of 14 men, made a preliminary reconnaissance flight round Erebus and chose a helicopter landing site, and the base camp site, which is on an old lava flow about 500yds from the main crater rim of the 12,450ft mountain.

With the two men were a survey assistant, Mr J. Rotheray, and a field assistant, Mr R. Rainsbury. The party walked to an old crater and built a survey cairn in view of Scott Base. A tellurometer was set up for accurate measuring of distances by radio waves. The men later walked round the crater rim and saw a minor eruption of lava from the lava lake in the inner crater.

Several days later the party, and a surveyor, Mr J. Williams, and the main expedition's official United States Navy Photographer, Mr Richard Beaudet, were flown in two helicopters to Mount Erebus again. Working from the camp near the summit the surveyors made a survey of the area, and mapped the rim of the main crater.

Before the survey was completed the party suffered from lack of oxygen at the high altitude camp. An urgent request for oxygen was sent to Scott base on November 18. A United States Navy helicopter left McMurdo Station with an oxygen cylinder, but took several hours to reach the camp because of low cloud and almost zero visibility.

The worst-affected member of the party was the field assistant, Mr Rainsbury. He was flown back to Scott Base, and has now recovered. But his place in the expedition has been taken by another field assistant from Scott Base, Mr J. Swindella.

FRENCH PARTY

Because of the dangers of altitude sickness the main expedition spent several days acclimatising before beginning the crater assault. Dr Tazieff and the five other Frenchmen stayed in the Mount Cook area at an altitude of about 7,000ft to accustom themselves to the rarefied atmosphere before they flew south from Christchurch early last month.

The first phase of the Erebus project ended on November 28, when the reconnaissance party returned to Scott Base. Plans for the expedition provide for occupation of the summit camp about December 10, and the descent into the inner crater about 10 days later.

GEOLOGICAL EXPEDITION TO BOWERS MOUNTAINS

A geological expedition to the Bowers Mountains in Northern Victoria Land, one of the major events in this season's New Zealand Antarctic Research Programme, began early last month. Two field parties were flown into the area on November 10 by a United States Navy VXE6 Squadron Hercules. Using five sledges and three motor toboggans, the parties will remain in the area for two months, and cover 500 to 600 miles each in a detailed study of the geology of the Bowers Mountains, which lie between the Rennick Glacier and the north-west coast of the Ross Sea.

One party led by Dr M. G. Laird, of the New Zealand Geological Survey, Christchurch, is concerned with stratigraphy—the differentiation and relationship between various rock strata and their ages. The other party, led by Dr R. A. Cooper, of the Geological Survey, Lower Hutt, specialises in palaeontology —the identification and dating of rocks according to the fossilised marine animals and plants trapped within them.

New Zealand's expedition is part of an International Geological Correllation Project sponsored by U.N.E.S.C.O. to examine the relationships between Australia, New Zealand, and Antarctica. In Dr Laird's party are Dr A. Wodzicki, Geological Survey, Lower Hutt, Dr J. Bradshaw, University of Canterbury, and Mr I. Curphey, field assistant, of Greymouth.

Dr Cooper's party includes Mr J. Simes, Geological Survey, Lower Hutt, Dr J. Jago, department of applied geology, South Australia Institute of Technology, Adelaide, and Mr P. Braddock, field assistant, of Picton. Dr Jago joined the expedition because of his specialised knowledge of Tasmanian fossil rocks, which are closely related to those found in the Bowers Mountains.

The geological research programme forms part of a larger study of the oldest rocks of South-east Australia, New Zealand and Antarctica. Fossils found by Dr Laird in the Evans Neve area in 1971 showed close relationships with those in rocks of similar ages in Australia, New Zealand, Eastern Siberia, and China. These finds indicated that about 50 to 120 million years ago these now widely-separated areas were much closer together and shared a common sea life.

FOSSIL EVIDENCE

Dr Cooper's party will attempt to find further fossil evidence to confirm these relationships. The geologist will also examine the various rock strata, using fossil evidence to map the chronological sequence of events which formed these rocks and to show how they relate to events elsewhere in Antarctica and the world as a whole.

Dr Laird's party will seek to extend the evidence from the limited area examined to date by travelling further north and examining the stratigraphy of similar aged rocks in other mountain areas. The rocks of the Bowers Mountains belong to the Cambrian period of geological history, which extended from about 600 million to 500 million years ago, and they reach an estimated thickness of 20 kilometres.

Because the Bowers group is so thick, and its upper part belongs to the late Cambrian period, there is a strong possibility that a complete sequence of Cambrian rocks may be found here. It may extend back to the truly ancient Pre-Cambrian area at the dawn of life on earth.

Recent reconstruction by geological experts of the ancient super-continent of Gondwanaland also place the western half of New Zealand's South Island near Northern Victoria Land. Detailed studies of the Bowers Mountains can help to construct a picture of the geography of the South-west Pacific as it was millions of years ago.

Dr Laird's party landed on the Leap Year Neve at the head of the Leap Year Glacier almost in the middle of the 120-mile long study area. Dr Cooper's party was put down about 60 miles further south on the northern edge of the Evans Neve.

In the Leap Year Neve area Dr Laird's party will spend up to a week studying the surrounding rock outcrops before moving north to the head of the Carryer Glacier, a distance of about 30 miles. It will return to its starting point this month and spend a week exploring to the south of the Molar Massif, a range of mountains forming the western flank of the Leap Year Glacier.

SECOND STAGE

At the beginning of the second week of this month the party will return to its starting point again to meet Dr Cooper's party which will have travelled up from the south. The two parties will spend two to three days together, comparing notes and revising plans for the second stage of the expedition. A re-supply flight will bring in extra fuel for the toboggans, mail and Christmas food, and take out rock samples.

Then Dr Laird's party will cross the Molar Massif, if they can find a negotiable pass, and travel slowly down the steep and narrow Sledgers Glacier, examining rock faces as they go. This part of the journey, about 30 miles, will probably take about 10 days because of the many rock outcrops to be examined, and because of the dangerous nature of the glacier terrain.

The Sledgers Glacier joins the Rennick Glacier at one of its narrowest parts (about 12 miles wide) and the party will turn to the north and travel down the edge of the Rennick Glacier to Mount Soza (7150ft), once again taking about 10 days to complete this leg of the journey and explore the Mount Soza region.

One week has been allotted to make the 4600ft climb up the Sledgers Glacier to the party's starting point. There the party will be picked up by a Hercules aircraft and flown back to Scott Base. If the party is unable to reach the starting point by January 10 it will cross the Rennick Glacier to an alternative landing site used by an American field party operating further to the west.

Dr Cooper's party will make a two-day journey to the Webb Neve 35 miles to the south-east of the original landing point. Here the party will spend 10 days examining Dr Laird's original fossil locality. This is the only known locality within 1000 miles for Trilobites, which are among the earliest known fossil life, and have been extinct for 270 million years.

R-SUPPLY FLIGHT

When the party returns to the landing point it will examine small rock exposures nearby for a few days before moving to the Houliston Glacier, 35 miles to the north. Here it will make a circuit round the Leitch Massif and the West Quartzite Range. Then it will travel north to meet Dr Laird's party for the re-supply flight. This flight will bring in a new member of the team, Dr D. I. MacKinnon, of the University of Canterbury, who will replace Mr Simes.

After the re-supply both parties will travel together to a point about half-way down the Sledgers Glacier where it turns sharply and pours over a huge ice-fall. Once Dr Laird's party as negotiated this difficult and dangerous obstacle, Dr Cooper's party will return up the glacier and go north to Helix Pass. On the way it will examine any fossil localities noted by Dr Laird during his earlier traverse. Failing that, it will try to examine places missed by Dr Laird before returning to the pick-up point on the Leap Year Glacier by January 10.

Exploration of Lakes in Darwin Mountains

Previously unexplored lakes in the Darwin Mountains of the Britannia Range, and the Brown Hills area, are being studied this season by scientists from the University of Waikato. Their main object is to investigate the chemistry, physics, and sediments of Lake Wellman in the Darwin Mountains. They will also study the geochemistry, geomorphology, and limnology of Trough Lake and Lake Wilson in the Brown Hills.

These three lakes are closed drainage basin lakes, and all are south of Lake Miers, the most southerly lake at present known to have perennial water. It is possible that Lake Wilson will contain perennial water because it is only 100 metres above sea level. Study of the present composition of the lakes and their sediments will provide knowledge of past climatic, glacial, and marine changes, and the geochemical processes now taking place in the basins.

Leader of the Waikato team is Dr C. H. Hendy. Other members of the party are Professor A. T. Wilson, Dr T. Healy, and Messrs A. Bonny, M. Grimsted, and P. King. The scientists were flown from Scott Base to Touchdown Glacier by a United States Navy VXE6 Squadron Hercules this month, and later by helicopter to Lake Wilson.

Later this month the party will be flown by Hercules from Touchdown Glacier to Midnight Plateau. From there it will walk to Lake Wellman. Early next month two helicopters will pick up the party and its equipment, fly to Lake Wilson, refuel at Touchdown Glacier, and then proceed to Scott Base.

Next month the University of Waikato scientists will also continue their intensive study of the bathymetry and sediment distributions of the McMurdo Oasis lakes by sounding and coring Lake Fryxell in the Taylor Valley. Later the team will continue its study of Lake Bonney. Two members of the party will travel by helicopter from Lake Fryxell; the others will walk.

Late in January the scientists will return to Trough Lake, and also work at Lake Miers. Two members of the party will go to Trough Lake, and the other four to Lake Miers. The six men will be picked up by helicopter towards the end of the month and flown from Trough Lake to Scott Base.

While in the dry valleys the party will attempt to determine the reason for the two distinct ice thicknesses on Lake Joyce. This lake was discovered by the Waikato expedition in the 1972-73 season.

Glacial history changes

Evidence which modifies theories on the glacial history in the Table Mountain area 115 kilometres west of Scott Base has been found by geologists of the Victoria University of Wellington expedition. About 6000ft up on the slopes of Table Mountain Dr P. J. Barrett, director of the university's Antarctic Research Centre, and Messrs H. Keys, R. W. Plume, and R. D. Powell, found deposits belonging to a temperate glaciation which took place more than five million years ago.

This glaciation was already known; the latest discovery indicates that there were two glacial advances separated by a period of milder climate when the glaciers retreated. The deposits found by the party are different from those associated with present-day glaciers in Antarctica. They are separated by gravel beds deposited by rivers and streams.

Some of the deposits are carbonaceous and may contain pollen grains from plants of the period. Identification of them will enable the glaciation to be dated far more accurately.

Christmas Gifts for N.Z. Teams

New Zealanders at Scott Base and Vanda Station will have home-made biscuits and fruit cake again this Christmas to add to the usual seasonal delicacies. Early this month 133 dozen biscuits and four cakes were flown from Christchurch to the Antarctic.

