ANTARCTIC

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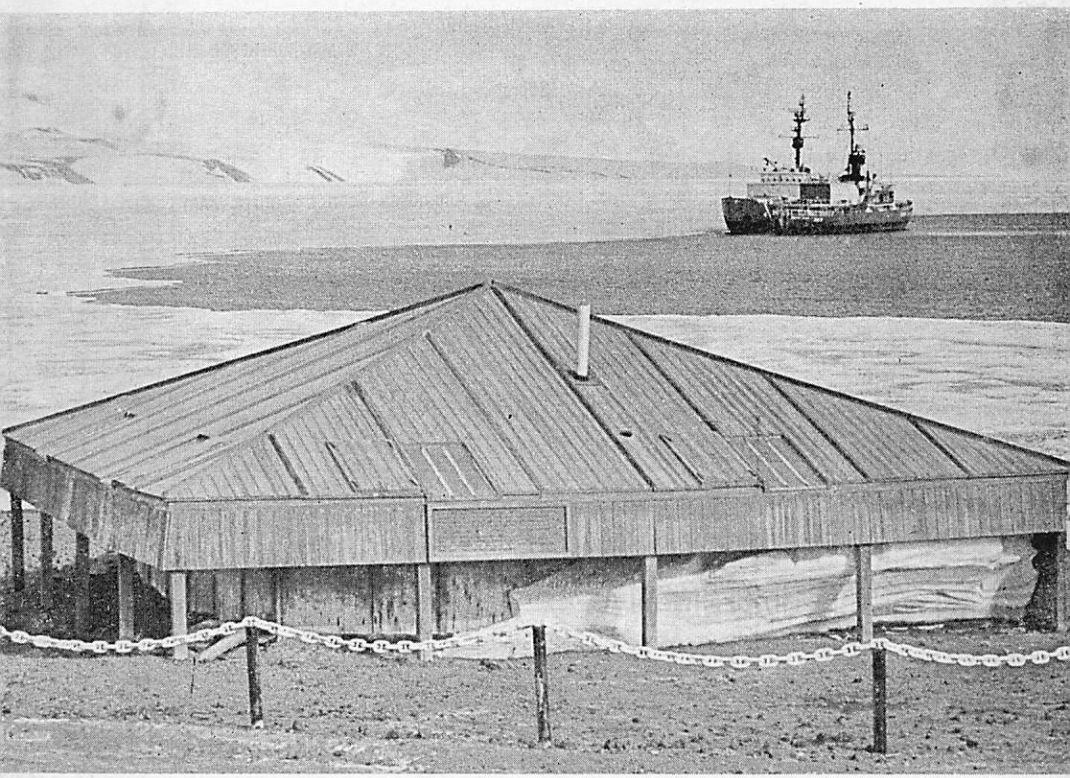

THE DISCOVERY HUT, ERECTED FOR SCOTT'S FIRST EXPEDITION IN 1901-1904, DOES NOT APPEAR TO HAVE AGED EXTERNALLY IN THE LAST 75 YEARS. BEYOND HUT POINT AND WINTER QUARTERS BAY ARE TWO REPRESENTATIVES OF THE MODERN AGE OF ANTARCTIC EXPLORATION AND RESEARCH —THE UNITED STATES COAST GUARD ICEBREAKERS GLACIER AND BURTON ISLAND.

Antarctic Division Photo: Neville Peat

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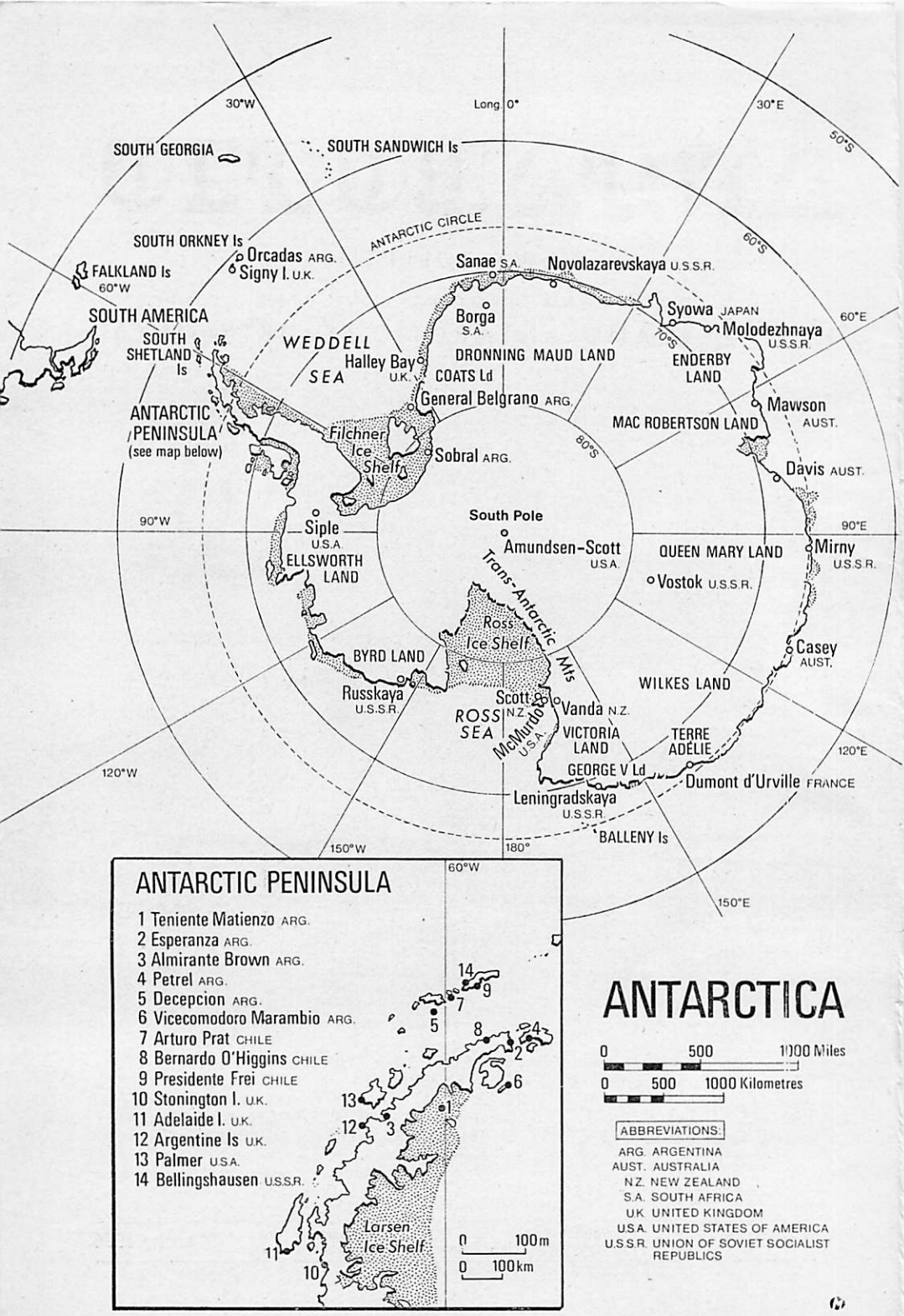

ANTARCTICA

0 500 1000 Miles

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ABBREVIATIONS:

ARG. ARGENTINA
AUST. AUSTRALIA
N.Z. NEW ZEALAND
S.A. SOUTH AFRICA
U.K. UNITED KINGDOM
U.S.A. UNITED STATES OF AMERICA
U.S.S.R. UNION OF SOVIET SOCIALIST REPUBLICS

"ANTARCTIC"

(Successor to "Antarctic News Bulletin")

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Address all contributions to the Editor.

CONTENTS

For some time now, "Antarctic", like many other publications, has been faced with the problem of rising costs. The last increase in subscription rates was made in 1971; it has since been absorbed by production and distribution costs.

Higher postal rates, both internal and overseas, and other costs, have compelled the New Zealand Antarctic Society to increase the cost of subscriptions to the bulletin, beginning with this issue.

Fees for membership of the society have also been increased in some categories. Full details of the changes are printed inside the back cover of the bulletin.

NEW ZEALAND SEASON

SCOTT BASE TO POLE AND WILKES LAND

New Zealand's reduced Antarctic research programme for the 1975-76 season ended early last month when the last five of the summer support staff at Scott Base returned home in the United States Coast Guard ice-breaker Burton Island. Now 13 men—11 at Scott Base and two at the South Pole—remain to await the spring flights of the new season.

Although the programme had to be reduced only a month after the start of the season because of the United States Navy's support force being left with only two Hercules aircraft for support operations, additional efforts were made, and more was accomplished with fewer people. New Zealand scientists made a geological survey of the Skelton and Koettlitz Glaciers region, monitored seismic activity at the summit of Mount Erebus. and discovered an unmapped lake in the dry valleys. A summer support team made the first ascent of Mount Discovery in 15 years, and for nine weeks the New Zealand flag was flown at Dome C, the ice dome in Wilkes Land, 1100km from McMurdo Station, where one New Zealander assisted the Americans to recover two of the three Hercules aircraft stranded on the Polar Plateau.

Fifty scientists and support staff were involved in the events of the four-month programme, mainly in the McMurdo Sound region. In addition New Zealnad drillers and scientists co-operated with United States and Japanese scientists in the first attempt to drill into the seabed sediments of McMurdo Sound from a drilling platform on the annual sea ice. More than 20 men kept Scott Base running, and four maintained Vanda Station for three months.

RECENT ACTIVITY

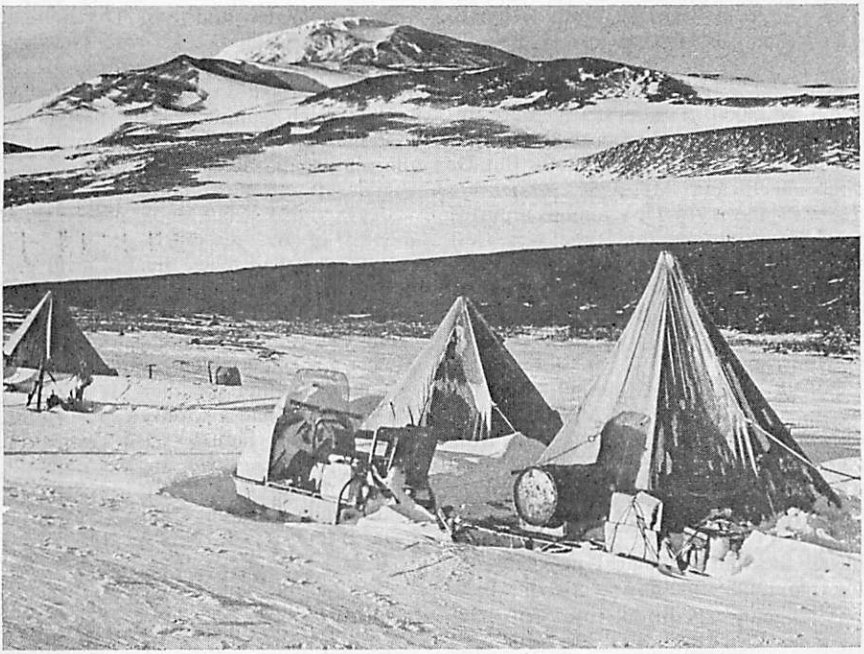
Evidence of fairly recent volcanic activity was found by the geological expedition which spent 77 days at 14 different locations studying the little-explored region of the Skelton and Koettlitz Glaciers in Southern Victoria Land about 160km south-west of Scott Base. The last geological study of the region by New Zealanders was made in 1957-58 by members of Sir Edmund Hillary's section of the Commonwealth Trans-Antarctic Expedition.

Using sledges and motor toboggans, two members of the New Zealand Geological Survey, Dr D. N. B. Skinner and Mr B. C. Waterhouse, and two field assistants, Messrs G. G. Brehaut and K. R. Sullivan, spent more time in the field than any of the 13 summer field parties. United States Navy helicopters flew the party and its gear to the base camp in the Cocks Glacier, which feeds into the Skelton Glacier. They also made other support flights, and evacuated Dr Skinner early in December for a week's rest at Scott Base when he injured a thigh muscle in a sledging accident on the Skelton Glacier.

YOUNG VOLCANOES

Dr Skinner's party came across some quite young but now dormant volcanoes in their survey, one cone being not more than a few hundred years old. A belt of copper mineralisation was discovered in the cliffs of Teall Island, near where the Skelton Glacier empties into the Ross Ice Shelf, and the party returned to Scott Base with 2000 rock samples for shipment to New Zealand.

High winds were experienced on all but two of the first 20 days in the field,



Mount Discovery, a 2745m volcanic cone, 64km from Scott Base. Six men from the base reached the summit on New Year's Day this year. They were the first New Zealanders to make the ascent in the last 15 years. In the foreground is the party's base camp.

Antarctic Division, D.S.I.R. Photo. Neville Peat

and glacier travel with the sledges was hampered by crevasses and sastrugi. But the party was able to mark New Year's Eve by climbing Mount Cocks (2400m) and Dr Skinner made good use of the time when blizzards kept the men tent-bound for days at a time. With the aid of a tape recorder he rehearsed for the baritone role of Guielemo in Mozart's opera, "Cosi Fan Tutti", which he played in Auckland this month. On some days he sang for two or three hours. His tentmate, Mr Sullivan, admitted later he did not find the singing unpleasant.