Each year for the last 11 years members of the Canterbury branch of the New Zealand Antarctic Society have sent biscuits and fruit cake to Scott Base for Christmas. This year the biscuits — a record number — and the cakes were baked by 15 women, nearly all of them members of the branch.

Men working in the field hundreds of miles from Scott Base also share the Christmas gift, provided that re-supply flights can be made in time. Otherwise the biscuits arrive for the New Year celebrations.

The biscuits and cake are eaten, but the plastic or polystyrene trays in which they are packed, and the plastic wrappings, have to be returned to New Zealand. This is in keeping with the New Zealand policy of protecting the environment.

The New Zealander Commissioner for the Environment (Mr I. Baumgart) who made a familiarisation visit to the Antarctic this month, has praised the New Zealanders working on the continent for the great care they are taking to protect the environment. He has noted that field parties are bagging their rubbish and returning it to Scott Base or even New Zealand.

In the past rubbish was dumped on a tip and burned in a tip at Scott Base. Now it is burned in a special incinerator because much of the material, particularly plastic, does not decompose in the Antarctic climate.

ANTARCTIC COOKING CLASSES

Several New Zealanders who spent last winter at Scott Base returned home in a better position to cook for themselves. Every Tuesday night for 10 weeks they attended a cookery class run by the base cook, Mr R. Colliver, who is now back on the job as a chef in an Auckland hotel.

Eight New Zealanders attended the cookery class, and three Americans, who went specially to Scott Base from McMurdo Station for the tuition. News of Mr Colliver's good home style cooking may have attracted the Americans. During the winter 90 men from McMurdo Station, in groups of 12, went over to Scott Base every second Friday to enjoy a four-course dinner.

Most of what was taught at the cookery class was elementary. But hints about making pastries and decorating cakes were popular with Mr Colliver's pupils. He had an interest in teaching his colleagues to cook. They were able to prepare Sunday meals on his day off.

Most of Mr Colliver's holidays from a hot stove were spent with a camera. He also took a correspondence course in hotel management, and learned to play the Spanish guitar well enough to give occasional performances at McMurdo Station.

Two members of the winter party made wool rugs as a hobby, and all the New Zealanders made good use of a pool table given to the base by the Canterbury branch of the New Zealand Antarctic Society. The table was in use three to four hours a day.

Mr Colliver did not spend all his time cooking for hungry men. He and most of the New Zealanders managed to visit the Amundsen-Scott South Pole Station, and Mr Colliver also took part in the re-supply of Vanda Station, 80 miles west of Scott Base, and made a 10-mile journey to Tent Island in McMurdo Sound.

ANTARCTIC MEMORIAL SERVICE

A memorial service in remembrance of 41 Americans and two New Zealanders who have died in the Antarctic since 1946, was held in Christchurch Cathedral on the morning of October 6, two days before the start of the summer season's operations on the contintent. During the service, attended by about 500 people, the flags of the United States, New Zealand, and the National Science Foundation were paraded, and an empty sledge bearing two ice axes was dragged behind them in memory of two Americans who died last season.

Readings from Antarctic history and literature were given by Mrs H. Holmes and Mr J. A. Cross, president of the New Zealand Antarctic Society. Bible readings were given by Captain E. W. Van Reeth, commander of the United States Naval Support Force, and Mr R. B. Thomson, superintendent, Antarctic Division, Department of Scientific and Industrial Research.

Commander T. Kirkpatrick, United States Coast Guard, introduced a recorded message from Rear Admiral George J. Dufek, U.S.N. (retd), first commander of Operate Deep Freeze from 1954 to 1959. He said that Antarctica had gradually become safer and more comfortable but its environment was still the most hostile to man on the face of the earth. The cost in money and lives of the United States programme on the continent had been high but worth it for science.

Prayers were offered for those going south for the new season, and the sermon was preached by the Rev. Angus McLeod, general secretary of the New Zealand National Council of Churches.

After last year's service the United States Navy and the United States Antarctic Research Programme presented the city of Christchurch with seven trees representing the world's seven oceans. This year the gift was recognised by the presentation by the Mayor of Christchurch (Mr N. G. Pickering) to Captain Van Reeth of a plaque. It was attached to one of the trees which now stand in the centre of the city, Cathedral Square.

Memorial Cross Re-erected

The jarrah wood cross erected on Observation Hill, overlooking McMurdo Station, in memory of Captain Scott and the four men who died with him on the return journey from the South Pole, is now firmly upright again after being blown down last winter. Two storms toppled the cross, which has been on the summit of the 830ft hill for 61 years.

Late in September a party of New Zealanders from Scott Base climbed the hill and put the fallen cross back in its hole. They packed rocks around and secured the base with "Antarctic cement" (water).

Winds of up to 100 miles an hour, which might have damaged more modern buildings, left Shackleton's hut at Cape Royds unscathed last winter. Men from Scott Base found no signs of damage when they visited the 66-year-old hut early last month.

A dog team had its day at Scott Base on December 3. It left the base with a geological field party because all the Motor toboggans normally used for most field trips were fully committed. With the field party was the base dog handler, John Stevens, of Christchurch.

Dogs were the basic transport for New Zealanders in the Antarctic from 1956 onwards. But in the last few years they have been replaced almost entirely by motor toboggans, and are now restricted to local trips from Scott Base.

ANARE REPORT

Australian Party Will Make Survey in Enderby Land

Scientists of the Australian National Antarctic Research Expeditions will make a survey in Enderby Land this summer. They will operate from a base about 400 kilometres west of Mawson, and will have helicopter and aircraft support. The programme will include aerial colour photography, geodetic and geological surveys, establishment of ice movement markers, gravity and magnetic observations, and a biological survey.

Once again the Danish ice-strengthened Nella Dan will provide the main support for ANARE parties. She relieved Macquarie Island in November, sailing from the New Zealand port of Lyttelton, and returned to Melbourne on November 29.

Early this month the Nella Dan sailed for Mawson to disembark members of the Enderby Land summer part, and the team for the base. In accordance with ANARE custom the Minister for Science (Mr W. L. Morrison) gave the expedition an official farewell from the wharf.

The leader of the expedition is Mr E. Macklin, acting administrative officer of the Antarctic Division, Department of Science. He has wintered twice in Antarctica, and has led many previous relief expeditions.

Also on board the Nella Dan were some members of the 1975 Mawson team, and the officer in charge, Mr L. H. Macey, and next year's party for Davis with the officer in charge, Mr G. C. Colback. The relief expedition also included a Japanese observer, Dr Yoshikuni, a cryobiologist from the National Institute of Polar Research, Tokyo, and four men from the Australian Army, who will assist in unloading operations, using amphibious vehicles.

BASE CAMP

Base camp for the Enderby Land summer field operation will be at Knuckey Peaks, about 400 kilometres west of Mawson. Men from the 1974 expedition made a spring tractor-train traverse from Mawson to Knuckey Peaks to establish depots of fuel and other supplies in readiness for the operation.

The leader of the Enderby Land party is Mr G. W. McKinnon, a geographer with the Antarctic Division. There are also two glaciologists, a medical officer, and a biologist from the Antarctic Division; two geologists from the Bureau of Mineral Resources (geology and geophysics); and five surveyors from the Division of National Mapping, Department of Minerals and Energy.

Some members of both the 1974 and 1975 Mawson expeditions will take part in the operation. Seven members of a civil air component will fly and maintain three Hughes 500 helicopters and one Pilatus Porter fixed wing aircraft in support of the party. An additional officer from the Bureau of Meteorology will be stationed at Mawson during the summer to provide weather forecasts for the flying operations.

From Mawson the Nella Dan will proceed to Davis to unload stores and equipment for the year, and exchange the 1974 and 1975 winter parties. A small construction party will remain at Davis for party of the summer to erect a new biology building.

The Nella Dan will then sail for Freemantle with the returning 1974 winter party from Davis on board. Depending on ice conditions and other factors, she is expected to return to Freemantle on about January 25 next year.

Because the Nella Dan could not return to Melbourne in time for the Macquarie Island voyage, the 25 members of the relief expedition were flown to Christchurch, and joined the ship at Lyttelton. Supplies for the party were bought in Christchurch and loaded aboard the Nella Dan.

Although they sailed from Lyttelton instead of Melbourne, the expedition was given the customary official farewell, this time on board the ship, by an Australian. The High Commissioner to New Zealand, Mr B. C. Hill, flew from Wellington to wish the men, and two boy scouts making the return voyage, a safe voyage and a successful term on Macquarie Island.

OUR OLDEST LIVING EXPLORER

Antarctica's oldest living explorer, Hugh Blackwall Evans, who was assistant zoologist with the Southern Cross expediton of 1898-1900 to Cape Adare led by C. E. Borchgrevink, celebrated his 100th birthday on November 19. Mr Evans, who has been in bad health most of this year, is now in hospital at Vermilion, Alberta, where he retired after many years of farming in Canada.

Hugh Evans, who was born in Chepstow, emigrated to Canada, where he attended an agricultural college and worked as a hired hand. He returned to England in 1897, and then went to Australia, where he joined a sealing expedition to Kerguelen Island. There he collected specimens for Lionel Rothschild and the Tring Museum, worked for the naturalist, Robert Hall, learning taxidermy, and sent home an albatross with a wing span of five metres.

In 1899 Hugh Evans joined Borchgrevink's expedition, and was one of the ten men left at Cape Adare, where the party spent a year. When the Southern Cross returned in 1900, the Ross Ice Barrier was charted afresh.

Hugh Evans was one of a small party led by Borchgrevink which made a short sledge journey over the barrier to Latitude 78deg 50min S. For two years and a half until Scott made his long journey, Evans and his colleagues shared the distinction of having stood at the "farthest south."

Hugh Evans is the last link with the pioneer expedition of discovery and research led by Sir James Clark Ross in the Erebus and Terror in 1839-43. When he returned from the Southern Cross expedition, he met and talked to his maternal grandfather's friend, Sir Joseph Dalton Hooker, who was the biologist with Sir James Clark Ross.

B.A.S. ACTIVITIES

Heavy ice and bad weather delay ship and aircraft

Heavy sea ice off the west coast of the Antarctic Peninsula, and bad weather over several bases, caused some delay to relief operations by ships and aircraft of the British Antarctic Survey early in the season. The Royal Research Ship John Biscoe was unable to reach Signy Island, and the Survey's two Twin Otter aircraft were held up at Punta Arenas for five days on the way to Adelaide Island.

The John Biscoe sailed from Southampton on October 1 with 22 men for the bases. After an uneventful voyage she landed a party of men on Doumer Island, near Anvers Island. From there the party was flown to Marguerite Bay by the Survey's two Twin Otter aircraft. The party included glaciologists, who are making ice depth measurements, both on the surface and from the air, in the area south-east of Marguerite Bay.

Heavy sea ice prevented the ship from continuing further down the west coast of the Antarctic Peninsula, so she then turned north to relieve the bases on Signy Island and South Georgia and to assist field parties. Signy Island was also inaccessible so she proceeded to South Georgia.

Field work this season in the northern areas includes land-form mapping on South Georgia and the South Shetlands, the study of the moraines of glaciers of different thermal regimes, and marine and fresh water biology. The latter projects involve diving in standard wet suits, and the biologists are being assisted by a professional diver.

A party of geologists will work also at the south-eastern end of South Georgia. This area has rarely been visited because it is very difficult to land there. At the same time a diving team from H.M.S. Endurance will work in the area with B.A.S. men on a survey of the seabed.

After Christmas the John Biscoe will proceed to the South Shetlands, and the Antarctic Peninsula bases.

When the Royal Research Ship Bransfield sailed from Southampton on November 7 she had a new master, Captain Stuart Lawrence. He has succeeded Captain Thomas Woodfield who resigned at the end of last season on his appointment as an Elder Brother of Trinity House.

The Bransfield's first port of call was Norfolk, Virginia, where she took on supplies for the Americans at Palmer Station on Anvers Island. On the Atlantic crossing she ran into very rough seas and damaged her rudder. She was put into dock for repairs before she sailed for Montevideo to embark senior B.A.S. staff touring the bases, and American biologists for Palmer Station.

After relieving Palmer Station the Bransfield will pick up more stores from the Falkland Islands and then visit all the main bases except Stonington Island. Stonington Island and the advance base, Fossil Bluff, in George VI Sound, which is relieved by air from Adelaide Island, will be closed for the winter in future, and therefore are not being re-supplied.

SCOTIA ARC

Four geologists were among the 26 passengers on board the Bransfield. They will spend several months in the South Shetlands mapping ancient volcanoes and searching for fossils. Their primary aims are to provide information on the geological relationships between the South Shetlands and South America, and on past climates. They will be accompanied by two geophysicists from Birm-

ingham University, who will collect volcanic rock for radiometric dating and chemical analysis as part of the long-term investigation of the Scotia Arc.

A glaciologist on board the Bransfield will join three others at Fossil Bluff. There the four men will take part in an international programme to study the response of the Antarctic ice-sheet to present climatic changes.

After being held up at Punta Arenas for five days waiting for the weather to clear over the Antarctic Peninsula, the Survey's Twin Otter aircraft arrived at Adelaide Island from Canada on October 17. The party from the John Biscoe was picked up from Doumer Island, as planned, but the weather then deteriorated over Adelaide Island so the aircraft were diverted to Stonington Island.

Fortunately the weather soon cleared, and flights in support of field parties were able to start almost immediately, one party on Adelaide Island being flown to Rothera Point to reconnoitre a possible alternative site for the base.

OTTER'S FLIGHT

In mid-November one aircraft was flown to McMurdo Station by way of Siple and Byrd Stations, having been leased to the Americans for one month to ferry field parties working on the Ross Ice Shelf Project. This was the first time that a B.A.S. aircraft had been flown in Antarctic beyond British Antarctic territory.

Two B.A.S. men accompanied the pilot and mechanics. They will assist in the field work, which includes seismic sounding, ice coring for stable isotope studies, and ice movement and deformation studies.

Field work from Stonington Island and Fossil Bluff began again at the end of August. Parties from Stonington Island worked again on the Palmer Land plateau, and on the east coast of the Antarctic Peninsula.

Parties from Fossil Bluff worked at both ends of George VI Sound, and the northern group opened the glaciological field station at Spartan Glacier en route. Short journeys were also undertaken on South Georgia, Signy Island, the Argentine Islands, and Halley Bay. But those from the latter two bases were brief holiday trips, not hard work. As usual, the Emperor penguin rookery at nearby Emperor Bay was one of the main attractions for the men at Halley Bay.

SLEDGING RECORD

A document sealed in a bottle and left in a rock crevice at Three Slices Nunatak (68deg 02min S., 64deg 58min W), 34 years ago was found by a field party from Stonington Island, working on the east coast of the Antarctic Peninsula. It was the travel record of the American sledge party which made the first crossing of the Antarctic Peninsula plateau to the coast of the Weddell Sea in November, 1940. These sledgers were members of the East Base party of the United States Antarctic Service expedition of 1939-41, which wintered on Stonington Island under the leadership of Richard B. Black. The West Base party of the expedition wintered at Little America III.

The sledge journeys and numerous air reconnaissances of the Stonington Island group extended the surveys of the British Graham Land Expedition, 1934-37, south-westwards down George VI Sound to the Ronne Entrance (finally proving that Alexander Land was an island) and south-eastwards over the Antarctic Peninsula plateau to the Black Coast of the Weddell.

Three men, Paul Knowles (geologist), Donald Hilton (surveyor), and Harry Darlington (radioman and dog driver) were the first to cross the Antarctic Peninsula and sledge down its eastern coast. They left East Base on November 19, 1940, and after crossing the plateau, sledged south to the Eielson Peninsula (70deg 37min S), before turning back. On January 17, 1941, they returned to their base with 22 rock samples, extensive photographs and survey data, and all but two of their dogs. They covered 683 miles in 59 days.

EXPEDITIONS FRANCAISES

25 Years of Research Work by French in Adelie Land

Expeditions Polaires Francaises will celebrate 25 years of scientific work in Adelie Land next month. The first base, Port Martin, 50 miles east of the present base, Dumont d'Urville, was built in January, 1950, and since then France has sent expeditions south each year except for the period 1953-55. Since 1956 the main base has been Dumont d'Urville, which is located on Petrel Island in the Point Geologie archipelago.

This season the 25th expedition left France by air for Australia to join the Thala Dan at Hobart. The winter party of 34 men is led by a topographical engineer, Claude Volck. It was followed by the summer group which will remain in the Antarctic until February.

The Thala Dan is expected to reach Dumont d'Urville about December 20 if she does not encounter heavy pack ice. She has nearly 600 tons of supplies and equipment for the base, and after they are unloaded, she will relieve the winter party of 35 led by Bernard Barriquand.

SUMMER WORK

During the summer the base will be repaired and extended. The bathrooms and sanitary installations will be renovated ,the kitchen modified and the radio aerial overhauled. Two new shelters will be built, the sea water desalination plant will be completely overhauled and a new platform will be constructed for the Air Force supply helicopter.

A full programme of scientific work will be carried out during the season. Biologists will tour the islands of the Point Geologie archipelago to check on its penguin population of 45,000 birds, and will observe and ring some. More glaciological measurements will be taken along the coast. Ice movement and snow accumulation will be recorded, and maintenance will be done on markers.

Topographical work will be done at Cape Prudhomme to locate an ice-free area where more buildings can be erected. A road for motor vehicles will also be traced out.

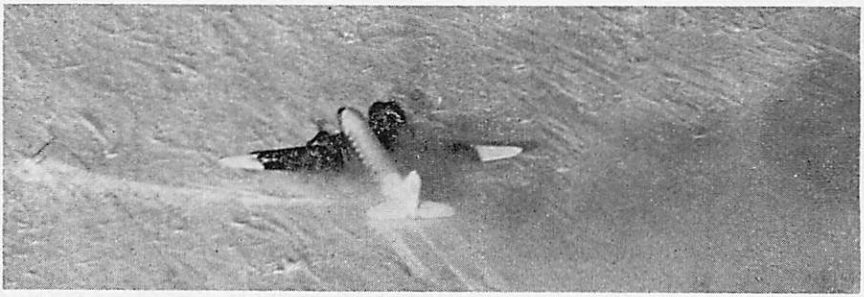
SPECIAL MISSION

A special mission led by Robert Guillard, will make ground preparations for the United States National Science Foundation which wants to recover the wreckage of the Navy Hercules which crashed on December 4, 1971, while making a jet-assisted take-off from the polar ice-cap about 200 kilometres from Dumont d'Urville.

This aircraft provided support for the French scientific traverse party on the first stage of its 2000-kilometre two-year journey across Wilkes Land to the Soviet Vostok Station in the 1970-71 season. Because of mechanical trouble, difficult terrain, bad weather, and low temperatures, the party stopped at the 800-kilometre mark although it planned to cover 1000 kilometres. Similar difficulties forced the 1972-73 party to end the last stage at the 400-kilometre mark.

This season the special mission will prepare a landing strip at Carrefour, the small advance base about 32 kilometres from Dumont d'Urville. It will make weather observations and provide a radio link with McMurdo Station for the arrival of a VXE6 Squadron Hercules reconnaissance aircraft.

A small group will also operate on the ice-cap about 1000 kilometres from Dumond d'Urville. It will make preliminary studies for operations to be carried out next winter. Scientists plan to resume the Wilkes Land glaciological traverse from the region of Dome C, a subglacial dome located about 400 to 500 kilometres south of Vostok.



SOUTH POLE STATION AND ITS BUILDERS

Men have lived and worked at the South Pole since 1957. But after 17 years of occupation the first Amundsen-Scott Pole Station has become unsafe because its buildings and underground tunnels have been slowly crushed under the weight of 35ft of snow. A new station, about a mile from the old station, will be dedicated early next month, and the occasion will mark 20 years of operations in the Antarctic by the United States.

Next winter scientists will live less than one-third of a mile from the geographic South Pole in a complex of buildings housed beneath a geodesic dome 160ft in diameter and 52ft high, and a corrugated aluminium arch nearly 800ft long. The new station, built by Seabees of the Navy's Mobile Construction Battalion 71, has been handed over to the National Science Foundation, and will be the third scientific research station in Antarctica to be manned entirely by civilians.

A geodesic dome was selected to protect buildings from winds and drifting snow.

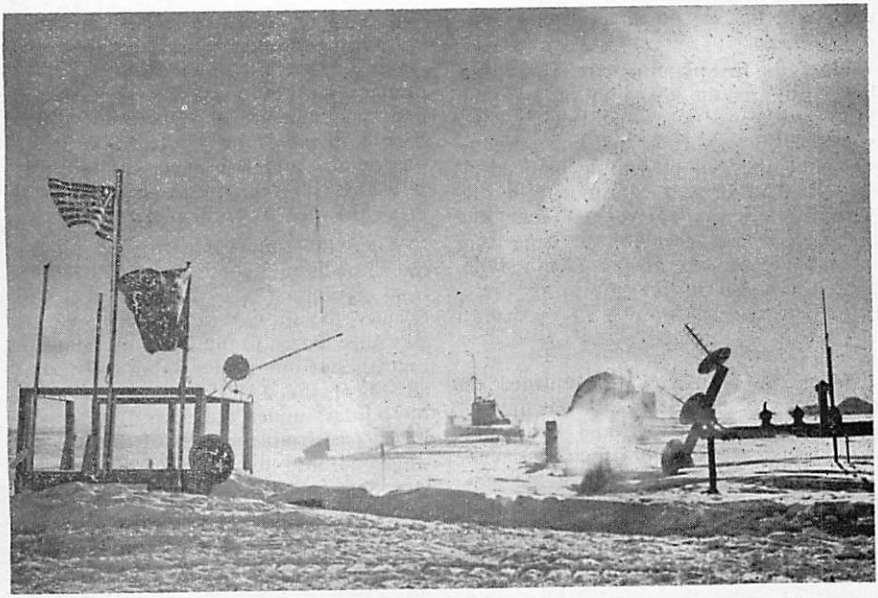
Under the dome are three buildings of modular construction, each two stories high. They house science facilities, living quarters, a library, a store and recreation hall, the dining room, and a conference room. Each building has interior panelling and wall to wall carpet.