LAVA LAKE

Mount Erebus is one of only three active volcanoes in the world with lava lakes at the summit. The New Zealand expedition, led by Mr C. C. Monteath, which spent eight days at the summit recording seismic activity on film, sound tape and seismograph, found that the lava lake is getting larger.

Pools of molten lava were first noticed in the inner crater of the 3800-metre volcano 40km north-east of Scott Base during the 1971-72 season. Since then the pools have expanded into a lake which was about 75m in diameter when measured last season.

With Mr Monteath, an Antarctic Division field officer, were Dr W. F. Giggenbach, a geochemist from the Chemistry Division, DSIR, a geologist, Mr P. R. Kyle, of Victoria University of Wellington, and a surveyor, Mr W. F. Wicks. They experienced temperatures in the summit area of about minus 30deg Celsius, and breezes which made work difficult. Becaues of the altitude they could work only five hours a day,

and needed at least 12 hours' sleep to function effectively.

FEWER TREMORS

Up to 3000 tremors daily were recorded by the expediton's seisimographs during its stay on the mountain. But Dr Giggenbach and Mr Kyle ,who were there in the 1974-75 summer, reported that the eruptions this time were less frequent. Mr Monteath and Dr Giggenbach climbed down to the main crater floor, but did not attempt to enter the inner crater, which is part-covered by swirling lava.

Before going to Mount Erebus the party acclimatised on Mount Terror (3230m), an extinct volcano, and Ross Island's second highest peak. The men, who were flown from one summit to the other, camped for four days near the summit of Mount Terror, and completed the first geological inspection of the mountain for a number of years.

A six-man expedition from Scott Base marked the New Year by climbing Mount Discovery, a 2745m volcanic cone 64km south of the base. The main aim of the expedition, headed by the deputy leader at Scott Base, Mr W. B. MacDonald, was to explore the area with a view to its possible inclusion in future reserach programmes. Rocks were collected for analysis, and samples of algae and lichen from the mountain's lower slopes.

Using motor toboggans and sledges to reach a base camp near sea level, and about nine miles from the summit, the party took 13 hours to reach the top. The expedition was also an exercise in search and rescue without the support of United States Navy helicopters.

NEW LAKE

An unnamed lake was discovered by the field party which made the annual glaciological and hydrological study of the dry valleys. The lake, 3km long, and covered by ice, is by the Miller Glacier in the Upper Victoria Valley about 136km north-west of Scott Base.

Mr T. Chinn, leader of the team frim the Water and Soil Division of the Ministry of Works and Development, reported that the nature of the ice on the lake would indicate that it melted each summer. His party, the first into the field last season, measured the mass balance of seven glaciers and the levels of nine lakes in the dry valleys, a task whch took nearly three months of the season.

After he had been in the field for seven weeks Mr Chinn had some pleasant news. He was told by field radio from Scott Base that he obtained a Master of Science degree in glaciology geology. Another member of the team, Mr G. Craig, had a windfall of a strictly non-scientific nature. He won the traditional sweepstake on the date the waters of the Onyx River top the weir near Vanda Station, 120km from Scott Base in the Wright Valley.

SUMMER FLOW

Fed by melt water from the lower Wright Glacier, the Onyx—Antarctica's only real river—starts as a trickle on its annual 30km journey to Lake Vanda. Its arrival at the weir marks—symbolically—the advent of summer in Antarctica. It was three days later last season, and the men at Vanda Station began their summer at the weekend of December 13-14.

FISH FOSSILS

Fish fossils more than 300 million years old, petrified plants, and a thick seam of high-grade coal, were among the discoveries of two women geologists who spent four weeks in the field collecting specimens in Southern Victoria Land for the Canterbury Museum's new Antarctic Centre. Mrs Margaret Bradshaw, the museum's geologist, and Dr Susan West, a British geologist with the Antarctic Division, collected 360kg of rocks and fossils representative of the region.

Accompanied by field assistants for most of the time, the two geologists who were among the five women to work with the New Zealand programme last season, camped as high as 3000m and recorded temperatures down to minus

28deg Celsius while collecting from five locations in the Trans-Antarctic Mountains. When they camped at Carapace Nunatak they were further from Scott Base than any other New Zealand expedition last summer.

Their remotest camp is 200km northwest of Scott Base. It is a unique locality because it is the only place on this side of the Antarctic Continent where sediments of Jurassic age (170 million years) are found. Some are pond sediments containing fossil crustacea and insects. Here the geologists found fossils of fresh-water fleas, and a type of prehistoric shrimp as well as outlines of fern-like plants.

SEAM OF COAL

A complete section of younger Beacon Sandstone rocks (which span at least 220 million years) was sampled at Mounts Aeolus and Fleming. Fossil fish remains from the Devonian period (325 million years) in the form of bony plates were found on Mount Fleming in the Aztec Siltstone formation.

On Mount Fleming a fossil "grove" of silicified tree stumps originally found by Victoria University of Wellington geologists was revisited. It included a 3m log lying where it had fallen on its side. In the same formation a 2m thick seam of high-rank coal was found beneath a local dolerite sill.

On Shapeless Mountain various Triassic plant fossils were found in the Beacon rocks, and various trace fossils (tracks and burrows left by animals) were seen in Devonian-aged sediments in other areas. On Mount Fleming some very large, obscure burrows were seen, and near the Heimdall Glacier in the Asgaard Range a different sort of trace fossil was extremely abundant.

SEAL STUDIES

After his third visit to the Antarctic Dr D. W. Featherston, leader of the Otago University team, believes he has established the link between the tapeworms that plague Weddell seals, and the fish they feed on. Dr Featherston began his study of the intestinal parasites which infest Weddell seals in the 1961-62 season at Cape Royds with the University of Canterbury biologist research unit, and continued it the next season.

Last season Dr Featherston, a senior lecturer in zoology, and a third-year student, Miss Vicky Cameron, worked on the theory that the tapeworm eggs excreted by the seals were eaten by tiny zooplankton which, in turn, were eaten by the fish on which the seals fed. This theory was confirmed by microscopic examination of the zooplankton called amphipods, and the insides of fish caught by Dr Featherston and Miss Cameron through holes in the McMurdo Sound sea ice close to Scott Base.

For three weeks the two scientists caught fish by handline and set trap, working in a heated hut positioned over a hole cut through the 2m-thick sea ice. They found larval stages in the fish, and also the amphipods, which confirmed the host relationship.

NINE BLACK COD

Next season Dr Featherston hopes to extend the study. But he would like to have a motor on the winch which hauls up the set trap from the seabed. Last season he had to wind in 400m of wire rope by hand—1350 turns on the winch.

Another contribution from Otago to scientific research in Antarctica was made by nine black cod, distant relatives of the Antarctic cod (Dissostichus mawsoni). They were used by an American biologist, Dr A. DeVries, of the Scripps Institution of Oceanography, in his study of the adaptation of Antarctic fishes to sub-zero water temperatures.

Dr DeVries collected the black cod from the marine aquarium at Portobello on the Otago Peninsula late in 1975. They were flown to McMurdo Station, and held in tanks for subject to low temperatures. Dr DeVries has been studying the role of glycoprotein—a kind of anti-freeze—in the bloodstream of the Antarctic cod.

REMOTE POSTS

Three New Zealanders worked far from Scott Base last season. Christchurch mountaineer, Mr E. J. Saxby, was at Dome C, 1100 kilometres away, and in a camp on the Polar Plateau 3500m above sea level. About 1325km south of Scott Base were Messrs B. V. Maguire and R. D. Stainer, who ran the summer meteorological programme, previously an American responsibility, at the Amundsen-Scott South Pole Station.

In November last year Mr Saxby was one of the party which set up the salvage camp at Dome C for the recovery of two stranded Hercules aircraft. He was there for nine weeks altogether, his task being to advise the Americans on snowcraft and high-altitude survival. Mr Saxby took a New Zealand flag to Dome C, and it flew at the camp with the Stars and Stripes until the end of the project.

For his part in the recovery of the two aircraft Mr Saxby was awarded the United States Antarctic Service Medal. This medal is rarely awarded to civilians, or to foreign nationals.

HONOUR SHARED

Of the two New Zealanders at the South Pole, Mr Stainer worked there only for the summer. Mr Maguire, who was to be the first New Zealander to winter at the Pole, has now been joined by Mr B. J. Potter, a radio technician, who will share the honour.

Far to the north are the other New Zealanders—three technicians, three maintenance men, two Post Office staff, a cook, and a dog-handler, led by Flight Lieutenant H. D. Raynham. Messrs G. Eames (fitter-mechanic) and M. Wing (dog handler) replaced Messrs A. MacGibbon and C. S. Chapman in the original winter team. Messrs Wing and A. J. Dawrant (radio technician) have wintered at Scott Base before.

Budgies, parrots, and canaries

Phil, the pet budgerigar at the Australian Antarctic station, Davis, who died on September 12 last year, may have been the last of his line. His 20-word obituary in "Aurora", the ANARE Club journal, recorded that he was a resident at the station for the last five years. But he cannot be replaced—officially.

Everything was in order when Phil first went south. However, the Antarctic Treaty now prohibits any animals or plants being taken into the treaty area.

Birds have been popular pets in the Antarctic for a long time. There was a parrot aboard the Discovery on Scott's first expedition; its presence on the mess-deck in an iron wire cage caused fears that magnetic observations on the return voyage to New Zealand might be affected. And Amundsen took a canary called Nansen south in the Fram.

Four canaries and a cat shared the 1958 winter with the Japanese team at Syowa Station. There is no record of whether the cat ate any of the canaries.

Hallett Station had a budgerigar in the 1963-64 season, but its stay was short. A New Zealand technician, Mr Neville Green, took the bird south on October 25, 1963. The bird was then five weeks old, and Mr Green hoped to teach it to talk during the 1964 winter. But on March 6, 1964, fire destroyed most of the station. Mr Green managed to rescue his pet.

South Africans at Sanae on the coast of Queen Maud Land, also had a fondness for birds. A budgerigar called Piet celebrated his fourth year at the base in the winter of 1965, and J.J., a non-talking parrot, was there at the same time.

This silent parrot was named after J. J. La Grange, the first South African to reach the South Pole. "Hannes" La Grange was with Sir Vivian Fuchs on his trans-Antarctic journey. A meteorologist from the Weather Bureau in Pretoria, he later became the first leader at Sanae.

Second McMurdo Sound drilling project awaits agreement

A drilling programme for the 1976-77 season which would provide for the completion of the scientific objectives of the Dry Valley Drilling Project by drilling another hole in the seabed sediments of McMurdo Sound awaits agreement by the scientific organisations of the three nations involved—the United States, New Zealand, and Japan. At present New Zealand and Japan are in favour, and an announcement is expected soon from the United States.

Originally, the Dry Valley Drilling Project was designed to obtain a better understanding of the Cenozoic geological history of the McMurdo Sound area. The final stage of the project, which has involved drilling at 14 sites in the dry valleys of Southern Victoria Land, and on Ross Island, was to drill into the seabed of McMurdo Sound from a drilling platform on the annual sea ice.

Scientific support for more drilling in Antarctica as a means of solving geological problems, and another drilling programme in the next summer season, was expressed at the second Dry Valley Drilling Project seminar, which was held in Wellington from January 13 to 15. It was convened by Dr P. J. Barrett, director of the Victoria University of Wellington Antarctic research centre at the request of the DVDP international board of co-ordinators. A third seminar will be held in Japan next year.

This seminar, like the first held in Seattle in 1974, was designed to serve as a forum for the presentation of scientific papers, and operational and logistics data, and to consider future drilling operations in Antarctica. Seventy-one scientists, support staff, and admnistrators from New Zealand, Japan, and the United States took part, and 29 scientific papers on the geology and character of the McMurdo Sound area or drill core materials were presented.

The most interesting scientific data came from a series of papers that dealt with the analysis of the core taken from the Taylor Valley and Ross Island. According to the geologists who analysed the core from the Taylor Valley, these rocks indicate that the valley was a deep fjord during the Miocene period (11 to 25 million years ago), and that the sediment deposited in the fjord was then uplifted during a period of mountain building, the sea level later fell, and the old sediment was subjected to glacial erosion by a grounded ice sheet that existed in the Ross Sea.

EROSION PROCESS

During Mid-Pliocene time (about 6 million years ago), shallow water sediments were deposited in Taylor Valley, and again eroded by a grounded ice sheet. During the Pleistocene period (up to 1 million years ago) the mouth of the valley was occupied by ice that eroded sediments deposited during open water phases.

Analysis of core materials from the three holes drilled in the volcanic rocks of Ross Island on Hut Point Peninsula indicates that the commonly-accepted model used to describe the distribution and abundance of volcanic rocks of oceanic islands is incorrect. It will have to be reformulated in light of the DVDP borehole data.

Analyses of the cores have also contributed to a better understanding of these rocks in the Ross Island area. Their study will contribute to our basic understanding of the mechanisms that produce these rocks, and therefore will have an important impact on the science of petrology and geology.

UNIVERSITY OF CANTERBURY

Studies of water bears and penguins at Cape Bird

By
DONALD S. HORNING

Penguin rookery counts, skua band recordings and territory mapping, water bear studies, springtail collections and station maintenance were the highlights of the four-week programme of the University of Canterbury Antarctic Research Unit Expedition 14. Because of the reduced New Zealand Antarctic programme the expedition included only two of the original five members.

Mr Paul Sagar, who returned to Antarctica for his fifth consecutive season, and I arrived at McMurdo Sound on November 20. We opened the Cape Bird station on November 22 and found it to be in good condition.