Scarlet carpet on the floor, coach-style lamps, overhead fluorescent lighting, and imitation rustic beams, make the dining room the most luxuriously appointed area in the new station, and perhaps in all Antarctica. Other facilities under the aluminium dome include a post office, a photographic laboratory and a small computer for the compilation of data.

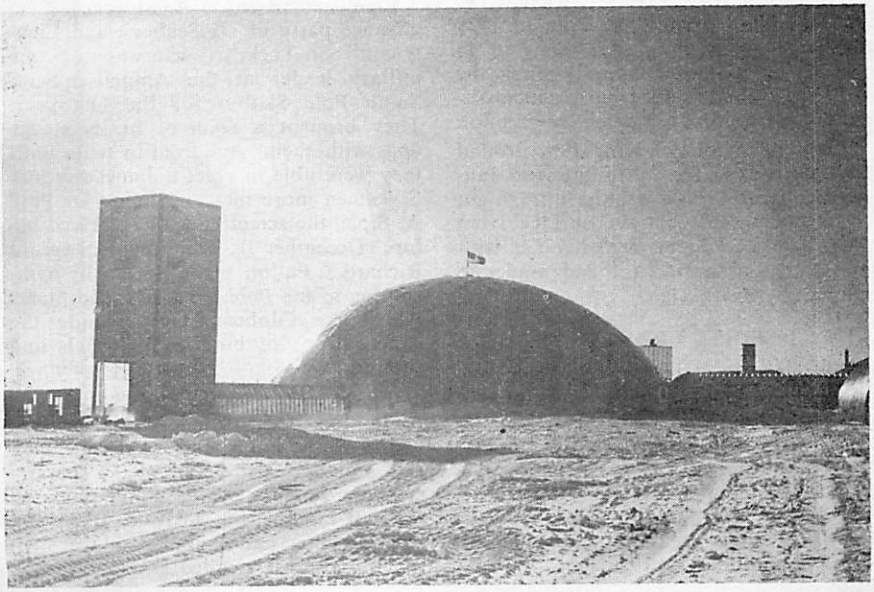
Two other buildings under the 800ft arch house a vehicle maintenance workshop, a biomedical facility serving as a dispensary and research laboratory, and a small gymnasium. Set away from the station under an arch separated by a snow wall 8ft high is a fuel storage area to hold 225,000 gallons of petrol, diesel fuels, and jet fuels.

Close to the geodesic dome is a tower 52ft. high, which will be used for auroral studies. The so-called "skylab" tower's height will afford an unobscured view of the bleak polar plateau surrounding the new station.

Twenty years ago the United States was committed to one of the most difficult construction jobs in history — building a permanent station at the South Pole — almost by accident. Eleven nations were expected to build stations in



POLE STATIONS, OLD AND NEW. **Above is the first Amundsen-Scott South Pole Station, built in 1956, and now almost hidden under ice and snow. Below is the new station, housed beneath a geodesic dome 160ft in diameter, and inside an 800ft long corrugated aluminium arch. To the left is a 52ft tower for auroral studies.** U.S. Navy Photo



the Antarctic for the International Geophysical Year.

When the first planning conference was held in Paris the question of a South Pole station was not raised. But the Russion delegates, who arrived late announced that the Soviet Union planned a station. The French chairman told the Russians he was sorry, and that the conference had accepted the American offer to erect and man a South Pole station because it did not think there should be two stations.

NAVY'S TASK

When the United States returned to the Antarctic, the Navy's task was to support the scientific effort, and build and man seven stations on the continent. The South Pole station was the unknown quantity. Men and materials had to be landed there by aircraft, and during the summer the scientists and Navy men who were to live at the bottom of the world had to be supplied from McMurdo Station 825 miles away.

Little was known of conditions at the Pole, and whether the snow surface was hard or soft. The only records available were those of Amundsen, from December 1911, and Scott, from January, 1912. Rear-Admiral Richard E. Byrd had flown over the Pole in 1929 and 1947 — he flew over it again in January, 1956 — but the only report the Americans had was from Lieutenant-Colonel Hal Kolp, a Marine Corps pilot.

Lieutenant-Colonel Kolp flew around the South Pole for 30 minutes on January 3, 1956 — this was the third flight — and reported that the surface from 500ft appeared to be perfectly flat with long, gentle snowdrifts, and moderate swells up to 3ft high.

FIRST LANDING

Ten months later seven Americans became the first men to set foot on the South Pole since Captain Scott and his party. The first aircraft landing in history was made by Lieutenant-Commander Conrad S. Shinn, piloting a wheeled Skytrain aircraft called Que Sera Sera. The time was 8.30 p.m., and the date was October 31, 1956.

Because of the bitter cold — the temperature was minus 58deg Fahrenheit, the Americans were at the Pole for only 49 minutes. Rear-Admiral George J. Dufek, first commander of Operation Deep Freeze, planted the United States flag on the ice, and two men set up radar reflectors for the aircraft which would bring the men to build the station.

When the time came to take off for the three-hour flight to the small refuelling station at the foot of the Liv Glacier, the aircraft would not move. Its skis were frozen to the ice of the plateau. Lieutenant-Commander Shinn had to fire all 15 of the JATO (jet-assisted take-off bottles) under the aircraft before it broke free from the grip of the ice and staggered into the air. Ten hours later Que Sera ended its historic flight at McMurdo Station.

Because of the intense cold the first Seabees of the construction team were not flown to the Pole until November 20, 1956. By then the temperature had risen to minus 30deg F. Lieutenant-Commanders Shinn and Roy E. Curtis landed eight miles from the Pole itself.

PARACHUTE JUMP

Lieutenant Richard A. Bowers led the advance party of six Seabees, and Lieutenant John Tuck, jr., who was to be the miltary leader at the Amundsen-Scott South Pole Station for the first year. They brought a team of husky sledge dogs with them, and lived in tents until they were able to erect a Jamesway hut. Seventeen more men, including Dr Paul A. Siple. the scientific leader, arrived before December 1. One man, Sergeant Richard J. Patton, made history by parachuting to the Pole from a United States Air Force Globemaster to guide the supply drops of building materials and supplies.

By December 29 the Pole Station was ready for occupation. Nine scientists and a Navy support team of nine men said goodbye to the crew of the last aircraft on January 9, 1957, and prepared for ten months of isolation from the world. They had company — a five-month-old husky called Bravo. But he

was lonely—the other 11 huskies had been flown back to McMurdo Station.

Early in November the first aircraft arrived with mail and fresh food, and the first men to live at the Pole returned home.

For the first few seasons after the pioneers the Pole Station seemed to be the most remote United States station in Antarctica. But the Globemasters and the Skytrains gave way to the ski-equipped Hercules aircraft which carried tons of supplies each season from McMurdo Station in slightly more than three hours. And then, suddenly the men at the Pole found themselves entertaining foreign visitors who arrived by land. Once again the South Pole was the goal of men of other nations.

HILLARY ARRIVES

First to reach the Pole by land since the days of Amundsen and Scott were Sir Edmund Hillary and his four companions. The New Zealanders arrived on January 4, 1958, having driven their three small farm tractors 1250 miles from Scott Base in 82 days.

Next came Sir Vivian Fuchs and his party, which included a New Zealander, an Australian, and a South African. They completed the first half of their crossing of the continent on January 20, 1958, and two dog teams travelled 932 miles with the snocats.

Sixteen Russians arrived at the Pole on December 29, 1959. Alexander Dralkin led the tractor train, which left Mirny on September 27, and covered 1670 miles. The Russians took 18 days to travel 800 miles from Kamsomolskaya, the base at the South Geomagnetic Pole.

The first Americans to reach the Pole by land over an unexplored route were 10 men led by Major Antero Havola, who reached the Pole from Byrd Station on January 16, 1961. They travelled 800 miles in 33 days. Dr Albert P. Crary, chief scientist of the United States Antarctic Research Programme, reached the Pole in early February of the same year. His party of seven men, including a Russian and an Argentinean, travelled 1450 miles from McMurdo Station in 64 days.

In 1965 the Argentine flag flew at the Pole. An Argentine Army expedition of eight men led by Colonel Jorge Leal left General Belgrano Station on October 26, 1965, and reached the Pole on December 10, travelling 825 miles.

Last to make an overland journey to the Pole were the Japanese. On December 19, 1968, a party of 11 men from the 9th Japanese Antarctic Research Expedition, led by Masayoshi Murayama, arrived from Syowa Station. They travelled 3,235 miles in 141 days—the longest journey of all.

Today it is comparatively easy to reach the Pole, provided transport is available to McMurdo Station. Over the years since the Hercules aircraft were brought into use hundreds of men — and six women — have reached the bottom of the world by air. But less than 100 have made the journey the hard way since Amundsen and Scott. There are 82 in this select band, representing eight nations.

PHILATELIC MAIL

Antarctic philatelic mail collectors will be limited to two covers a person this year. Covers, which must be clearly marked in the lower left-hand front corner with "McMurdo Station", should be addressed to: Philatelic Mail Clerk, McMurdo Station, U.S. Naval Support Force, Antarctica, F.P.O. San Francisco, California, 96692.

Philatelists will be advised later of procedures for sending covers to the Amundsen-Scott South Pole Station. United States Antarctic operations this season will end in late February, 1975. All covers mailed after that date will be held until the opening of next season's operations in about the first week of October, 1975.

Covers to be cancelled in Antarctic must have either United States postage or an international reply coupon enclosed to defray postage to foreign countries.

U.S. SCIENCE PROJECTS THIS SUMMER

Geological studies to determine whether the ice sheet in West Antarctica is collapsing, and the establishment of an automatic station to monitor atmospheric conditions on the Polar Plateau, are among the 64 projects of the United States Antarctic Research Programme this season. Scientists financed by the National Science Foundation will work at the five United States stations on the Antarctic Continent, on the Ross Ice Shelf, in North and South Victoria Land, and in the Amundsen and Weddell Seas.

This season programmes at the Amundsen-Scott South Pole Station, and Siple Station at the foot of the Sentinel Mountains in Ellsworth Land, will continue to concentrate on atmospheric sciences, although one project at the Pole will be an attempt to drill to a depth of 100 metres into the ice and obtain a continuous core. The emphasis at Palmer Station and in the Antarctic Peninsula area will be on marine biology and penguin studies. Scientists at McMurdo Station will study seals, penguins, marine life, and Antarctic fishes.

Several projects in the research programme will be carried out in co-operation with scientists of other nations. United States scientists will accompany New Zealand and French investigators in an attempt to descend into the crate of the active volcano, Mount Erebus. They will work with New Zealanders and Japanese in the dry valley drilling project, accompany a Norwegian expedition into the Ellsworth Mountains, and have British, Argentinean, and Chilean assistance in glaciological and geological studies on the Ross Ice Shelf, and in the Antarctic Peninsula area.

Recent glaciological and geological investigations have suggested the strong possibility that ice in West Antarctica, floored largely below sea level, is disintegrating from a full-boded state attained when grounded ice recently filled much of the Ross and Weddell Seas. Continued collapse of this ice would cause world-wide sea level rise, and perhaps would influence climate.

Field work this season by scientists from the University of Maine, will focus on glacial deposits that mantle Beaufort, Franklin, and Inexpressible Islands in the Ross Sea. This continues the project to map the former extent of grounded West Antarctic ice in the Ross Sea, with particular emphasis on carbon-14 dating of the recession of the grounding line southward through the Ross Sea and McMurdo Sound.

ROSS ICE SHELF

Once again surface studies by field parties on the Ross Ice Shelf are included in the programme. This season scientists from the University of Nebraska, the University of Wisconsin, the Virginia Polytechnic Institute and State University, the University of Copenhagen, the United States Geological Survey, and the University of Nevada, will take part in the project. They will continue the research begun in the 1973-74 summer. An additional project will be a study of the major chemical constituents of snow, and precipitation forming mechanisms on the shelf.

Continuing studies include a geophysical programme to make ice thickness, water depth, and gravity measurements, measurement of the ocean tide

beneath the shelf, and the collection of ice cores for isotope studies. To examine the dynamics, history, and stability of the ice shelf strain rates will be measured in a network of stations for the second season of a three-year project.

Scientists will work at last season's base camp at 82deg 30min S., 166deg W., at 82deg 22.5min S., 168deg 38.7min W., the proposed site for drilling through the ice shelf, and on Roosevelt Island and several other locations. Drilling through the ice shelf has been postponed because of delays in assembling the drill and associated equipment. Air support in the field will be provided by Hercules aircraft of the United States Navy's VXE6 Squadron, and a de Havilland Twin Otter aircraft.

AUTOMATIC STATION

Plateau Station, 700 miles from the South Pole in the direction of South Africa, which was closed in 1969, will be the site of the automatic station to monitor atmospheric conditions on the high Polar Plateau nearly 12,000ft above sea level. Wind speed and direction, barometric pressure, air temperature, and power system performance will be transmitted to the Nimbus F polar orbiting satellite and stored by it for later reading by National Atmospheric and Space Administration tracking stations.

Temperatures at Plateau Station may exceed minus 87deg Centigrade, which are too low for standard battery operation. Therefore the station will be powered by either a 10-watt propane-thermo-electric generator or a small radio isotope generator.

Two remote topographic survey mapping operations this season will be conducted by United States Geological Survey engineers off the Amundsen Sea Coast of Ellsworth Land, and in the Ellsworth Mountains. Two engineers will accompany a Norwegian expedition into the Ellsworth Mountains to establish geodetic control to position satellite imagery for revising topographic maps of the Sentinel Range.

With the support of a United States Coast Guard icebreaker two engineers with surveying equipment will made a reconnaissance of Pine Island Bay and Lindsey Island on the Walgreen Coast of Ellsworth land. A reconnaisance of the area as part of a study for a possible deep-water port was to have been made last season. But delay to the icebreaker Staten Island and heavy ice in the area forced the survey to be cancelled.

REMOTE PARTIES

Glacial geology and ice surface reconstructions in the Bowers and Freyberg Mountains of Northern Victoria Land will be studied by two scientists from the University of Maine. They were flown into the area early last month by a United States Navy Hercules aircraft, and will remain there for two months. Another geologist from Ohio State University will study the sedimentary and volcanic rocks in the Scott Glacier region, which is between the Amundsen and Leverett Glaciers in the Queen Maud Range of the Transantarctic Mountains.

On the other side of the Antarctic Continent oceanographers from the Scripps Institution of Oceanography will make a physical oceanographic investigation of the northern and western parts of the Weddell Sea, operating from a Coast Guard icebreaker. This is a continuation of the International Weddell Sea Oceanographic Expedition. An attempt will be made to penetrate the pack ice near the Larsen Ice Shelf to the north-east of the Antarctic Peninsula, a region previously unexplored.

A brief summary of other scientific projects follows.

ANTARCTIC PENINSULA

University of Minnesota. Ecological and behavioural studies of skuas, gulls, and terns begun at Palmer Station in 1973, will be continued during the next two years.

Case Western Reserve University. Study of the sympathetic nervous system in the regulation of blood flow and

temperature responses in the flippers of Adelie penguins. The birds will dive under controlled experimental conditions to determine cardiovascular responses to submersion.

Scripps Institution of Oceanography, Max Planck Institute for Physiological and Clinical Research. Observations of the responses of Adelie penguins to altering central temperatures. Heating central tissue induces eating of snow and increased activity of the salt gland; cooling inhibits these effects. Thermoregulatory responses will be investigated in Adelies implanted with a vertebral thermode.

University of California, Berkeley. Study of radioactive and chlorinated pollutants in Antarctic ecosystems. Large volumes of snow will be extracted near Palmer Station. Chlorianted hydrocarbon residues will be analysed, and lead-210 and plutonium measured, to determine the accumulation of these natural and artificial radioactive fallouts.

SIPLE STATION

Stanford University. Use of the very low frequency transmitter in studies of wave-particle and wave-wave interactions in the magnetosphere. Studies of coupled ionosphere-magnetosphere effects involving electric fields and interchange of plasma.

Universities of New Hampshire and Minnesota. Continued operation of a sensitive micropulsation detector to study generation and propagation of signals near the plasmapause. A similar detector will be operated near the foot of the Siple magnetic field line in Quebec, Canada.

University of California, San Diego. Measurement of ionospheric absorption, and comparison of results with very low frequency and magnetic data recorded by other groups. This will lead to a better understanding of the complex interactions of the sun, the ionosphere, and the earth.

POLE STATION

National Oceanic and Atmospheric Administration. Study of the thermal infrared radiation budget over the station. Surface observation of wind temperature, pressure visibility, clouds, and snow measurements. Upper air observations of the wind and temperature structures above the South Pole to altitudes of 15 miles. Continuance of long-term measurements of atmospheric constituents that can influence climate or shed light on climatic processes.

University of California, Davis, and Stanford University. Selection and installation of data acquisition and computation equipment for the new South Pole station. The system is based on two mini-computers.

University of Maryland. Study of particulate trace elements in the atmosphere. Samples will be collected for trace metal and hydrocarbons, using high volume samplers.

Scripps Institution of Oceanography. Twice a month all the year air will be collected to extend nearly uninterrupted measurements of atmospheric carbon dioxide begun in 1957. These data furnish the most reliable record of the world-wide rise in atmospheric carbon dioxide thus far obtained.

United States Army Cold Regions Research and Engineering Laboratory. A 100-metre drill hole with continuous core will be attempted early in the season. Initial core analysis will be done on the spot before the cores are shipped to the United States. Then the 1967-68 Byrd Station drill hole will be resurveyed. A depth-velocity profile will be obtained for a depth of 1545 metres by comparing data from the 1967-68 survey. The profile will be used to verify ice sheet deformation studies.

University of Bristol, England. Radio echoes returned from the bed of the ice sheet will be used to determine the horizontal and vertical components of ice movement at the surface.

University of California, Los Angeles. Observations of long period earth tides and of earth's free vibrations excited by large quakes (should there be earthquakes of sufficient energy, magnitude 8 or more) will be continued.

DRY VALLEYS

Ohio State University, University of Georgia. Collection of samples for the study of the mechanism of chemical weathering in a polar desert. Examination of various localities in the dry valleys to identify additional occurrences of a volcanic ashfall recognised in the Wright Valley. Geochemical studies of several ponds, and further study of the relationship of the McMurdo volcanics and the glacial chronology of the Wright Valley.

University of Wyoming. Measurement of subsurface temperatures in new and previously completed holes drilled by the Dry Valley Drilling Project. Studies to obtain new data on the thicknesses of permafrost, on paleoclimate, on heat flow, and on the McMurdo Sound region's thermal history.

State University of New York. Relations between Adelie penguins and south polar skuas will be studied at Cape Crozier where breeding penguins are exposed to skua predation. The breeding success of penguins within and outside skua feeding territories will be examined.

Point Reyes Bird Observatory. Study of the breeding biology of nine to 13-year-old Adelie penguins. It is hoped to find how long Adelies live, and how many years a penguin must reproduce successfully to ensure replacement in the population by offspring.

McMURDO STATION

University of Minnesota. Studies of the population dynamics of the McMurdo Sound Weddell sea population will be continued. Underwater spacing of seals in the pupping colony will be measured at Hutton Cliffs, using sonic tags and a hydrophone.

University of Oklahoma Medical Centre. Temperate zone and Antarctic penguins will be collected to analyse their gross and microscopic structure. Most research will be at the University of Otago Medical School, Dunedin, New Zealand.

Duke University. Study of energy expenditure and thermoregulation in fasting Emperor penguins, and the cost of locomotion in little blue penguins. The Emperor penguin will be studied at McMurdo Station, and the little blue penguin at the University of Canterbury, Christchurch, New Zealand.

Bartol Research Foundation, Franklin Institute. Continuously recording high precision cosmic ray detectors will exploit the special advantages of the polar regions for providing information about electromagnetic conditions in space, and about earth's immediate environment.

Ice Will be Cut With Saw in Winter Quarters Bay

To ease the movement of supply ships in Winter Quarters Bay below McMurdo Station this summer, the United States Navy will use a modified trenching machine chain saw to cut through the annual 9ft sea ice. The chunks of ice will then be towed out of McMurdo Sound by Coast Guard icebreakers. This will prevent damage by sea ice to the seaward face of the man-made ice wharf in Winter Quarters Bay.

Last summer Commander T. Kirkpatrick, ship operations officer with the Antarctic naval support force, who conceived the idea of the ice wharf, considered the use of a giant saw to cut through ice 30ft thick, ease the movements of the supply ships in the new season, and face the seaward edge of the ice wharf. ("Antarctic", June, 1974, Page 60).