The yearly Adelie penguin count was 36,136 occupied nests. This is only 110 nests fewer than the 1974 count. There have been increased collecting demands in the Cape Bird study colonies, and our goal was to draft guidelines for collecting penguins with the least disturbance to the colonies. A team from Sea World, and the Scripps Institution of Oceanography, California, collected 43 penguin pairs for research purposes before we arrived at Cape Bird.

All rookery maps were updated and 47 banded Adelie penguins were recorded. A long-term Adelie chick banding programme for the middle rookery also was designed.

SKUA BANDING

McCormick skua territories were mapped in the northern rookery and 125 bands were recorded. Some of these birds were banded at Cape Crozier and are seven to eight years old. Others were banded at Cape Bird, and some are more than 10 years old. Unfortunately, we could not band the skua chicks this year to maintain the known-age banding programme.

Tardigrada, or water bears, are microscopic aquatic invertebrates that are found in many land and sea habitats. The short (0.2-0.8mm long) cylindrical body has four pairs of stubby legs ending in claws or paddles, and the mouth has a pair of sharp stylets used in feeding on mosses, lichens, algae, and microscopic animals.

Water bears have no respiratory or circulatory organs. Their common name is derived from the rolling gait as they walk, which is reminiscent of the Northern Hemisphere black bears.

COLD RESISTANT

Tardigrades live in plants and other places that are subject to drought and cold, and they have evolved adaptations for survival under extreme conditions. Many species form a cyst which becomes egg-shaped and immobile. In this dried state, tardigrades become resistant to drought, cold, heat and various chemicals. Dried Macrobiotus cysts have survived 20 months in liquid air (—190 to —200° C), but died after 22 months at that temperature.

James Murray found five species of water bears living in algae and mosses at Cape Royds and the Strand Moraines during Shackleton's 1907-1909 expedition. There had been no other work

on them in the Ross Sea area until I made collections in 1970 and 1975.

During these summers algae and mosses were taken from Capes Bird, Crozier, Evans and Royds, on Ross Island and Cape Hallett, Blue Glacier, Suess Glacier, the Strand Moraines, and Lakes Bonney, Fryxell, and Vanda on the mainland. Several additional species were found, and a manuscript is being prepared that will describe and illustrate these animals.

NEW TECHNIQUES

Collembola, or springtails, are the only insects found in the Ross Sea area. They are jet black—an adaptation for absorbing solar radiation. They are common in moss patches where they feed on moulds such as Penecillum.

Two life history studies were done in 1968 and 1969 on Gomphiocephalus hodgsoni, and some of the results were conflicting. The main problem was not being able to differentiate instars or age classes of the immature insects.

We made a large collection of springtails at Cape Bird and will use new techniques to help resolve these differences. The techniques will involve an analysis of internal head structures and the use of the scanning electron microscope.

Painting, inventories, and an extensive clean-up of the penguin study areas and around the huts took a large share of our time. We were able to clear out more than 1500kg of trash and equipment that was no longer needed. The Cape Bird station was closed on December 12.

We then went to Cape Royds to count the penguins and make water bear collections there and at Cape Evans. On December 13 Paul Sagar and I went to the Strand Moraines to search for algae.

The helicopter left us in the middle of a frozen lake and it took us some time to find a way to shore. The margins of the lake were melted and the ice edge was thin. Future parties should be aware of this problem.

On December 15 we and the Otago University party went to Blue Glacier, Lake Bonney, and Lake Vanda to look for water bear habitats. The south side of the Blue Glacier outlet has extensive carpets of moss. This could be one of the best terrestrial invertebrate study areas in South Victoria Land known to date.

The return trip to Scott Base was highlighted by a stop at the ice edge to observe killer whales, Adelie and Emperor penguins, and a leopard seal. It was a beautiful day, and this was a wonderful end to a most productive programme. We left McMurdo Sound about 1 a.m. on December 17 and returned to gray and rainy skies over Christchurch.

[Dr Horning, who is a senior lecturer in zoology at the University of Canterbury, led the Antarctic Research Unit expedition last season].

WINTER JOURNEY PLAQUE

A bronze plaque has been erected at Cape Crozier to commemorate the winter journey of Wilson, Bowers, and Cherry-Garrard in 1911 to collect eggs from the Emperor penguin colony. Four New Zealanders of the winter party at Scott Base travelled 130km on the round trip, using two dog sledges and a motor toboggan.

The party, which returned to Scott Base on March 3, took six days to make the round trip, travelling in indifferent weather, and in temperatures which dropped as low as minus 36deg Celsius. Deep snow hampered the sledging, and at one stage a motor toboggan with the dog teams was used to lighten their load. But the toboggan broke down short of the base, leaving the dogs to complete the journey.

The dog-handler, M. Wing, led the party. It included the Scott Base leader, Flight Lieutenant H. D. Raynham, C. Mills (technician) and G. Eames (dog-handler/mechanic).

UNIVERSITY OF WAIKATO

New evidence on Labyrinth valleys development

Research into the nature and origin of the Labyrinth in the Upper Wright Valley by the University of Waikato Antarctic research expedition in the 1975-76 season has produced another theory on how this system of valleys has developed in the past. In this report Dr T. R. Healy, leader of the expedition, explains the theory he and Dr J. Shaw evolved from their field work.

Because of loss of the third Hercules aircraft on Dome C. early in November our original party of six men was cut to only two. Our original programme was, of necessity, modified to enable us to complete as much work as possible within the short time allowed.

We travelled to the ice on November 17 and within only 20 hours had been transported into the field. Our major field research during the five weeks we were in the field centred on the following areas:

(1) Channel Morphology, bedforms and sediments of the Onyx River: The Onyx River geomorphology has not previously been investigated in detail. We surveyed eight cross sections to illustrate the variation in channel and bank-morphology from the mouth of the Onyx through to its final entry into Lake Vanda.

Special notice was taken of the terrace formations at each site. In addition, at each site the channel slope was surveyed for some 200m, and samples of fine bedload collected for subsequent laboratory analysis. The coarse bedload was sampled in the field both in the channel and on the terraces, using the Wolman method.

The main set of field measurements were achieved by having a helicopter for a 12-hour day. It transported us down valley in 8km jumps. Acknowledgment is made of the use of two D.S.I.R. field assistants for this day.

ONYX RIVER

Most of this work was done early in the season before the Onyx River flowed. We returned to the Onyx after it was flowing to investigate the actual bed forms as indicators of bedload transport.

(2) Nature and Origin of the Labyrinth, Upper Wright Valley: The Labyrinth is a unique area of geomorphology cut in a broad sill of Ferrar dolerite, and is somewhat similar to the "scablands" of Washington State. Its origin has previously been the subject of a number of papers. The theories include:

(a) Gunn and Warren attributed the Labyrinth valleys to subglacial dissection of the dolerite sill;

(b) Catastrophic fluvial erosion possibly during an interglacial melting of the ice cap. (H. T. U. Smith);

(c) Normal valley glacial erosion (C. A. Cotten);

(d) A catastrophic flood caused by melting of ice beneath the nearby polar ice by active volcanic activity (Warren);

(e) Selective salt weathering working along major joint planes (M. J. Selby and A. T. Wilson).

SALT WEATHERING

There are serious objections to all hypotheses. Selby and Wilson (1971) point out major objections to the earlier

theories. Our major objections to the Selby-Wilson salt weathering hypothesis are that:

(i) Although we recognise that salt weathering does occur, our interpretation of the field evidence points to the conclusion that salt weathering is not necessarily as active in Antarctic geomorphology as its proponents claim. Indeed, our interpretations of the field evidence pointed to frost shattering as being a much more potent process of rock decay in the dolerite sill than salt weathering.

(ii) More significantly, it is quite evident that the present processes operative in the Labyrinth—including salt weathering—are acting to destroy its present character. Mass movements of block fall and creep, and solifluction, both within the individual canyon valleys of the Labyrinth, as well as from the high valley slopes of the Upper Wright Valley, are presently filling up the Labyrinth valleys with debris. According to the Selby-Wilson hypothesis the salt weathering should be acting fast enough to weather the debris and continue cutting the Labyrinth canyons.

ICE SCOURING

Our theory, evolved from the recent field work, incorporates the following elements:

(a) Evidence of classical ice scoured features such as roche moutonnees shows that ice scour has indeed taken place in the past even though the Upper Wright Glacier is presently considered to be "dry-based".

(b) There are at least five lines of Beacon sandstone erratics aligned transversely across the Labyrinth representing an Upper Wright Valley glacial advance and retreat.

(c) Geomorphic evidence suggests the main valleys are ice marginal channels which develop into an integrated proglacial drainage system influenced by the major joint systems in the dolerite.

(d) The common occurrence of hanging valleys suggests polycyclic history of Labyrinth Valley development, i.e., several sets of ice marginal channels have formed.

(3) Rectilinear ("Richter") Slope Development on the Olympus Ranges: A short visit was made to the Mount Boreas area of the Olympus Ranges. Arising from this, we have investigated the applicability of the theoretical model of slope development put forward

BIRDS FAR FROM HOME

A black-billed gull which could have been 3000km off course turned up in Antarctica early in December last year. The bird, common to the New Zealand coast, is believed to be only the second of its species to have been sighted in the Ross Sea region. The first sighting was at Cape Royds, Ross Island, eight years ago.

Appropriately the gull was sighted by two scientists from New Zealand. They were Dr D. Horning and Mr P. Sagar, who worked at Cape Bird, the University of Canterbury biological research station, 70km north of Scott Base, on Ross Island. Black-backed gulls are rarely seen south of New Zealand, and the bird sighted at Cape Bird probably lost its way in a storm.

Americans and one New Zealander working in Wilkes Land 1100km from McMurdo Station on the recovery of Hercules aircraft stranded there last season also had a rare visitor in January this year. A skua gull flew over the salvage camp established at Dome C, the ice dome on the Polar Pateau 3500m above sea level and 800km from the coast. The men photographed the visitor, and were astonished at its appearance such a long way from nowhere.

by Lehmann, and Bakker and Le Heux to the slope development in the Olympus Ranges. This paper offers some alternative conclusions on the slope development in the Olympus Ranges to those put forward by previous workers.

LAKE LEVELS

(4) Glacial Geomorphology and History of the Taylor Valley: Work started on the 1874-75 expedition on the origin of the Kame-like mounds in the vicinity of the La Croix Glacier was continued. Samples of in situ carbonate were collected with careful elevation control and site description.

The carbonate was frequently found in relation to ancient strandlines and deltas from glacial melt water streams flowing into a greatly enlarged Lake Bonney. Thus, when results of the U-Th dating of the carbonate samples are known, we should be able to put an age on the high lake levels in the Lake Bonney Basin.

Having found plentiful carbonate in the Lake Bonney internal drainage basin we moved to the Lake Fryxell basin with the expectation that we might also find carbonate in this area. The longitudinal profile and elevations of well-preserved deltas were measured on two streams draining into Lake Fryxell. Carbonate was found in several in situ locations, and we are awaiting with interest the results of the geochemical analysis of these.

Time did not permit complete ground survey in the Canada Glacier - Lake Chad area. We hope to return during the 1976-77 expedition to cover this.

GYPSUM SAMPLES

(5) Evaporite Deposits, Geochemistry and Geomorphology, Miers Valley: A few days were spent in the Miers Valley to collect samples of gypsum for geochemical analyses. Surprisingly we also found carbonate "biscuit" similar to that found in the Taylor Valley. Thus we noted the elevations of carbonate and gypsum, also in relation to ancient lake levels and moraines. Depending on the results of the geochemical analyses, we hope we will be able to tie in the higher lake levels in the Miers Valley with the sequence of events in the Taylor Valley.

Another interesting feature was found within a terrace near the outlet of the Miers stream. Kenyte-like boulders in the terrace sequence had been deposited in a tuffaceous matrix. Apparently the boulders had been deposited on the subaqueous part of the delta at a time of higher lake level. We are hoping to have the feldspar crystals in these boulders K-A dated as well as having the glass in the tuffaceous matrix fissian track dated.

Altogether we enjoyed a scientifically successful field season. Although our party strength was weak, we undertook a very concentrated field effort and achieved as much work as can adequately be written up before next season. We hope to complete those parts of the programme originally set down for the 1975-76 season, and not completed during the next Antarctic season.

ANTARCTIC JOBS POPULAR

More New Zealanders than ever want to work in Antarctica next summer. There are about 50 positions to be filled in the 1976-77 New Zealand Antarctic research programme, and this month there were about 340 applications, including several from overseas. This was about 20 per cent more than last year.

Among the applications received by the Antarctic Division, D.S.I.R., are about a dozen from women, mainly qualified geologists. Each summer field assistants with mountaineering and snowcraft are needed in the programme, and the biggest number of applications is for this kind of work.

VICTORIA UNIVERSITY

Study of glacial deposits in Upper Taylor Valley

Two main scientific projects—study of the Late Cenozoic glacial stratigraphy of the dry valleys of Southern Victoria Land, and glacial sediment studies during the Dry Valley Drilling Project in McMurdo Sound—were part of the programme of the 20th Victoria University of Wellington expedition in the 1975-76 summer season. Six geologists were in the field for varying periods between October 13 and January 8. They were also involved in a third project—investigation of the glacio-marine deposits of Black Island and Brown Peninsula.