A company in California uses 16ft chain saws to cut giant trees. The expense of having a bigger saw specially made would have been considerable so it was decided to cut the annual sea ice and not the ice wharf. The sea ice is never more than 8ft to 9ft thick, and an adapted trenching machine will be used. It can cut through ice 10ft thick, the cuts measuring 8in across.

Antarctic support flights favoured by fine weather

United States scientific research in the Antarctic this season will cost $US26.2 mllion. Logistic support of the scientific activities by the United States Navy, Coast Guard and Air Force, will cost $US16 million. The size and scope of the programme are on the same level as those of previous seasons, and the budget is about the same as last season's despite higher fuel costs.

This season the summer airlift of scientists, servicemen, and supplies by Starlifters of the United States Air Force Military Airlift Command was favoured by almost unbelievedly good weather in Antarctica. The first aircraft of the summer flew from Christchurch to McMurdo Station on October 8 with 100 passengers, and mail and fresh food for the men who had been there for more than seven months.

By the middle of November the supply flights were in full swing, and there were few delays to the programme. Up to that time the Starlifters had carried south about 750 men and more than 1,000,000 pounds of cargo, supplies and spart parts.

Early last month the United States Navy began its 20th season in support of scientific activities on the continent. Five VXE6 Squadron Hercules aircraft flew from New Zealand to start the transport of men and supplies to inland stations.

Twenty-one scientists and servicemen at the Amundsen-Scott South Pole Station, who had been isolated for more than eight months, received their first mail from home, and fresh food, on November 2. The Hercules was the first aircraft to land on the new 14,000 skiway at the Pole.

CHANGE MADE

Three days later an historic change was made. The station, which has been operated by the Navy since 1957, was handed over to the National Science Foundation. In future it will be operated by civilian contractors for the foundation. Lieutenant R. Braddock, military leader at the station, and 12 other Navy men, who spent nearly a year at the South Pole, were the last to winter there.

On November 15 a Hercules aircraft made the first visit of the new season to Siple Station, which is at the foot of the Sentinel Mountains in Ellsworth Land, and 1350 miles from McMurdo Station. Four men, all civilian scientists who spent the winter at the most remote American inland station, welcomed the visitors, and the mail, magazines, and fresh food they brought.

Lieutenant Braddock and his men, who spent 363 days at the South Pole, returned to civilisation last month, and in Christchurch looked forward to two months' leave in the United States. Last to leave the station was Chief Petty Officer R. L. Bowers, the third of his name to reach the South Pole.

Horses, lettuce, children, freedom, air and plenty of falling snow were some of the things Lieutenant Braddock's team missed during their isolation at the Pole. They also had trouble in the last month with their home appliances.

One man became a father while he was at the Pole Station. Only eight hours after his son's birth he was able to hear the baby's crying by radio from the United States.

Towards the end of their stay the men had no ice-cream because the ice-cream making machine was out of action. The waffle iron had to be repaired — it was well-used during the winter — and the home-baked bread had to be cut with a knife when the bread-slicing machine was also out of action.

Richard E. Byrd, sculptured in bronze, looks skyward at McMurdo Station.

U.S. Navy Photo

FIRST FLIGHT OVER SOUTH POLE

Forty-five years ago Rear-Admiral Richard E. Byrd became the first man to fly over the South Pole. His flight, on November 29, in a Ford monoplane from Little America to the Pole and back — a distance of 1380 miles, took 18hrs 59min.

On November 29 this year this historic flight was commemorated by the flight of a United States Navy Hercules aircraft of VXE6 Squadron, which has provided air support for American operations in the Antarctic since 1955. The flight to the Pole and back to McMurdo Station took six hours, the Hercules covering a distance of 1650 miles.

When Rear-Admiral Byrd flew over the Pole he carried the Norwegian and British flags in the aircraft as a tribute to Amundsen and Scott. He dropped a small American flag weighted by a rock from the grave of Floyd Bennett, who was with him when he made the first flight over the North Pole.

Commander F. C. Holt, commanding officer of VXE6 Squadron, and his crew re-created the scene when they flew over the Pole last month. An American flag tied to an Antarctic rock was dropped from the Hercules when it was over the flags of the Antarctic Treaty nations which now fly at the South Pole.

Deep hole drilled at Pole

United States and Norwegian scientists have drilled three holes through the ice of Antarctica this season, the first at the South Pole, the second on the Ross Ice Shelf, and the third at Siple Station, near the Sentinel Mountains in Ellsworth Land. The 101.5 metres deep hole drilled under the geodesic dome of the new Amundsen-Scott South Pole Station yielded the deepest core recovered from the Pole, and the drilling was the first scientific project at the station this summer.

A light-weight shallow drill developed by Mr John Rand, of the United States Army's Cold Regions Research and Engineering Laboratory, was used to drill the hole at the Pole. In late September it had been used to drill a 100-metre hole through the Greenland ice-cap. Work began at 9 a.m. on November 19, and the hole was completed at 11.20 a.m. on November 21.

Associated with Mr Rand in the Pole project were Dr Robert H. Rutford, director of the Ross Ice Shelf Project, and two scientists from the Norwegian Polar Institute. An ice-core study team was led by Dr Chester Langway, a glaciologist, who was assisted by Mr Jim Cragin, a chemist from CRREL.

Later the group moved to about the middle of the Ross Ice Shelf where a second 100-metre hole was drilled. Then the men flew to Siple Station to drill the third hole.

Information gained from this season's drilling will be used next season when one event in the Ross Ice Shelf Project will be to drill a hole 30 centimetres in diameter through the 450-metre thick ice shelf. It is hoped to penetrate the ice in about a week, and reach the sediment of the sea bed 275ft below the shelf.

A larger drill, which will have to be carried in a Hercules aircraft to the drilling site has been designed for the work. Drs Rutford and Langway, and Messrs Rand and Cargin, will test this drill in Greenland in preparation for next season.

Next year New Zealanders will take part in the drilling project. They will come from the oceanographic section of the Department of Scientific and Industrial Research, and the Victoria University of Wellington.

AIR BOAT TESTS ON ICE

An air boat driven by an aircraft engine will be tested on Antarctic ice this season to determine whether it is a suitable replacement for tracked vehicles or trucks. The air boat can carry 14 passengers or 5000lb of cargo at 50 to 60 miles an hour in shallow water; its American designer believes it could do the same on ice, provided the surface is not too rough.

Made by the American Air Boat Corporation in Florida, the boat, specially strengthened for ice work, is 20ft long and 8ft wide, and is driven by a 250 horsepower aircraft engine. A large metal canopy is fitted to protect passengers or cargo.

The designer of the boat, Mr A. Smith, says that similar boats have been used successfully in work on the Alaskan oil pipeline from the North Slope field in the Arctic. Mr Smith flew to McMurdo Station this month to supervise the trials of his boat. It will be tested between the ice runway on the Ross Ice Shelf, the Williams Field camp on the sea ice in McMurdo Sound, and McMurdo Station.

If the boat lives up to its designer's claims and proves economical, it will speed up travel between these points. At present the time taken by tracked vehicle or truck can vary, depending on conditions, between 30 and 90 minutes. The boat will be left at McMurdo Station if it is suitable, and more may be used next season. Otherwise it will be returned to the United States.

JARE 16 PLANS

Survey in Yamato Mountains and Mizuho Camp drilling

Glaciological, geological, and terrestrial surveys in the Yamato Mountains area, and a traverse to Mizuho, the small inland camp 185 miles south-east of Syowa Station, are among the planned activities of the 16th Japanese Antarctic Research Expedition (JARE 16) next year and in 1976. Air support on these trips will be provided by a Cessna 185 aircraft. Routine meteorlogical, geophysical, and geochemical observations will be made at Syowa Station, and members of both JARE 15 and 16 will continue deep core drilling at Mizuho Camp next month and in February.

Forty men of the expedition left Tokyo towards the end of last month aboard the icebreaker Fuji, which is commanded by Captain Mamora Morita. Leader of the 1974-75 winter party is Dr Takao Hoshiai, associate professor of biology at the National Institute of Polar Research in Tokyo, who is returning to the Antarctic for the fourth time. Dr Yoshio Yoshida, professor of geography at Hiroshima University, will lead the 1974-75 summer party. Captain Morita is taking the Fuji south for the third time. One of three summer visitors to Syowa Station aboard the Fuji is Dr Tetsuo Tomiyama, of JARE headquarters.

The Fuji left Fremantle about the middle of this month for Syowa Station. She is expected to send her first helicopter to the station about New Year's Day. She will make oceanographic observations in the Southern Ocean after the relief of Syowa Station, and then call at Cape Town early in March to disembark the JARE 14 winter party led by Mr Nozomi Murakoshi, which will return to Japan by air. The Fuji will call at Singapore, and is expected back in Tokyo on April 20 next year.

Ship-board programmes this summer will be routine marine, meteorological, and oceangraphic observations, and radio physics. Near Syowa Station the scientific programme will cover biology, glaciology, geology, cartography, geomorphology, and geochemistry.

FIELD RESEARCH

Research activity at Syowa Station and in the field was described by Mr Murakoshi, leader of JARE 15 in a report received at JARE headquarters on November 22. He said that the Cessna 185 aircraft had made several ice reconnaissance flights over Lutzow-Holm Bay since the beginning of November. It will be used for aerophotogrammetry and to support field parties. Men at Syowa Station are eagerly awaiting the arrival of the new party.

The first party to move into the field was sent to Mizuho Camp at the beginning of September. It found heavy snow cover after the winter inland from Syowa Station.

On October 1 a glaciological party led by Mr Okitsugu Watanabe, who had previous wintering experience with JARE 11, left Syowa Station to make a resurvey of the strain network established in 1970-71 in West Enderby Land. The party will return to Mizuho Camp about January 10.

Four men led by a geologist, Dr Keizo Yanai, left Syowa Station on October 30 to make a geological survey of the Yamato Mountains, and to collect meteorites. Meteorites were first found in the area in 1969 and in 1973 were named Yamato. Dr Yanai's party, which has collected a number of meteorites, will return to Syowa Station next month.

Deep core drilling was resumed at Mizuho Camp at the beginning of this month and two men doing the work will remain there until the end of next month. They expect to drill to a depth of 500 metres, but drilling is behind schedule at present.

Biological and geochemical field surveys around Syowa Station were carried out all winter. The surveys were stopped in the middle of October when the sea ice deteriorated, and trips over it became precarious. Supplementary surveys such as the observation of the penguin rookery will be carried out in the neighbourhood of the station.

A maximum air temperature of 1.5deg C above zero was recorded at the station on November 5. With the return of penguins, skuas, and other birds to the coast biological activities were in full swing.

DRY VALLEY PROJECT

Since the establishment of the National Institute of Polar Research, Japanese responsibility in the Dry Valley Drilling Project, in which New Zealand and the United States are also involved, rests with the director of the institute, Professor Takesi Nagata. Dr Katsutada Kaminuma, a geophysicist, who is an associate professor at the institute, will act as liaison officer with the project while he is in the McMurdo Sound area this season.

Five other Japanese scientists will work in the dry valleys and on Ross Island this season. Messrs Takashi Nishiyama, a geologist at Kyoto University, and Kikuo Kato, a geochemist at Nagoya University, went south in October. They were followed by Dr Tetsuya Torii and Mr Osama Waguri last month. Drs Kaminuma and Hajime Kurasawa, flew to McMurdo Station this month.

Mr Nishiyama will be in charge of X-ray diffraction analysis at McMurdo Station, and Mr Kato will work mainly on hydro-geochemistry. Dr Torii will work at Don Juan Pond in the Wright Valley with the assistance of Mr Waguri. Dr Kurasawa, who is on his second visit, will continue his isotope geology work.

Dr Kaminuma is expected to instal seismographs on Ross Island. He hopes to register volcanic seismicity around Mount Erebus in addition to his main work wtih the Dry Valley Drilling Project.

Members of the 16th expedition, and their scientific disciplines or capacities are:

SUMMER PARTY (1974-75)

Yoshio Yoshida (leader); Taizi Imoto (physical oceanography); Masashi Sue (chemical oceanography); Masao Ohno (marine biology); Masao Ishihara (surveyor); Satoshi Nakanishi (biology); Takatoshi Takizawa (glaciology); Takeshi Kurokawa (drilling engineer); Mituru Wada (construction engineer); Masamichi Otaguro (general assistant).

WINTER PARTY (1974-75)

Takao Hoshiai (leader); Shigenori Sakai (meteorology); Shinichi Okimasa (meteorology); Shigemi Meshida (meteorology); Takahiro Sakamoto (meteorology); Masahiro Manabe (geophysics); Kenji Chujo (surveyor); Hidetoshi Sugiuchi (ionospheric physics); Noriaki Komiya (upper atmospheric physics); Fumiyoshi Ohmi (upper atmospheric physics); Yukio Matsumoto (geology); Masahisa Hayashi (geomorphology); Tsutomu Abiko (geochemistry); Hiroatsu Shimizu (biology); Yuhei Ichimaru (medical science); Osamu Araki (medical science); Noriyasu Sekiguchi (surgeon); Katsuryo Yamazaki (mechanic); Shigekazu Imura (mechanic); Akira Yamamoto (mechanic); Kiyoshi Takigawa (mechanic); Satoru Ito (radio operator); Tetsuo Takaoka (radio operator); Yoshio Itabashi (radio operator); Yukio Endo (cook); Hisayosi Watanabe (cook); Goro Nagata (aviation pilot); Masao Kuroki (aviation engineer); Yasuo Shimada (general assistant); Minoro Funaki (general assistant).

SOUTH AFRICA

SANAE 16 Party Leaves Next Month for Queen Maud Land

Twenty-one men of the 16th South African National Antarctic Expedition (SANAE 16) who will spend 14 months in the Antarctic, are expected to leave Cape Town for Queen Maud Land aboard the research ship RSA on January 18 next year. The team, which is led by Mr E. P. Morkel, of Cape Town, is being trained at Pretoria this month.

When the RSA completes unloading at Sanae Base in Western Queen Maud Land, she will steam northwards through the pack ice to enable scientists from the University of Pretoria to continue seal observations, and for the Bernard Price Institute for Geophysical Research to do research. Then she will return to pick up members of SANAE 15, and scientists and maintenance staff who visited the base for the take-over period. The RSA is expected back at Cape Town towards the end of February.

This year six men wintered at Grunehogna (72deg 02min S 02deg 48min W), the geological base in the Ahlman Ridge mountain range, 215 kilometres south of Sanae Base. The Borga team, led by Mr H. P. Barrand, a radio echo sounding technician, included two geologists, a surveyor and two diesel mechanics.

DEPOTS STOCKED

After the winter five men left Sanae Base to stock depots on the way to Grunehogna. They also visited the base. The geomagnetist in the party used the opportunity to check on previous expeditions' measurements. On the return journey both vehicles used by the party dropped into crevasses, and it took four days to retrieve them.

A second field party left Sanae Base shortly after the return of the first. It worked its way to Borga Base (72deg 50min S 03deg 48min W). This base, established in 1969, is 350 kilometres south of Sanae Base. It is at a height of 7920ft in the Borga Massif, near the Huldreslottet Nunatak.

Field work from Sanae Base (geology, land surveying and radio echo sounding) is progressing well, and the Borga Team is expected back shortly after New Year's Day. The upper air physics programmes at the base are running smoothly.

Thirteen men on Marion Island experienced a cold winter, the water supply being frozen for 16 days at one stage. The team consists of four meteorologists, a radio operator, a radio technician, a medical orderly, one geomagnetist-onosphericist, two zoologists, and three ornithologists.

One of the highlights of the year was a visit by two ships in November. They were the South African Navy's survey ship Protea, and the RSA. The purpose of their visit was for the erection of six refuges at strategic places round the island.

SEAL RESEARCH

The annual relief voyage to Gough Island took place during October and early November. There are eight men in the new team. The leader, Mr Andre Pretorius who is also the senior technician (meteorology) has already served a year at Marion Island, and at Sanae Base.

With the permission of the British Government, a zoologist has, for the first time, been included as a member of the meteorological team. He will conduct a one-year programme of research on the island's seals. Like the programme at Marion Island, this study is carried out by the Mammal Research Institute of the University of Pretoria.

SOVIET NEWS

Veteran supply ship first to reach Bellingshausen

Relief of Soviet stations in the Antarctic began early this month. The veteran supply ship Ob, which began Antarctic operations in 1956, was the first vessel of the 20th Soviet Antarctic Expedition to arrive at Bellingshausen Station, on King George Island, in the South Shetlands, and unload supplies. She will be followed by the research ship Professor Zubov with the new team for the station.

Another scientific research ship, the Professor Vize sailed from Leningrad in the middle of last month with 150 members of the new expedition. A second research ship, the Professor Virvugin, will spend the summer in Antarctic waters with a party of ichyologists from the Pacific Fisheries and Oceanographic Research Institute. They will study the migrations of marine organisms, and measure the temperature and salt content of Antarctic currents.

Scientists at Bellingshausen Station will make meteorological observations, and temperature and weather soundings. They will also continue to collect ice and hydrological data. During the winter they will construct three buildings from aluminium panels.

A ski journey of 1000 miles from the Pole of Cold to the South Pole is planned by a group of Soviet women next year, according to a report in the Moscow newspaper, "Komsomolskaya Pravda." They hope to cover the distance between Vostok Station at the Pole of Cold to the Amundsen-Scott South Pole Station in 50 days.

According to the newspaper report, the group, known as Metelitza (snow storm) will dedicate the expedition to International Women's Year, which the United Nations has declared for 1975.

ARGENTINE POLAR FLIGHT

Two Argentine Air Force Hercules transport aircraft flew from Christchurch to Buenos Aires early this month, crossing the Antarctic Continent, and refuelling at an Argentine base off the Antarctic Peninsula. The two aircraft, which stopped for three hours at McMurdo Sound, had crews of 10 officers and sergeants each, and carried 67 passengers. Of these 56 were officer cadets of the Argentine Air Force Academy, who had made a 22-day instructional flight to countries round the Pacific.

One Hercules left Buenos Aires on November 18, and after visits to Colombia, the United States, Hawaii, Japan, the Philippines, and Australia, reached Christchurch on December 9. The second Hecules flew direct to Christchurch over the South Pole from the Vice-Comodore Marambio base on Seymour Island, off the Antarctic Peninsula.

Last summer an Argentine Air Force Hercules flew from Buenos Aires to Canberra and back by the polar route, landing at Christchurch on the way back to the Argentine. The commander of the aircraft, Vice-Comodore Jose Gonzales, also commanded the aircraft which flew from Vice-Comodore Marambio base to Christchurch this month.

OBITUARY

Charles Green Was Cook on Shackleton's Expeditions

A small Englishman with a high, squeaky voice, who cooked in the Antarctic under appalling conditions on the ice of the Weddell Sea, in the semi-darkness of a primitive hut made from ships' boats, and aboard two ships, died in hospital at Beverley, England, towards the end of September. He was C. J. Green, one of the two survivors of Shackleton's 1914-16 expedition in the Endurance, who was also cook on the last expedition in 1921-22 when Shackleton died aboard the Quest in the harbour at Grytviken, South Georgia.

In 1972 there were three survivors of the 1914-16 expedition. Walter How, an able seaman, died in that year. Charles Green's death at 85, leaves Commander Lionel Greenstreet, R.N.R. (retd.) the sole survivor of the men who reached Elephant Island after the Endurance was crushed in the ice, and remained there for 137 days before they were rescued. Commander Greenstreet, who was first officer of the Endurance, is 85, and now lives in retirement at Worthing, Sussex.

Charles Green, the cheery cook, as Commander Frank Worsley, captain of the Endurance, called him, was both capable and resourceful. His experience in cable ships before he joined the Endurance had been hard. It became harder long before the expedition ended.

Under the most trying conditions Green always managed to scrape together some sort of a hot meal. He did nearly all the cooking for the Weddell Sea party after the Endurance had to be abandoned. His stoves were made from oil-drums, he used seal blubber and penguin skins for fuel, and the food he had to cook included seal and penguin meat, limpets, seaweed, and skua gulls.

Men who served with Green and wrote about their Antarctic experiences have praised his skill, and his remarkable ability to contrive and make shift. Some aboard the Quest believed that, given an ancient pair of seaboots, he could serve up a dinner that would leave those at the Ritz and the Carlton behind.

But the finest tribute to Green can be found in the biography of Shackleton by Margery and James Fisher. They say that of all the men who learned endurance with Shackleton none learned the lesson better or under harder circumstances than Charles Green.

Green was not the original cook of the expedition. The first cook was discharged when the Endurance reached Buenos Aires, and Shackleton instructed Worsley to look out for another. Green, a baker and pastrycook, was aboard a ship in Buenos Aires when he learned from the butcher that the expedition ship was looking for a cook. He obtained leave, went aboard the Endurance, and was engaged after an interview.

After the expedition left the Endurance and camped on the ice Green had to cook his first meals on a stove made from an oil-drum mounted on three boat hooks. It was precarious and only moderately efficient, and not many days after the men had left the ship it lost them a good meal of Irish stew.