VUWAE20's field programmes were curtailed to finish by mid-December when the loss of a third United States Navy Hercules at Dome C in early November reduced the number of flights back to New Zealand. But later changes in the flight schedules enabled three members of the expedition to continue working until early January. This allowed completion of the full programme of the party working on the Taylor Valley glacial stratigraphy, and of another project to study the movement of the Taylor Glacier near the snout.

Dr P. J. Barrett and Miss K. J. Sillars worked with an international team of American, Japanese, and New Zealand scientists and a New Zealand drilling crew in the attempt to drill a hole into the floor of McMurdo Sound to discover when glaciation began in East Antarctica. DVDP15 was sited on the ridge between the submarine extensions of the Taylor and Ferrar Valleys, about 15km east-south-east of Marble Point, in 122m of water.

The sediments were drilled to a depth of 65m, with 52 per cent core recovery, using the annual sea ice as the drilling platform. Drilling ceased when the sea ice began to break up and the last core was recovered on November 21.

A bathymetric survey was carried out near the drill site, and bottom samples collected showed that the sea floor in that area is mainly muddy sand with patches of sponge spicule mat and a bottom fauna consisting largely of bryozoans and coelenterates.

GLACIAL DEPOSITS

The glacial deposits of the upper Taylor Valley were studied by Messrs P. H. Robinson and A. S. Palmer. using outcrop in meltwater stream beds to attempt correlation of the till deposits. It was found that the recent tills were deposited in sheets, and that the sediments change character laterally over very short distances making correlation difficult. However, in the older deposits till sheets occurred more commonly, suggesting that there has been a change in the character of deposition with time.

This investigation was extended to the Wright Valley and Cape Chocolate where recent and present deposition was studied.

Dr J. D. H. Collen and Mr A. J. Eggers found that the ice cored moraines on the north-eastern end of Black Island are apparently derived from grounding and subsequent shrinkage of the part of the Ross Ice Shelf flowing between Black Island and Brown Peninsula. Well-preserved marine fossils, which may represent a former bottom fauna living under the shelf, were collected from the west coast of Black Island.

Older fossiliferous deposits on the northern end of Brown Peninsula were

mapped and sampled to investigate the conditions of deposition. Nearby volcanic agglomerates were studied as a possible sediment source.

With the help of an Antarctic Division field assistant, a network of flagged poles was installed near the snout of the Taylor Glacier to determine the lateral and vertical movement, and the ablation rate at the glacier surface. The poles were accurately located by D.S.I.R. surveyors, and will be resurveyed next season to measure any movement that has taken place.

In spite of the early return to New Zealand of three members of the party, most of the original programme was completed as planned.

Polar diary

Next month the 10th international polar meeting will be held in Zurich under the auspices of the German Society for Polar Research. The meeting will be held at the Swiss Federal Institute of Technology from April 6 to 8.

As the main topic of discussion the society's executive committee has selected the climate and environment of glaciated regions. After the meeting delegates will make an excursion on April 9 and 10 to Grindelwald and the Jungfraujoch.

△

A Japanese marine biologist, Mr Mitsuo Fukuchi, worked last summer with Argentine scientists at Almirante Brown Station in Paradise Harbour on the west coast of the Antarctic Peninsula. Mr Fukuchi, who is a research associate at the National Institute of Polar Research, was an exchange scientist under the provisions of the Antarctic Treaty.

△

New buildings are being erected for the Japanese National Institute of Polar Research in Tokyo. Construction began in October last year, and the main building, which has 5800 square metres of floor space, will be finished at the end of this year. An annex of about 4000 square metres will be built next year.

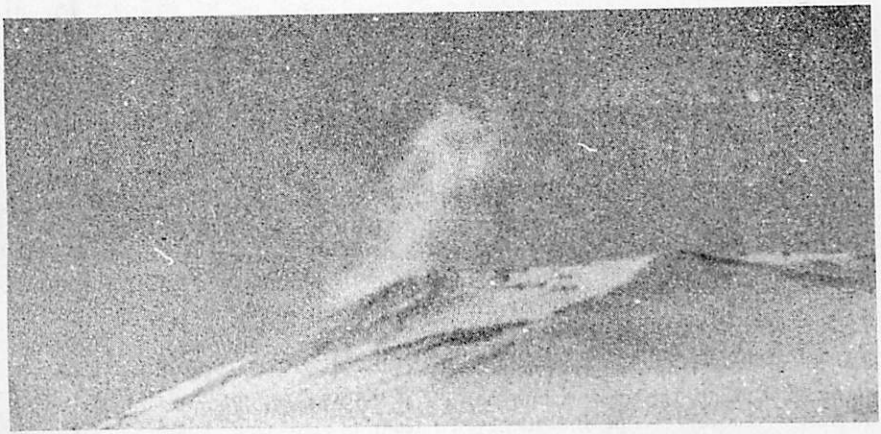
Antarctic Milk Round

Two bottles of New Zealand milk were delivered to an Antarctic research station early in December last season. They were received by four New Zealanders at Vanda Station in the Wright Valley, about 130km from Scott Base, but the delivery was far from simple. It took four eight-hour flights by a Royal New Zealand Air Force Hercules between Christchurch and McMurdo Station, and an hour's flight by a United States Navy helicopter.

Early in the season a milk box appeared at Vanda Station—with two empty milk bottles inside, and a neatly-inscribed "17A" on the outside. The Scott Base engineer, Mr E. G. R. Ramsbotham, saw the bottles on a visit to Vanda Station, and decided to play milkman. He asked the crew of the Hercules to bring two full bottles on a scheduled flight, but the milk travelled back to Christchurch the next day because of a misunderstanding.

Back the bottles came. This time they were delivered personally by Mr R. B. Thomson, superintendent, Antarctic Division, D.S.I.R., and the executive officer, who were on a routine visit to New Zealand Antarctic bases. The "milkman" flew from Scott Base by helicopter with the precious bottles.

The Vanda Station quarter had a shock. They were told by the "milkman" that the milk would cost them eight cents—and the delivery $250.



A cloud on the summit of Mount Terror, one of the two extinct volcanoes on Ross Island, which was believed to be an eruptive steam cloud. The photograph was taken with a telephone lens from Scott Base, which is about 60km away.

TERROR'S STEAM CLOUD PUZZLE

Mount Terror, one of the three volcanic peaks on Ross Island—the others are Mounts Erebus and Bird—has not been an active volcano for at least half a million years. But periodically there have been reports that the long dormant volcano appeared to be showing signs of activity again.

These reports, some from United States Navy helicopter pilots, and others from Scott Base, have been prompted by the appearance of steam rising from the top of the peak, which is 3200m high. The belief in possible volcanic activity has been strengthened by the appearance of steam rising at the same time from Mount Erebus, the only active volcano on Ross Island.

For the last four seasons the hanging cloud of what seemed to be steam has appeared above the summit of Mount Terror, and last season photographs of it were taken from Scott Base, using a telephoto lense. The puzzle was solved in December by the New Zealand team which spent eight days making seismological observations on Mount Erebus (3800m).

When the party—Messrs C. C. Monteath, P. R. Kyle, Dr W. F. Giggenbach, and Mr W. F. Wicks, flew to Mount Terror to acclimatise before going to Mount Erebus, they decided to check if there was any emission of hot gas from Mount Terror. On the side of Mount Terror opposite Scott Base they found a very large area of bare volcanic rock running from the summit almost to sea level.

Because this rock is bare and dark it produces a lot of heat in summer. When the humidity is very high the rising warm air produces a cloud at the summit. Wind currents on top of the peak give the impression that the cloud is rising from the peak.

The higher the humidity the more water vapour there is in the air for the heat from the bare rock to act on.

Now there is no need to send helicopters over Mount Terror to observe possible activity, as was done several years ago. And if Mount Bird starts steaming it is unlikely to herald an eruption. The volcano ceased activity three to four million years ago.

Two U.S. aircraft recovered from East Antarctica

Although the United States scientific programme on the Antarctic Continent was reduced by about 35 per cent in the 1975-76 season because of limited aircraft capability, all research projects which did not depend on field support were completed successfully. The ability of the United States Navy's support force to provide logistic support for the programme was severely curtailed early in the season when it was left with only two Hercules ski-equipped aircraft after a third was damaged at Dome C, an ice dome in Wilkes Land 1150km from McMurdo Station.

But in one of the most remarkable aircraft recovery operations ever attempted, the support force recovered two out of three Hercules aircraft damaged at Dome C between January and November last year. These were repaired in the field, and flown back to the United States after additional work on them in New Zealand. With only two aircraft operational, the support force also completed its usual transport of men and supplies between Christchurch and McMurdo Station, and the relief and resupply of the Amundsen-Scott South Pole Station, and Siple Station in Ellsworth Land.

When the summer season ended on February 15 with the departure of a United States Navy Hercules from McMurdo Station, 92 Americans, two New Zealanders, and one Russian remained to spend the winter in Antarctica at three winter stations. Sixty servicemen, five civilian scientists and technicians and one Soviet exchange scientist, will work at McMurdo Station under the leadership of Lieutenant E. R. G. Goepfort. They can expect mail and fresh food again early in September.

FIRST TO WINTER

Two other American winter stations are manned by civilians. There are 16 Americans led by Mr D. Horton, and two New Zealanders at the Pole Station. The New Zealand meteorologists are the first from their country to winter at the Pole. Palmer Station. on Anvers Island off the Antarctic Peninsula, has a winter team of 11. One American will have Soviet scientists as his winter companions. He is Mr R. G. Johnson, the United States exchange scientist at the remote Soviet station, Vostok, in East Antarctica.

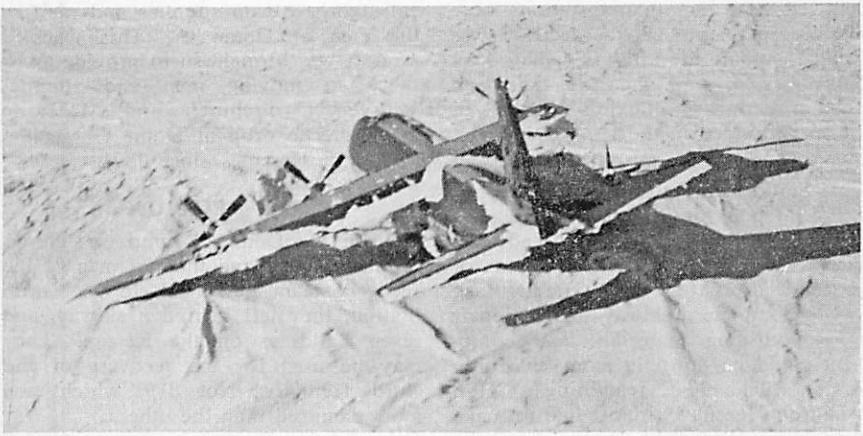
Siple Station, 2250m from McMurdo Station, at the foot of the Sentinel Mountains in Ellsworth Land, has been closed for the winter. As early as November 4 when the third Hercules was damaged at Dome C, it seemed likely that the lack of aircraft might prevent resupply of the station for the winter team of five civilian scientists.

A summer team of 12 men was flown in from McMurdo Station early in the season, but in December the team came down with gastro-intestinal ailments. In mid-December one member of the team showed signs of hepatitis.

SUMMER PLANS

On January 1 the men were evacuated to Christchurch by way of McMurdo Station. The hepatitis—a non-infectious type—was confirmed in the one man who had shown signs at Siple Station, and the others received a medical clearance. Because of the sickness, the continuing limited availability of air transport, and the lateness of the season, the station was closed for this winter. Plans are to reopen it in the 1976-77 summer.

Next season the research programme will be restored to the level planned for



This United States Navy Hercules was the most severely damaged of the two aircraft stranded at Dome C in Wilkes Land, 1100km from McMurdo Station, after takeoff accidents on January 15, 1975. No. 129, and a third Hercules, No. 320, damaged on November 4, were recovered last season. No. 319 may be salvaged in the 1976-77 summer.

U.S. Navy photo.

the 1975-76 season. Projects cancelled or deferred because of lack of field support will be continued. Finance for the National Science Foundation's programme has been reduced slightly, but this is only because of special expenditure in last year's budget, which included $18 million for two new ski-equipped Hercules aircraft—a non-recurring expense.

Support force operations will be reinforced next season by the addition of the United States Coast Guard's new icebreaker Polar Star. The Navy's VXE-6 Squadron will have four Hercules aircraft to start the season, and the two new aircraft which it will operate for the National Science Foundation are expected to be delivered in April and May of next year.

NEW ICE WHARF

For the last three seasons the supply ships have entered McMurdo Sound along the channel cut by the icebreakers, and tied up in Winter Quarters Bay at a man-made ice wharf. Towards the end of last season the wharf—a huge ice cube covered by several inches of soil—was broken up and floated out to sea.

This winter the men at McMurdo Station will build a wider and large ice wharf which is expected to last for six to eight years. Before the old wharf broke up a core was removed for analysis of the effects of ageing on man-made ice structures.

Recovery of the two Hercules aircraft damaged during attempted take-offs from Dome C, which is 3500m above sea level on the East Antarctic ice-cap, was a first priority last season, and the National Science Foundation allocated $3 million for the project. Early in November an advance party of 13 men, including a New Zealand mountaineer experienced in snowcraft and high-altitude survival, flew to Dome C in bitterly cold weather to set up a salvage camp for the recovery of one of the two aircraft stranded there on January 15 last year.

But on November 4 a third Hercules (No. 320), on a servicing flight from McMurdo Station to Dome C was damaged on take-off. Recovery plans had to be revised, and operations were

deferred until the inland stations were relieved and supplied. A decision was made to repair the aircraft damaged on November 4, and then, if time and weather permitted, the less-damaged of the two stranded in the 1974-75 summer.