Green recalled nearly 20 years before his death how 28 tins of Irish stew were rescued from the Endurance in a case. A pound tin was distributed to each man, and Shackleton told them the cook would heat it up. Green put the tins into the ash bucket, made a good fire on the ice with wood, blubber, and petrol, and a tin can underneath. But

just as he shouted out "Hoosh-O" the bottom fell out of the bucket, and the men lost their Irish stew.

They ate raw meat for a day or two until Green was provided with a better stove. It was made from the ship's ash chute with an oil-drum for the fireplace, and a chimney made of biscuit tins. The ship's wheel-house was put up with sails and tarpaulins on spars to form a galley and storehouse.

Ocean Camp, the Weddell Sea party's first home on the ice, was a mile and a half from the Endurance. Conditions for cooking were not so bad, and Green was able to provide meals far better than those he had to prepare at Patience Camp and on Elephant Island. December 22, 1915, was celebrated as Christmas Day, and once the sledges were loaded for the journey to Patience Camp the next day, the remaining stores were free to all, and Green's menu included ham, sausages, jugged hare, peaches, and baked beans.

TOUGHER CAMP

Patience Camp was tougher. Green's galley was four oars pushed into the snow with an old sail strained round them. He cooked in high winds and freezing temperatures over a portable stove improvised from two oil-drums and scraps of metal. His menus on New Year's Day, 1916, included seal steak for breakfast, flour and water pancakes fried in seal blubber for dinner, and stewed seal meat for supper.

But during the next three months while Patience Camp on its ice floe drifted in the Weddell Sea meals became less satisfying. There were few luxuries except on special occasions. One of these was Leap Year Day when Green was able to produce notable meals—seal steak and onions for breakfast, a flour and dog pemmican bannock fried in blubber for lunch, and penguins' kidneys and Irish stew for supper.

Captain Frank Hurley, the expedition's photographer, refers in his book, "Argonauts of the South", to Green, our capable cook, who continued his duties, undaunted, at Patience Camp. He says that Green's never-ending activities among the flying blubber soots gave him the appearance of a merry chimney sweep who had not washed for months.

ON DRY LAND

After the gruelling journey in the boats, suffering agonies of thirst and cold, and existing on uncooked dog pemmican, the party reached Elephant Island, and there Green was able to cook on dry land. But conditions in the hut made with walls of stone and a roof contrived from two of the boats, the Stancomb-Wills and the Dudley Docker, were even worse than on the ice.

Green did his cooking outside at first but then the cooking stove was rigged inside the hut because enough shelter could not be provided. His cooking was done in twilight gloom, and in an atmosphere of soot, smoke, and the fumes of improvised tobacco.

Commander Worsley describes the scene in his book, "Endurance" in these words: "As the cook, Green, attended to his job, great volumes of black, greasy smoke would pour out and almost stifle the poor wretch. Every two or three minutes he would rush from his 'galley', which consisted of a small sail spread from the rocks to some packing-cases, coughing and gasping, and wiping the tears from his eyes. Long before the meal would be ready he would resemble a very shiny darkie. Wonderful to relate, the grin never left his face."

When Shackleton's 22 men were first marooned on Elephant Island, the indomitable Green showed signs of a breakdown and was relieved temporarily by Hurley. But he recovered and resumed cooking. His soups may have been thin, and there were often strange ingredients in the penguin hooshes, but the men kept healthy because there was so much fat in their diet. They were able to eat thin slices of raw blubber and drink penguin oil without revulsion.

On Midwinter Day, June 22, Green produced a memorable meal—at least to those who ate it. Earlier Hurley had captured a sea elephant which contained 30 undigested fish. These preceded the poultry course which consisted of gulls that had been snared with thread.

And the best dish of all was Green's pudding—12 mouldy nut food bars, 20 mouldy biscuits, and four mouldy sledging rations, all boiled together.

Despite the privations of the boat journey and Elephant Island Green never lost his ambition to go south again. He accepted at once when Shackleton invited him to join the 1921-22 expedition. The original plan was to explore the Beaufort Sea, and Green wanted to be the only cook who had crossed both the Arctic and Antarctic Circles.

When the Quest sailed south one of the crew was a 17-year-old Boy Scout from Aberdeen, J. W. S. Marr, who later had a distinguished career as a scientist in the Antarctic. Young James Marr was steward, stoker, and able seaman in turn aboard the Quest. He recalls in his book "Into the Frozen South" how Green, "an enterprising man who thoroughly revelled in his job," was able to produce meals even when gales washed out the galley fire, and the floor was knee-deep in greasy brine.

An American writer has claimed that the little cook had no sense of humour. Marr disagrees, and offers the evidence of Worsley's birthday. Green produced a noble cake for the occasion, iced to perfection and inscribed with an insulting motto. Worsley was given a boarding axe and instructed to cut the cake.

Worsley did his best but the cake resisted his efforts. Green had carefully iced a 56lb sinker belonging to the Quest's sounding machine.

Edward Wilson watercolours

Four Antarctic watercolours painted by Dr Edward Wilson on Scott's last expedition in 1910-12 have been published in facsimile for sale to the public by the Scott Polar Research Institute. These paintings in full colour have been published because of requests by numerous admirers of Wilson's work, who have been inspired by the reproduction of some of his finest paintings in his Discovery and Terra Nova diaries.

The Scott Polar Research Institute has in its possession the largest single collection of Wilson's paintings and sketches. It has selected four which have been reproduced in facsimile by the collotype process on sheets each measuring 22.5cm by 32cm. The paintings are: "Iridescent Clouds," "Hut Point from the top of Observation Hill," "Paraselena," and "Looking North in McMurdo Sound."

Overseas admirers of Wilson's work who wish to purchase single copies of the facsimiles or the set can order them from the Scott Polar Research Institute, Lensfield Road, Cambridge CB2 1ER, England. Cheques should be made payable to the University of Cambridge.

The cost of each facsimile to overseas customers is £2, and of the complete set £6. They should add 67 pence to the order for surface mail. Packing and air mail postage to New Zealand and Australia costs £2.65p, and to the United States and Canada £2.10p.

R.N.Z.A.F. SUPPLY FLIGHTS

Royal New Zealand Air Force Hercules aircraft of No. 40 Squadron began flights from Christchurch to McMurdo Station last month in support of the United States airlift of men and supplies to the Antarctic. Seven flights will be made this season, the last on December 8.

Last season the R.N.Z.A.F. made 10 flights in Operation Ice Cube. The number has been reduced this season to cut down flying hours and conserve fuel. The first flight south was on November 27, and others on which material for the New Zealanders at Scott Base was carried also, were on November 28, 29, December 2, 4, 6 and 8.

ANTARCTIC BOOKSHELF

Writers continue to find material for books in Antarctica. This year has been marked by the appearance of at least five books about the continent, its natural history, and explorers and scientists who have sought to unlock its secrets.

Captain Scott has been the subject of another study, an American naturalist has written of the birds of the Southern Ocean, and the ice birds, and a history of Ross Island has been produced by an American author and critic. Some of the books have relied more on pictures than words, and the authors have discovered photographs of past expeditions which have not been published before.

Of all the photographers of the Antarctic one man stands supreme today although his pictures were taken more than 60 years ago. He is Herbert George Ponting, official photographer on Scott's last expedition. The pictures he took under extraordinary conditions with almost primitive equipment have become classics. Few have been matched by modern photographers in the Antarctic.

More of Ponting's work appears in a new book, "Scott's Last Voyage Through the Antarctic Camera of Herbert Ponting." The book has been edited by Anne Savours, who was also the editor of Dr Edward Wilson's diary of the Discovery expedition of 1901-04.

Some of the photographs have been reproduced in an English Sunday newspaper's magazine. One of particular interest to New Zealanders is of Thomas Clissold, the expedition's "excellent cook," who came back from the Antarctic to live and die in New Zealand.

Tom Clissold is shown in the kitchen of the hut at Cape Evans rolling out his pastry for rhubarb pies. On the table are two pies ready for the oven, and some open tins of Frank Cooper's rhubarb (presumably the Cooper of Oxford marmalade fame). Against the wall of the hut is a box of Fern Leaf butter, a popular brand in New Zealand many years ago.

The birds of the Antarctic and the waters around the continent are vividly described in "The Sea and the Ice. A Naturalist in Antarctica." The author is Louis J. Halle, well known in the United States as a nature writer and an amateur specialist on seabirds.

Mr Halle travelled south in the Coast Guard icebreaker Staten Island from Wellington in 1970, and saw much of the work of scientists in Antarctica. The Staten Island called at Campbell Island and Cape Hallett, and Mr Halle also visited Scott Base, Vanda Station, and the historic huts at Cape Evans and Cape Royds. Later he flew to the South Pole and Byrd Station.

Captain Scott's complex character is examined in "Captain Scott and the Antarctic Tragedy" by Peter Brent. It is one of the series, Great Explorers, the general editor of which is Sir Vivian Fuchs, and is illustrated with 100 black and white pictures, and 16 pages of colour plates. Ian Cameron, who wrote the story of Magellan in the Great Explorers series, has written also "Antarctic—the Last Continent," which contains many previously unpublished prints and colour photographs.

"Edge of the World. Ross Island, Antarctica" is a personal and historical narrative by an American critic, Charles Neider, who has edited an anthology of Antarctic literature, and written a pocket historical guide to Ross Island. The book deals exhaustively with the Scott and Shackleton expeditions, and has detailed descriptions of the huts at Cape Evans and Cape Royds as they are today.

Mr Neider also writes of United States activities, and his personal experiences on two visits, including the crash of a helicopter in which he was a passenger near the summit of Mount Erebus. His book is distinguished by its 15 excellent maps, and 33 of his own colour photographs.

"ANTARCTIC"

is published quarterly in March, June, September, and December. It is the only periodical in the world which gives regular up-to-date news of the Antarctic activities of all the nations at work in the far South. It has a world-wide circulation.

Yearly subscription for non-members of the Antarctic Society NZ$3.50. Overseas NZ$4.50, includes postage (air mail postage extra), single copies $1.00. Details of back issues available may be obtained from the Secretary, New Zealand Antarctic Society (Inc.), P.O. Box 1223, Christchurch, New Zealand.

Overseas subscribers are asked to ensure that their remittances are converted to New Zealand currency.

The New Zealand Antarctic Society (Inc.)

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

The society has taken an active part in restoring and maintaining the historic huts in the Ross Dependency, and plans to co-operate in securing suitable locations as repositories of Polar material of unique interest.

There are two branches of the society and functions are arranged throughout the year.

You are invited to become a member, South Island residents should write to the Canterbury secretary, North Islanders should write to the Wellington secretary, and overseas residents to the secretary of the New Zealand Society. For addresses see below. The yearly membership fee is NZ$3.00 (or equivalent local currency). Membership fee, including "Antarctic", NZ$5.00.

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Printed at the Raven Press, 241 Cashel Street, Christchurch