Supply flights to the Pole Station and Siple Station were completed on December 5. Operations at Dome C began again on December 7 when the advance party returned after three days of acclimatisation at the Pole. The first task was to complete a skiway so that repair crews, building materials, and equipment could be flown in from McMurdo Station. The two remaining VXE-6 Squadron Hercules aircraft had to make hazardous open field landings on the rough surface of the ice-cap at Dome C to bring in equipment for completion of the skiway.

Then on December 22 a repair crew of 17 volunteers from VXE-6 Squadron flew from the South Pole where they had acclimatised, to begin work on No. 320, the last to be damaged. The job was expected to take 17 days, but in only four days the crew changed an engine and propeller, and repaired the aircraft's damaged electrical system and fuselage.

LONG JOB

Commander D. Desko and a volunteer crew flew the repaired Hercules from Dome C to McMurdo Station. Because the aircraft was unpressurised, the flight was made at low altitude, and the crew had to wear oxygen masks. After Christmas the aircraft was flown from McMurdo Station to Christchurch under similar conditions.

Repairs to Hercules No. 129 took longer. The job was completed in 16 days by a repair crew from the Naval Air Rework Facility, North Carolina. and technical experts from the Lockheed Corporation, makers of the Hercules. By January 14 the aircraft was ready for the flight to McMurdo Station. It reached Christchurch on January 19.

During the recovery operations a United States Air Force Hercules was called on to drop supplies and mail to the men at Dome C. This wheeled aircraft was brought in to provide assistance in moving men and supplies between Christchurch and McMurdo Station. The drop at Dome C was the first by a Hercules since 1971.

NO DECISION

When the Dome C camp was closed on January 18, and the last men of the recovery team flew back to McMurdo Station, they left behind a skiway, and seven buildings on the ice-cap. They may be used for the recovery of the third Hercules, No. 319, which was more damaged than the others.

Glaciological research is likely to benefit by the existence of a camp and skiway at Dome C. At present the United States, France, Australia, the United Kingdom and the Soviet Union are co-operating in the International Antarctic Glaciological Project, a study of the East Antarctic ice-cap. Their present interest is in the Dome C area, the thickest part of the ice-cap, and their objective is to retrieve at this point an ice core which will probably contain the longest paleoclimatic record ever compiled.

In the 1971-72 and 1972-73 seasons the French tried to reach the Dome C area by ground traverse with United States air support, but were foiled by rough surface conditions. The two Hercules aircraft damaged on January 15 last year were supporting a French team flown to the area to carry out shallow drilling, and develop plans for deeper drilling in the future. Core samples from the drilling, which had to be left behind after the accidents, were recovered last season.

Summer support activities continued without incident after the recovery of the aircraft from Dome C, and VXE-6 Squadron was able to concentrate on the return of scientists and support staff to the United States. The last flight to the Pole Station was made on February 11, and the last ships left Winter Quarters Bay on February 12.

Powerful new U.S. icebreaker for Antarctic operations

Next season the United States Antarctic research programme will be supported by the United States Coast Guard's two most powerful icebreakers—the new 13,000-ton Polar Star, and the Glacier, which has operated in the Southern Ocean since 1955. The Polar Star replaces the Burton Island, now due to be decommissioned after 30 years of Arctic and Antarctic services.

Two veterans of Antarctic support activities for nearly 20 years made their last voyages early last month. They were the Burton Island, and the supply ship Private John R. Towle, which first sailed south in 1956, and is now to be replaced by the Bland. Appropriately the two ships left McMurdo Sound together at the end of the summer season.

Ice-breaking operations next season are expected to be less difficult when the Polar Star joins the support force. First of the new Polar class icebreakers, she cost $53 million, and has been designed to break fast ice when moving forward at three knots. When she encounters ice which cannot be broken using diesel-electric power, her three gas turbines can produce 60,000 shaft horsepower, enabling her to steam through 12ft of ice without backing and ramming. She can tackle 20ft of ice using normal ice-breaking methods.

MIRNY VISIT

One of the veteran Antarctic icebreakers, the Burton Island, first sailed south in the 1957-58 season. She assisted in the relief of Wilkes Station (now Casey) and her crew were the first Americans to visit the Soviet station, Mirny.

In February, 1960, the Glacier and the Burton Island succeeded in penetrating the ice-bound Bellingshausen Sea. They reached the coast and made a landfall near Cape Palmer, close to the Thurston Peninsula, at the western extremity of the sea. The ships charted 120 miles of the Thurston Peninsula coastline, landing scientific parties in accessible areas, but the programme was not completed because the Glacier had to proceed to the aid of the Argentine icebreaker General San Martin. In her absence the Burton Island carried out scientific reconnaissance off Peter Island.

Two seasons later the Burton Island took New Zealand scientists to Commonwealth Bay on the George V Coast. Their mission was to determine the position of the constantly shifting South Magnetic Pole. In 1960 the Magnetic Pole was very close to Cape Denison, which is near the centre of Commonwealth Bay.

Age has finally caught up with the Private John R. Towle after 31 years. She needed hull and boiler repairs before her last Antarctic voyage, but carried 3300 tonnes of cargo to McMurdo Station, and brought back 2000 tonnes.

Launched in 1945, the Towle is the only Victory-class cargo ship still in service with the United States Navy. Her key role in United States and New Zealand Antarctic research began in 1956 when she was one of five cargo ships which carried materials for building five bases for use by United States scientists in the International Geophysical Year (1957-58).

When the Towle sailed from Lyttelton on December 10, 1956, her cargo included 800 tons of materials for building Scott Base. On her final trip she carried 26 tonnes of cargo for Scott Base, nine tonnes of it food, mostly tinned.

With a gash in her bow cut by pack ice in the Ross Sea, the United States naval tanker Maumee is ready to discharge her fuel cargo at the ice wharf in Winter Quarters Bay, McMurdo Sound. At left the icebreaker Burton Island clears a small iceberg from the bay.

Antarctic Division, D.S.I.R. Photo: Neville Peat

Since 1956 the Towle has supplied United States and New Zealand bases almost every Antarctic summer. In 20 years she has carried nearly 60,000 tonnes of cargo. During the northern summer she has supplied DEW (distant early warning) line bases in the Arctic.

SHIP'S BELL

To mark the link between Lyttelton and the Towle the Lyttelton Harbour Board presented a small plaque bearing its arms to the ship's master, Captain E. A. Lanni. From the Antarctic Division, D.S.I.R., Captain Lanni received a charcoal and wash drawing of the interior of Scott's hut at Cape Evans, done by a Christchurch artist, Maurice Conly.

When she reaches New York the Towle will be placed on what is called officially "ready reserve standby." Eventually she will be scrapped, but her bell will not go to the breakers. The ship's officers and crew presented it to the Canterbury Museum for the Antarctic collection.

Unusually heavy pack ice in the northern Ross Sea caused damage to the 25,000-ton tanker Maumee on her way to deliver 4,250,000 gallons of fuel to McMurdo Station. An 8ft gash was cut in her bow at the waterline, and increased to 20ft when she attempted to continue. But, escorted by the Burton Island, which went to her assistance, she was able to proceed at reduced speed and discharge her cargo.

When the Maumee met the heavy ice on January 22 she was about 450 miles north of McMurdo Sound at 71deg 40min S/177deg 44min E. Damage was limited to one tank containing water. She was able to move at four knots, but was halted when the pack closed about her again.

After the Burton Island reached the Maumee on January 23, the tanker steamed slowly towards McMurdo Sound. Close escort was needed at times, particularly near Cape Bird and Beaufort Island because of ice conditions, but the Maumee finally berthed at the ice wharf in Winter Quarters Bay on January 25.

When the Maumee left on January 29 the Burton Island escorted her through the ice-choked channel in

McMurdo Sound to open water. On her way through the Ross Sea pack ice with the Maumee astern the Burton Island encountered difficult ice conditions, again near Cape Bird.

To ease the pressure on her damaged bow the Maumee proceeded to Lyttelton at the reduced speed of 10.4 knots. She averaged only eight knots on the return trip, and for long periods was stopped altogether in the pack ice. Her master, Captain H. H. Church, said on arrival that the ice near McMurdo Sound was the worst he had ever experienced.

Temporary repairs were made to the Maumee after she reached Lyttelton on February 10. Shipwrights repaired holes in her deep tanks and No. 1 cargo tank. After bunkering she sailed with the gaping hole in her bow, and continued to Panama at slightly more than 10 knots instead of her usual 17 plus knots.

SHIP MOVEMENTS

Except for the damage to the Maumee, ship operations last season proceeded normally, and were not hindered by the ice conditions. The Glacier and the Burton Island cleared the ship channel through the annual sea ice in McMurdo Sound in almost record time. Favourable prevailing winds helped to clear the channel of brash ice as it was broken loose by the two Coast Guard cutters.

After supporting a piston coring project for a palaeoclimatic analysis of Ross Sea continental shelf sediments, the Glacier sailed on January 17 from McMurdo Station for Palmer Station, and the Weddell Sea to support current meter work by scientists from the Scripps Institution of Oceanography. But on January 22 Petty Officer G. E. Reilly, of Independence, Missouri, was killed in the boiler room when he accidentally touched the back of a 440-volt switch.

As a result the Glacier had to return to a position 140 miles from McMurdo Station on January 26, and Petty Officer Reilly's body was flown by helicopter to the station for return to the United States. The Burton Island acted as guard ship for the two helicopters on their long flight over water. The Glacier resumed her voyage the next day.

Before the Glacier returned, and the arival of the Maumee, the Burton Island supported longline fishing and a bottom dredging project in the Ross Sea area. She escorted the Maumee in and out of McMurdo Sound, and through the pack ice, and did the same for the Towle. Her departure in company with the Towle early last month marked the end of the summer season.

Change in U.S. Command

In the mountains of West Antarctica, near the head of the Ross Ice Shelf, at 86deg 25min S/148deg W is the Van Reeth Glacier. Last month the man whose name was given to the glacier, Captain E. W. Van Reeth, flew home from Antarctica after two years as commander of the United States Navy's Antarctic support force.

Captain Van Reeth, who was the ninth naval officer to head the support force since 1955, began his association with the Antarctic 10 years ago. He commanded Antarctic support activities at McMurdo Station, and in 1968 and 1969 was commander of the Navy's VXE6 Squadron, which has supported the United States research programme in Antarctica for the last 20 years.

In 1974 Captain Van Reeth replaced Captain A. N. Fowler as the support force commander. Before he was posted to duty in Antarctica he spent two years with the National Science Foundation as associated manager of polar operations in the Office of Polar Programmes.

Captain Van Reeth's successor also has an Antarctic background. Commander C. H. Nordhill, who is now at the United States Naval War College, commander VXE-6 Squadron in 1971 and 1972.

ANARE REPORTS

Plans for major traverse along line to Vostok

Establishment of an automatic geophysical observatory on the Amery Ice Shelf, an inland traverse from Casey towards the Soviet station, Vostok, and aerial mapping in Enderby Land, were among the projects in the 1975-76 research programme of the Australian National Antarctic Research Expeditions which ended last month. Next season a major traverse to Vostok is planned, and in 1977 a traverse along the 2000-metre contour inland from Casey to inland of the French base, Dumont d'Urville.

A new season of Australian Antarctic research began when the Danish ice-strengthened ships Nella Dan and Thala Dan left Melbourne with the expeditions for Mawson and Casey. The Nella Dan sailed early in December with the Mawson expedition under the leadership of Mr W. F. Young, senior technical officer, Antarctic Division, who led the relief earlier of the sub-Antarctic station on Macquarie Island.

On board the Nella Dan were some members of the 1976 Mawson winter party led by Lieut.-Colonel I. Teague, of Canberra, the 1976 Davis winter party, including the officer-in-charge, Dr P. A. Arriens, of Duffy, A.C.T., and the Enderby Land summer field party led by Mr D. R. Twigg, Antarctic Division.

Twenty-three men who will continue the scientific programme at Casey this year sailed from Melbourne aboard the Thala Dan early in January. The leader of the expedition was Dr D. J. Lugg, senior medical officer, Antarctic Division, and the deputy leader was Mr H. A. Williams, a technical officer with the division. Mr K. I. Chester, of Palm Beach, Queensland, will be officer-in-charge at Casey.

FOUR WOMEN

Four women members of the Antarctic Division also travelled with the expedition. Ms Elizabeth Chipman (publications officer), Mrs Jutta Hosel (photographic officer) and Mrs Shelagh Robinson (welfare officer) made the round trip; Dr N. C. Gardner joined the Macquarie Island expedition for the winter.

Women have travelled to Macquarie Island with ANARE since 1959, but this was the first visit to Casey by a group of women, the second known visit by Australian women to the Antarctic Continent, and the first time a woman had wintered with ANARE. One other Australian woman has visited an Australian Antarctic station before. Mrs Nel Law accompanied ANARE to Mawson and Oates Land in the 1960-61 summer.

Three Hughes 500 helicopters were used for ice reconnaissance on the voyage south, and for the airlift into Mawson. An Army detachment of four men assisted in the discharge of stores and bulk fuel with LARC amphibious vehicles.

FIELD WORK

From Mawson the Nella Dan proceeded to the ice edge off Enderby Land where the summer survey party disembarked to begin its programme of mapping, geology, glaciology and gravity and magnetic observations. A Pilatus Porter fixed-wing aircraft and the three helicopters, manned by civilian air crews, were used for the field operations.

From Enderby Land the Nella Dan sailed for Davis where the members of the winter party were put ashore, and the station was resupplied with stores

and equipment. The ship arrived at Fremantle late in January with the 1975 Davis winter party, and some of the 1975 team from Mawson. She sailed on her final voyage to Davis and Mawson early last month, and was expected back at Melbourne early this month.

Two Hughes 500 helicopters operated by a civilian air crew were used by the Thala Dan for ice reconnaissance on the voyage to Casey. The helicopters also transported scientists and others into the field during the changeover at Casey which was made late in January. A four-man Army detachment assisted with unloading operations, using two LARCs.

On the return voyage the Thala Dan called at Macquarie Island early last month to pick up 11 professional and technical members of the ANARE summer expedition. Also aboard was a biologist from the University of Queensland who made the round trip to study seals. The Thala Dan was scheduled to sail from Melbourne late last month on her final voyage to bring back the French summer party from Dumont D'Urville.

FUTURE TRAVERSES

Glaciological research from Casey is Australia's contribution to the International Antarctic Glaciological Project. France, the Soviet Union, the United States, and Britain are also involved in the study of the East Antarctic ice sheet.

In 1973 a traverse was made along a 300-kilometre route south from the summit of Law Dome (about 110 kilometres from Casey), reaching an elevation of nearly 2000 metres. A net of ice movement markers was established to the end of the traverse, and was resurveyed last year to provide an accurate direct measurement of the ice flow.

A major traverse is planned next season to carry the network of markers through to Vostok. This would require n air drop of 7500 litres of fuel by the United States Navy about 500 kilometres from Vostok, and the positioning of more fuel at Vostok.

Another traverse from inland of Casey to inland of Dumont D'Urville, approximately along the 2000-metre contour, is planned for 1977. As the steep coastal slopes near Dumont D'Urville, are difficult to negotiate, contour maps will be provided by the French for a study of the operation. The French are considering the possibility of sending a scientist on the Australian traverse to make surface chemistry studies.

ICE MOVEMENT

.Blizzards with winds of up to 60 knots, and temperatures ranging from minus 15 degrees Centigrade to minus 20 degrees Centigrade immobilised the spring traverse party which left Casey on October 25 to re-measure the ice movement markers along the 1973 route from the Law Dome. The traverse party of eight men in four vehicles was held up for three weeks 230 kilometres south of Casey.

Ice movement markers established around the Lambert Glacier basin in the summer of 1971-72 were relocated during 1973-74 to provide the first results of ice movement in this inland region. Last summer it was planned to establish markers from inland of Mawson to the Sandercock Nunataks, but the work was done this summer. These markers will link up with Japanese markers already in position between the Queen Fabiola (Yamato) Mountains and the Sandercock Nuntaks. In later years it is hoped to establish a line of markers from inland of Davis to the Grove Mountains.

NEW BASE CAMP

This season the summer programme in Enderby Land has been carried out from a base camp at Mount King instead of Knuckey Peak. The camp was relocated largely because of weather. Observations taken at Knuckey Peak over 25 days in January last year showed there were six days of whiteout lasting all day, and seven days on which whiteout was reported sometime

during the day. Drift was experienced on 19 days, and on 12 days visibility was less than 500 metres. Surface conditions at Mount King were expected to be better, but whiteout remained a problem in the safe operation of helicopters and the Pilatus Porter aircraft.

Originally plans called for the spring traverse from Mawson to set up the Mount King base, and then return. A second traverse was then to return to the summer camp, carrying more fuel for the aircraft. Because of tractor problems the first traverse, which left at the end of October, waited at Mount King, and left when the glaciologists arrived.

SURVEY NETWORK

Aerial photography from the Pilatus Porter at a height of 6000 metres, using colour film, was the main survey task in the Enderby Land programme. The survey network, which over the last decade has been established from Davis to Mawson and south into the Prince Charles Mountains, will be tied into the Soviet station Molodezhnaya.

Logistic support provided by the Hughes 500 helicopters enabled geologists from the Bureau of Mineral Resources to do much of their work around the survey markers, and for much of the season they camped in the field with the surveyors. Their programme provided for a visit to a peak from where another geologist collected in 1958 a rock containing a rare combination of minerals which indicated very high temperatures (about 1000 degrees Centigrade) obtained during the rock's formation. Colour photographs were studied to aid planning for a later summer programme.

During the season an automatic geophysical observatory was placed on the Amery Ice Shelf to aid upper atmospheric physics research in conjunction with instruments at Davis and Mawson. A similar station, designed by ANARE. has been operating south of Casey for some time, but it was more of an engineering model. The Amery station represents the first direct use by Australia of an unmanned station in research. It will be recovered next summer.

WEATHER BUOYS

Drifting buoys which will transmit measurements of sea surface temperature and sea level atmospheric pressure to Nimbus 6, the United States experimental satellite. were launched in the ocean south and west of Australia by the Nella Dan and the Thala Dan on their voyages to Mawson, Casey, and Davis. These buoys were built by the Australian Bureau of Meteorology when it decided to take part in experiments to test the Nimbus 6 system for the location and collection of data from moving platforms, such as constant level balloons or ocean buoys.

Because the major portion of the Southern Hemisphere is ocean, there are large areas from which no meteorological observations can be obtained for an adequate analysis of weather conditions. Planning for the First Global Atmospheric Research Programme Global Experiment (FGGE) in 1978-79 revealed that much more surface data, particularly sea surface temperature and sea level atmospheric pressure, were needed over the uninhabited ocean areas of the Southern Hemisphere.

SATELLITE REPORTS

Nimbus 6 was developed in preparation for the FGGE period, and was launched into polar orbit in September last year. Last winter it received data from an experimental automatic weather station at the Amundsen-Scott South Pole Station. This was passed on with excellent reliability to stations in the United States.

Based on the hull design developed by Dr G. Creswell, of the Commonwealth Scientific and Industrial Research Organisation, the Australian buoy contains a communications system to communicate with the satellite, and instrumentation to measure atmospheric pressure and surface temperature. Power is provided by 168 alkaline cells with a life of six to 12 months.

Signals from the buoys will be transmitted for one second each minute, and received by the satellite if within view. The position of the buoy is determined by a doppler technique. Only one or two observations a day can be received because the satellite passes overhead near mid-day (sun time).

Data received by the satellite is read out by a satellite tracking station, and processed to transfer the observations into decimal digital form, and to determine the position of the buoy. The data are passed to the National Centre for Atmospheric Research at Boulder, Colorado, for re-transmission to Australia by the meteorological global telecommunications system.

Two buoys were launched from the Nella Dan on her voyage from Melbourne to Mawson early in December. The first was put into the water after Latitude 40deg S, and the second 500 nautical miles further south, although not past 55deg.

A third buoy was launched from the Thala Dan when she was on her way to Casey. She left Melbourne in the second week of January. and the buoy was put into the water at about Latitude 50deg S.

Two more buoys were placed in the water during the Nella Dan's voyage from Fremantle to Davis at the end of January. The first was launched between Latitudes 40deg and 45deg S. and the second 500 nautical miles further on, but not south of 55deg.

These buoys have an expected useful life of between six and 12 months, which is how long the power supply lasts. In six months they could drift from south of Western Australia in a generally easterly direction to the south of Tasmania. Sea and wind drift will determine the actual distance.

Data the Bureau of Meteorology expects to receive from the buoys by way of Nimbus 6 will have a direct operational use. The impact of the programme will be determined largely by the extent of that operational use.

New building construction at the three continental bases, and on Macquarie Island, was included in the 1975-76 ANARE programme. Mawson will have a new science building, which replaces two existing buildings, and the transmitted shack will be replaced by a building situated closer to the main area, near the hangar. There will be a new building trades workshop at Casey, allowing expansion of the vehicle workshop for greater storage of mechanical parts. A new powerhouse, the second building in the redevelopment of the station, will be erected at Davis.

Macquarie Island's building programme reflects ANARE's thoughts for the future when more women will work there. There will be a new powerhouse, and women's quarters and a warm store building are also planned. The women's quarters will have three bedrooms, a common room, a laundry, and an ablutions block. Bedrooms will have beds near the floor, and slightly larger than those provided in the past.

GOLD COAST SUN FOR SEALS

After a 3850-km journey by sea and air from sub-Antarctic Macquarie Island, two elephant seals have begun a new life in an Australian aquarium on the Gold Coast of Queensland. It is the first time elephant seals have been shown in Queensland, and only the second time in Australia.

Dr Michael Bryden, a reader in anatomy at the University of Queensland, who was with the ANARE expedition to Macquarie Island last season, helped to capture the two seals—a male and female christened Sam and Samantha. He will study their locomotion and their temperature controls. It is hoped that they will breed. No elephant seal has ever been born in captivity.

After their arrival at Melbourne aboard the Nella Dan the seals were flown to Queensland. They are in a specially prepared enclosure made to resemble a rocky Macquarie Island beach, and are being fed on live Queensland sea mullet.

Australian role in Antarctic research still not defined

After nearly three years of discussions, reports, and political controversy, Australia's future role in Antarctic research, and the administration of the scientific programme, have reached the stage where a White Paper on Government policy is being prepared for consideration by the Minister for Science, and approval by the Cabinet. Delays in reaching a decision have been caused by changes in the administration of the Department of Science, the political argument about the proposed transfer of the Antarctic Division from Melbourne to Hobart, and the defeat of the Labour Government.

Since the report on Australia's Antarctic research role appeared in "Antarctic" in June last year the subject has been widely discussed by leading representatives of the Antarctic research community in Australia. In 1974 the Advisory Committee on Antarctic programmes suggested to the then Minister for Science (Mr W. L. Morrison) greater university participation in the Antarctic programme, the formation of a planning committee, consideration of the closing of one Antarctic station, and a review of the organisation of the Antarctic Division.

In March last year the Minister presented to Parliament a Green Paper, "Towards New Perspectives for Australian Research in Antarctica". This discussion paper produced 44 submissions from interested parties. On the basis of these responses and the advisory committee's report the policy division of the Department of Science prepared a working paper on Australian scientific research in Antarctica, which was discussed at a series of seminars around Australia in October last year. The Minister also referred the question of the future of Antarctic research to the Australian Science and Technology Council.

MAIN POINTS

By late in October the main points at issue in the discussions seemed to be the proposal for a planning committee (seen by some as representing a special purpose Australian Research Grants Committee with a policy-making role so it can steer Antarctic research actively in particular directions) and the proposal for a statutory body (an Antarctic Institute) in place of the present administration by the Department of Science.

Perhaps the immediate basic problem is one of logistics. Transport and life support cost more than the research in Antarctica itself. Australian research programmes are limited at present by logistical factors, particularly transportation. Each season ships have to be chartered to take expeditions south.

DAVIS AIRSTRIP

In the logistics area a key proposal is for the construction of an airstrip at Davis, in the Australian sector of the continent. This would cost $20 to $30 million to build; it has been suggested that the cost could largely be recovered in fees. There is no permanent airstrip at present in this area where the Soviet Union, Australia, and Japan have been engaged in research for the last 20 years.

There has been no indication to date of the new Government's views on future Antarctic research. As the Opposition it agreed with the Labour Government on the need for an active scientific programme, but it regarded the administration of the present programme as inadequate, particularly the decision to transfer the Antarctic Division to Hobart. Also it favoured the establish-

ment of an Antarctic Institute to administer the scientific programme.

Of more immediate concern is the position of the Antarctic Division. It has had three different Ministesr for Science in the last three years. The decision to transfer it to Hobart was made two years ago, but plans for seven buildings on the site at Kingston, near Hobart, were not referred to the Public Works Committee of the House of Representatives until October last year.

When the present Government was the Opposition its spokesman on science and technology agreed with the move to Hobart, apparently for political reasons. The cost of the proposed new complex of seven buildings for the Antarctic Division and one for the Government Analytical Laboratories, was estimated in September last year at $7 million. Restraints on public spending could well cause the Government to have second thoughts on the scheme.

References: "Search", journal of the Australian and New Zealand Association for the Advancement of Science, November-December, 1975; "Aurora", ANARE Club journal, January, 1976.

JAPANESE SCIENTISTS BEGIN SYOWA ROCKET-FIRING PROGRAMME

Scientists of the 17th Japanese Antarctic Research Expedition now wintering at Syowa Station have begun the first stage of the rocket-launching programme to study the upper atmosphere, which is part of Japan's involvement in the International Magnetosphere Study (IMS, 1976-79). Two rockets were launched from the launching facility south-west of the centre of the station. the first on January 26, and the second on February 13.

Dr Takeo Yoshino, professor of radio physics at the University of Electro-communications in Tokyo, who is leader of the winter party of 30, reported early this month that the S310 rocket, the largest ever launched from Syowa Station, reached a height of 215.6km. All the instruments mounted on the rocket. and designed to study the aurora, functioned normally.

JARE-17 has also installed a telemetry reception device for earth satellites to receive data from an ionosphere observation satellite. Dr Yashino says that the telemetry device has enlarged the scope of observations at Syowa Station, and will enable Japanese scientists in Antarctica to contribute more to geophysical research.

Having relieved Syowa Station, the icebreaker Fuji sailed at the end of last month for Tokyo with the 30 men of the JARE-16 winter team, and 10 members of the JARE-17 summer party. She was caught in the pack ice shortly after leaving, but was able to break loose and continue her voyage.

Early this month the Fuji called at Port Louis, Mauritius, for refuelling. The JARE-16 winter party flew home from the island. The Fuji is expected to reach Tokyo about the middle of next month.

AWARD OF POLAR MEDAL

One of the first 10 men to winter on the Antarctic Continent, Hugh Blackwall Evans, who died on February 8 last year at the age of 100, has been awarded the Polar Medal. The announcement in the "London Gazette" of January 25, made it clear, however, that the decision to make the award to Evans, once the last survivor of Borchegrevink's Southern Cross Expedition of 1898-9, was taken before his death.

BRITISH SURVEY

Adelaide Island base will be moved next season

First established in 1961 when it was known as Base T, the British Antarctic Survey's base on Adelaide Island north of Marguerite Bay will be transferred in the 1976-77 season to a new site at Rothera Point, 64 kilometres to the north-east. Early last year the Stonington Island base, first established in 1946, was closed, and in future all B.A.S. operations south of Marguerite Bay will be based on Adelaide Island.

In recent seasons the snow landing strips on Adelaide Island have deteriorated seriously, and numerous crevasses have appeared on the runway, drastically reducing its length. Therefore the base will be transferred gradually to Rothera Point. The air facility was moved in the 1975-76 season, and the new base hut is being built this year.

Ship and air operations to relieve the bases began in October. The Royal Research Ship John Biscoe sailed for the Antarctic on October 1, and the Royal Research Ship Bransfield on October 31. They took 63 men who will winter at the bases this year, and more joined the ships on route. Southern air operations began on October 24 when one of the two Twin-Otter aircraft flew from Adelaide Island to Fossil Bluff.

The Biscoe, which has visited all bases except Halley Bay, arrived off the west coast of the Antarctic Peninsula at the at the beginning of November. Ice conditions further south rarely allow the ship to reach Adelaide Island early in the season, and men and stores were unloaded on Wiencke Island for transport by air to Adelaide Island and Fossil Bluff.

SNOW RUNWAY

A snow runway was marked out, and a small refuge hut erected at Damoy Point, Wiencke Island. Doumer Island, which was used as a temporary air facility in 1974, was inaccessible and appeared to be less suitable than Wiencke Island. There is an old British base, Port Lockroy, nearby, but as this is situated on an islet it is unsuitable for housing stores to be picked by by the aircraft.

When the John Biscoe left Wiencke Island she turned north and sailed for the base at King Edward Point, South Georgia. landing biologists on Bird Island, and geologists at localities on the north coast of South Georgia en route. These parties remained in the field until this month.

After collecting more men and supplies from the Falkland Islands (Islas Malvinas), the John Biscoe spent a few days landing geologists and geomorphologists on islands in the South Shetlands as part of the long-term Scotia Arc Project. She also took a party of geophysicists to the Damoy Point airstrip to await transport to Adelaide Island.

A call was made at Signy Island at the beginning of December, and then the ship returned to South Georgia for a lengthier visit to resupply the base, repair minor damage to the ship, and transport field parties around the island before returning to the Falkland Islands at the end of the month.

The third Antarctic cruise began with a visit to Punta Arenas, Chile, to embark a B.B.C. television crew, who spent several weeks filming at the Antarctic Peninsula bases. Work was then resumed in the South Shetlands, this time on King George Island, but was restricted by continuing bad

wether. On her last cruise of the season the shipp will revisit Signy Island and South Georgia.

After she left Southampton the Bransfield called first at Jacksonville, Florida, to take on stores for the United States Palmer Station on Anvers Island. Seven United States staff who were going to the base were picked up later at Montevideo.

Palmer Station was relieved towards the end of December after a call at the Wiencke Island staging post. While the Bransfield was there a member of the British Antarctic Survey Atmospheric Sciences Division set up an atmospheric experiment as part of the preparations for the International Magnetosphere Study, which is scheduled for 1977-78.

Equipment was also installed at the Argentine Almirante Brown station, at the B.A.S. Argentine Islands base and, later, at Adelaide Island. The network is now functioning and will remain in operation for two years.

Fog and dense pack ice to the south prevented further work in the Peninsula area at that time, so the Biscoe then turned north.

As usual, the Bransfield's main task was to relieve Halley Bay, spending time at South Georgia and Signy Island and running geophysical tranverses on the way. The ship was expected to remain at Halley Bay for about a week, then sail for Signy Island and thence to Punta Arenas, Chile, to pick up more men going to the bases.

She arrived in the vicinity of Halley Bay an January 22 and began a search for a suitable "iceport" at which to unload cargo. This proved even more difficult than in previous years, and several inlets in the ice cliffs that were tried rapidly crumbled and were obviously too dangerous.

Finally, most of the unloading had to be done 40 miles down the coast. Difficulties were exacerbated by protracted warm weather resulting in soft surfaces. The heavily-laden sledges soon became bogged down and put excessive strain on the vehicles, which consequently needed constant maintenance.

Even in comparatively fine spells the return journey from base to ship took 18 hours, and poor visibility and gales frequently made it necessary to camp on the way. In addition, the ship had to hastily stand off on two occasions as large icebergs bore down the unloading site.

After three weeks the unloading had still not been completed, but as the base by then had adequate stocks of all essential supplies, and it was becoming increasingly hazardous for the ship to remain, it was decided that she should leave. She therefore sailed on February 12, proceeding to the Peninsula bases, and will later visit the South Shetlands to assist the geologists working there.

Before she returns to the Falkland Islands in the middle of next month the Bransfield will make final calls at Signy Island and South Georgia. There she will complete the change-over of staff, and embark field parties.

ROTHERA POINT

During the winter the two Twin-Otter aircraft were given their annual overhaul in Toronto. They were flown south again on October 8. One arrived at Adelaide Island on October 17, and the other, which had been delayed by bad weather, followed at the beginning of November. Before the aircraft arrived two men travelled from the base to Rothera Point, 64 kilometres to the north-east, to establish an alternative runway in case landing was impossible at Adelaide Island.

After the first flight of the season to Fossil Bluff assistance was given to field parties working on Alexander Island, and in the southern part of George VI Sound. While one aircraft was landing at a camp site on the Palmer Land plateau, it was found that the main bolt was missing from one of the ski-wheel assemblies, and the ski hung down at an angle in flight. A successful emergency landing was made at Adelaide Island without damage to the aircraft or injury to the men on board.

Men and cargo were ferried throughout the season to and from Wiencke

Island, and a flight was also made to Halley Bay on February 4 to transport the B.A.S. director, Dr R. M. Laws, to Adelaide Island.

One aircraft carried out extensive magnetometer traverses in the southern part of the Antarctic Peninsula and on Alexander Island. This was supplemented by ground-based geophysics.

The aircraft was later engaged in a joint B.A.S.-U.S. Geological Survey programme over the whole peninsula from the southern end of the Ellsworth Mountains at 80deg S to the vicinity of Teniente Matienzo at 64deg S. This has established geoceiver control for mapping using Doppler satellites.

Two launches for use near the Signy Island and South Georgia bases were included in the cargo taken south by the John Biscoe and the Bransfield. One is seven metres long, and the other eight metres. The Signy Island launch is equipped for marine biology work.

FIELD JOURNEYS

Field work on Signy Island, from bases on South Georgia, and other areas, was resumed in August. and a number of journeys were made from all bases. On the west coast of the Antarctic Peninsula high temperatures caused the sea ice to deteriorate in early September. Travel from the Adelaide Island and Argentine Islands bases was limited, but boat journeys were possible by early October.

Further south the four men at Fossil Bluff in George VI Sound started work again as soon as daylight returned — in early August. Fine weather allowed them to travel to a number of areas, including Spartan Glacier, the glaciological field centre 20 miles to the north.

Two weeks of wind and rain on Signy Island in October caused extensive melting on the slopes behind the base, and emergency drainage schemes took priority over all other activities. Biologists then resumed all their programmes, including the marine work and water sampling in the 17 lakes on the island.

On South Georgia, field work has progressed well in spite of unusually persistent bad weather. Biologists have continued work on the reindeer and vegetation of the Barff Peninsula (at the entrance to Cumberland East Bay) and elsewhere, and on the bird and seal populations of Bird Island.

Glaciologists have again been working on Hodges Glacier, assistance having been given by H.M.S. Endurance's helicopters in mid-January. Geologists and geomorphologists have worked in a number of areas around the island.

At the base on King Edward Point, foundations have been laid for a magnetics hut and also a recompression room for the divers (biologists). Small field huts have been erected for the biologists working at Elsehul and Dartmouth Point.

From Halley Bay, a number of short journeys were undertaken before the arrival of the Bransfield. Several were to inspect the ice front and select a possible unloading site, others to reconnoitre routes across the Hinge Zone, about 50 miles away, and two were to carry out VHF tests inland in preparation for an International Magnetosphere Study project. These were concluded successfully.

OTHER SHIPS

A number of ships have visited British bases. R.R.S. Shackleton has continued its long-term Scotia Arc Project, chiefly near South Georgia and the South Orkney Islands. H.M.S. Endurance has assisted B.A.S. parties in South Georgia and established a seismograph in the South Sandwich Islands in connection with the work on the Scotia Arc.

Two German research vessels, Walter Herwig and Weser, has also been working in northern waters. A B.A.S. biologist is on board one of them.

The United States research vessel Hero transported B.A.S. men from the Argentine Islands to the Weincke Island air facility. The Lindblad Explorer also called at the Argentine Islands.

Return to Antarctic Peninsula after absence of 40 years

One of the world's leading authorities on the birds of the south polar regions, Dr Brian Roberts, returned earlier this year to the Antarctic Peninsula where he began his studies more than 40 years ago. From 1934 to 1937 he was the ornithologist of the British Graham Land Expedition led by John Rymill, which spent three summers and two winters in the Antarctic.

For the last 32 years Dr Roberts has been head of the Polar Regions Section, Joint Research Department, Foreign and Commonwealth Office, and has played a leading role in the shaping of Britain's Antarctic policy. He was one of the chief architects of the Antarctic Treaty.

Dr Roberts retired from the Foreign and Commonwealth Office at the end of last year. He returned to the Antarctic Peninsula for the first time since 1934 as the guest of the British Antarctic Survey. With Dr Richard Laws, director of B.A.S., he visited all the bases aboard the Royal Research Ship Bransfield. Mr Roy Piggott, head of the B.A.S. Atmospheric Sciences Division, and Mr Eric Salmon, personnel officer, also accompanied the director.

POLAR BIRDS

Before he went to Graham Land Dr Roberts was at Emmanuel College, Cambridge. He led a University of Cambridge expedition to Iceland in 1932, and spent the summer of 1933 in East Greenland. In the Antarctic he did detailed work on the birds of Graham Land, South Georgia, and the Falkland Islands.

Because he suffered from recurring appendicitis during the expedition's first winter Dr Roberts sailed in the Penola for the Falkland Islands where he was operated on. When the Penola went to South Georgia for a refit he remained on the island to continue his studies of south polar birds. He also worked on the Falkland Islands and made a voyage in the Royal Research Ship Discovery II.

After his return from the Antarctic Dr Roberts worked at the Scott Polar Research Institute. In 1943 he was borrowed to assist in the organisation of Operation Tabarin, the secret wartime forerunner of the British Antarctic Survey, which established the first British bases in the Antarctic Peninsula area.

BRITISH OBSERVER

Since the Antarctic Treaty was signed in 1959 Dr Roberts has been a United Kingdom representative at meetings of the representatives of the 12 signatory nations. In 1961 he was the British observer with the United States Navy expedition which explored the Bellingshausen Sea in the icebreakers Glacier and Staten Island.

With three men of the expedition Dr Roberts was caught in a blizzard on the Eights Coast, and was rescued after nearly three days in the open without food or water. The party was flown inland 35 miles on the afternoon of February 12 to obtain a final mapping control point from an isolated rock outcropping.

After his return from the Antarctic Peninsula Dr Roberts will spend more of his time at the Scott Polar Research Institute where he has been a research associate for a number of years. Some years ago he edited "Birds of the Antarctic", a selection of more than 300 drawings and paintings made by Dr Edward Wilson on Scott's two expeditions.

New Station established on Filchner ice shelf

On the last day of 1975 a group of Soviet scientists ceremonially hoisted their nation's Red Flag at a new scientific station — Druzhnaya — on the Filchner Ice Shelf. The establishment of this station, the Soviet Union's first in the Weddell Sea area, and its sixth coastal station, was one of the major projects of the 21st Soviet Antarctic Expedition last season. Druzhnaya is the 15th station to be established in the 20 years of Soviet exploration of Antarctica.

In their first penetration of the Weddell Sea by a Soviet expedition in 20 years the research ships Kapitan Markov and Vasily Fedoseyev encountered heavy ice, and had to manoeuvre through accumulations of huge icebergs. One ship called at the British Antarctic Survey base at Halley Bay, and its route southwest to the Filchner Ice Shelf was reconnoitred by helicopter.

Helicopters from the two diesel-electric ships landed 60 scientists and specialists on the ice at a site "several tens of miles west" of the Argentine station, General Belgrano, in the middle of December. More than 1200 tons of building materials, fuel, food, and scientific equipment, were transported from the ships by helicopter.

Under the leadership of a 42-year-old geologist, Garik Grikurov, who has served with other Soviet and foreign expeditions, the expedition took two weeks to establish Druzhnaya. Twenty pre-fabricated buildings were erected, and a diesel power plant was installed. As soon as the station was established Soviet scientists began a series of survey trips south.

SEASONAL BASE

Druzhnaya, which lies between General Belgrano, and the old United States and Argentine Ellsworth Station, has been established as a seasonal base for a long-range programme of exploration of the mountain systems which fringe the Weddell Sea. In a report to the Arctic and Antarctic Research Institute in Leningrad, quoted by the Soviet news agency Tass, Garik Grikurov says that this part of the continent is geologically one of the last blank spots. Its detailed exploration by Soviet scientists is expected to enable the geological maps of West and East Antarctica to be joined together. Exploration is also expected to reveal new regularities in the area's plutonic structure, and enable a review to be made of the data on its mineral resources.

Relief of the other five Soviet stations where 224 men wintered began when the new flagship of the Antarctic fleet, Mikhail Somov, and the Mikhail Kalinin, sailed from Leningrad. The Mikhail Somov relieved Bellingshausen Station on King George Island in the South Shetlands early in December, and then proceeded to Mirny. Later in the season the Mikhail Kalinin took 40 men from Perth to Mirny and Leningradskaya, the station on the Oates Coast.

WEATHER DATA

During last season the research ship Professor Vize collaborated with the United States research ship Professor Thompson in the international programme, Polex-South, in Drake Passage between South America and the Antarctic Peninsula. Polex-South is part of the International Global Atmospheric Research Programme for the study of the interaction between the ocean and the atmosphere, and its effect on weather. The Professor Vize spent two months collecting data to compile mathematical models of weather and climate in the Southern Hemisphere.

Two Soviet exchange scientists worked with the United States Antarctic Research Programme last season. A glaciologist, Dr Nartsiss Barkov, spent 13 months in the Antarctic, and wintered at McMurdo Station. Another glaciologist, Dr Sergei Miagkov, of the geographical facility, Moscow State University, made surveys of glacier fronts in the dry valleys of Southern Victoria Land.

Dr Barkov, who was previously in the Antarctic with Soviet expeditions in 1960 and 1970, and supervised the deep drilling project at Vostok Station in the latter year, studied the McMurdo ice shelf last winter and summer, and made three trips to the South Pole.

Dr Miagkov was the Soviet exchange scientist in 1968-71, and did glaciological and geomorphological research in the dry valleys. Last season he continued his phototheodolite surveys of glacier fronts to determine relationships between glacial episodes and changes in sea level through movement of the fronts.

Soviet scientists were engaged in deep drilling through the ice-cap near Novolazarevskaya Station on the coast of Queen Maud Land last season. Using a thermal drill they discovered an ice-free lake more than 300m below the ice-cap. The lake was between 185 and 215m deep.

Argentina moves main base to Luitpold Coast site

Argentina's main base on the Antarctic Continent, General Belgrano, established 20 years ago, is being moved to a new site. By next season it will be located on the Bertrab Nunatak, a rocky outcrop located east of Duke Ernst Bay on the Costa Confin (Luitpold Coast) at 77deg 54min S/35deg 20min W. The transfer of men, equipment, and materials, began last summer and will be continued this winter.

General Belgrano II is located between Shackleton, the 1956-57 base of the Commonwealth Trans-Antarctic Expedition, and Vahsel Bay. Duke Ernst Bay lies between the shore of the Luitpold Coast and the Filchner Ice Shelf, and the Bertrab Nunatak is at the south side of the entrance to the Bay. Three glaciers descend from the interior heights of the Luitpold Coast to the bay. The two most northerly are the Lerchenfeld and the Schweitzer Glaciers, which run towards the west. West of the Bertrab Nunatak is the Penck Glacier, which flows in a north-westerly direction to the south side of Duke Ernst Bay. Most of the features in the area where the new Argentine base has been established were named by Dr Wilhelm Filchner, who led and planned the German expedition of 1910-12 to the Weddell Sea in the Deutschland. Filchner discovered the Luitpold Coast, and continued south until stopped by the Filchner Ice Shelf. The Deutschland was trapped on March 6, 1912, and was carried 600 miles in nine months before being released on November 26.

BARE ROCK

Bertrab Nunatak, a bare rock about 150m high, was discovered by the German expedition early in 1912, and named by Filchner for Dr von Bertrab, chairman of the expedition. Bertrab was a general in the German General Staff, and was chief quartermaster, and chief of the land survey. The name of General Helmuth von Moltke, Chief of the German General Staff, is commemorated by the Moltke Nunatak, which is about 40km south of Duke Ernst Bay.

When General Belgrano was opened on January 18, 1955, it was the most southerly scientific station in the world. It was established on the Filchner Ice Shelf at an elevation of 32m, and some 40km from Ellsworth, the United States I.G.Y. station later occupied by the Argentine until 1962. Because of the movement of the ice shelf the position of General Belgrano is about 77deg 46min S/38deg 11min W (co-ordinates determined on February 28, 1973.)

Since 1955 General Belgrano has been manned by a staff of 34 scientists and servicemen all the year round. The scientific programme has included meteorology, geodesy and topography, and studies of the ionosphere, the aurora, cosmic radiation, and the movement of the ice shelf.

General Belgrano, which has facilities for ski-equipped aircraft, has been the starting point for several major flights and traverses since 1962. In that year two DC-3 aircraft under the command of Captain Hermese Quijada made the first Argentine flight to the South Pole from General Belgrano.

In 1965 the Argentine Army set up a small scientific base called Sobral at 81deg 04min S/40deg 30min W on the southern edge of the Filchner Ice Shelf, and only 940km from the Pole. The base was used for studies of the ice shelf movements, and to make astronomical measurements.

Italian Expedition worked off west coast of Antarctic Peninsula

An Italian expedition of scientists and mountaineers spent three months in the Antarctic Peninsula area last season. Its presence in Wiencke Bay, between Anvers Island and the west coast, operating from a chartered Norwegian ship, was reported at the end of January by the National Science Foundation research vessel Hero during one of her cruises from the United States Palmer Station, but there have been no other reports of the expedition's activities.

Described in its advance publicity as the first Italian expedition to Antarctica, the expedition of 15 men was financed by a group of Italian sponsors. It planned to spend three months in the Antarctic, using a 500-ton vessel called the Repunte, formerly used for fishery research by the Food and Agriculture Organisation, and a small four-passenger hovercraft.

Members of the expedition included geologists, skin divers, and several highly-experienced mountaineers. The two geologists from Genoa University, Gian Camillo Cortemiglia, and Remo Terranova, were members of an Italian Arctic expedition to Baffin Bay in 1972.

One of the main purposes of the expedition was to make the Italian Government and the public aware of the need for Italy to accede to the Antarctic Treaty, and take part in Antarctic scientific research. The expedition hoped to gain experience for the organisation of future Italian expeditions—with the aid of the Argentine Republic—and to erect the nucleus of a permanent base camp.

Scientific research in geology, glaciology and hydrography, was planned. The mountaineers were to explore some Antarctic mountain ranges, and make ascents of unclimbed peaks.

Promoter and leader of the expedition was Renato Cepparo. He is a film producer, mountaineer and skier, and served with the Alpine Corps in the Second World War. Later he was in a midget submarine squadron operating against the Russians in the Black Sea.

Deputy leader of the expedition was Commander Flavio Barbero, of the Italian Navy. He is a graduate engineer in electronics from Pisa University, and has carried out research in underwater warfare. His interests include geology, archaeology and yachting.

Dr Angelo Gardini, a lecturer in general pathology, has taken part in two crossings of the Sahara, one with the Italian expedition which observed the total eclipse of the sun in 1973. He has explored in Syria, Jordan, Afghanistan, and Kashmir.

Two skin divers and underwater cameramen, Luciano Bolzoni and Giampiero Fusello, have taken part in expeditions to the Indian Ocean and the Red Sea. Bolzoni is a former alpine guide and climbing instructor. Fusello is a skin-diving instructor with the Italian Angling Federation.

An alpine guide, Gigi Alippi, who has climbed in Alaska, Peru, Patagonia, East Africa and in the Himalayas, headed the mountaineering team. Arcari Gianni, who is a member of the Italian Alpine Club, has climbed in Peru, Patagonia, Argentina and on Tierra del Fuego. Benvenuto Laritti, a climbing and ski-ing instructor at the Excise Corps Alpine School, and Donato Erba, an apprentice alpine guide, have made several first ascents in the Italian Alps.

Other members of the expedition were Antonio Rezia (stores officer and accountant); Paolo Fueri (building and transport officer); Riccardo Cepparo (camerman-photographer); and Carlo Ottolini (topographer-victualler).

Italian scientists, mountaineers and yachtsmen have been to Antarctica in the past either as guests at the bases of other nations or as members of non-Italian expeditions. Last season's expedition, however, was the first to be fully self-contained with its own research and sporting programme.

New Zealand has been associated with Italian scientists in Antarctica since the International Geophysical Year (1957-58) when Lieutenant Franco Faggioni, of the Italian Navy, wintered at Scott Base in 1958. Italy's best-known alpinist, Carlo Mauri, visited Scott Base as a newspaper correspondent in 1967-68, and took part in an ascent of Mount Erebus with New Zealanders.

In the 1968-69 season four scientists led by Professor Aldo Segre worked with the New Zealand Antarctic research programme. Professor Segre returned in the 1973-74 season as leader of a party representing the Italian National Committee of Scientific Research, which worked in the dry valleys of Southern Victoria Land for six weeks.

In 1959 the Italian Polar Geographical Institute organised an expedition to Bouvet Island where exploration was carried out by Silvio Zavotti and Giorgio Costanzo. Other Italians have been to Antarctica as mountaineers or yachtsmen, among them Commander Giovanni Aimone-Cat, who was the first to fly the Italian flag in Antarctic waters. He made two voyages in 1969-71 and 1973-74 in the motor schooner San Giuseppe Due.

SHACKLETON BASE UNBURIED

Shackleton, the old Commonwealth Trans-Antarctic Expedition base, established 20 years ago at Vahsel Bay on the Filchner Ice Shelf, has not been buried completely by the snow like other abandoned Antarctic bases. Steady 15-knot winds keep it clear of snow.

Early in December last year a helicopter pilot of the 21st Soviet Antarctic Expedition which established a new base on the Filchner Ice Shelf reported that Shackleton was still clearly visible from the air.

In the 1973-74 season Dr R. M. Laws, director of the British Antarctic Survey, visited Shackleton. The hut was found to be in very good condition with the radio masts and the apex of the roof still visible.

THE READER WRITES

Sidelights of Antarctic Research

Letters, preferably not longer than 500 to 600 words. are invited from readers who have observed some little-known facet of Antarctic life or have reached conclusions of interese on some Antarctic problem — Editor

SKUA AT DOME C

Sir,

Americans working in Wilkes Land last season on the recovery of two Hercules aircraft stranded at Dome C, the ice dome 1100km from McMurdo Station, are reported to have been astonished by the appearance of a skua which flew over their camp—800km from the coast and 3500m above sea level. They had reason for their astonishment. Sightings of Antarctic birds far from the coast or their nesting places are rarer than they used to be in the days when most polar travel was by dog or tractor, not by high-flying aircraft.

Long flights by skuas have been recorded in the Antarctic several times before. In 1911 Amundsen, completing his journey to the Pole, saw a skua flying south also 700km from the nearest coast. And Scott recorded in his diary on January 3, 1912, that a skua visited the party on the march about 165 miles from the Pole. Scott wrote: "It seemed to have had little food— extraordinary visitor, considering our distance from the sea."

That was a long time ago, but in the last 20 years members of other parties have observed skuas far from the coast. In 1965 two Soviet scientists reported the sighting of a skua at Vostok on December 15, 1964. Vostok is more than 1200km from the coast, and the scientists wondered what the bird, apparently a great skua, was doing so far from the sea, and from any source of food. ("Antarctic," June, 1966).

Mr R. B. Thomson, superintendent of the Antarctic Division, Department of Scientific and Industrial Research, gave an explanation of how the bird flew so far inland and located Vostok Station, a mere dot on the featureless Polar Plateau, in a letter printed in your columns in September, 1966. He was leader of the 1962-63 Australian traverse from Wilkes Station to Vostok. The party was nearly 320km south of Wilkes on January 6, 1963, when it sighted a great skua following the flagged trail southward. It spent some time with the party, and then flew south, still following the old trail and marker flags.

Mr Thomson said that the party left flags on 10ft poles every 2½ miles along the Wilkes-Vostok traverse, and also left behind drums, cairns and other trail markers. Skuas have good eyesight, and are curious birds which will investigate strange markings or material on the snow, according to Mr Thomson.

Perhaps a skua could have followed the trail markers all the way to Vostok as Mr Thomson suggested. But not the bird which arrived on December 15, 1964. It's a long time between drinks on the way from Wilkes to Vostok.

Yours etc.,

JAMES PIGG

Plans to mark the 65th anniversary of Roald Amundsen's arrival at the South Pole are being made by Norwegians, and Americans of Norwegian descent. Amundsen and his four companions reached the Pole on December 14, 1911, and it is hoped to unveil a bronze bust of the explorer at the Amundsen-Scott South Pole Station on that date this year.

Many memorials now honour Antarctica's explorers

Huts are not the only historic monuments in Antarctica. There are many more memorials to the early explorers than the huts built by Borchgrevink at Cape Adare, and by Scott and Shackleton on Ross Island. The signatories to the Antarctic Treaty have approved 43 historic monuments, which are now the responsibility of the nations involved in Antarctic research.

The earliest of these monuments dates back to 1874. It is a metal plaque at Potter Cove, King George Island, in the South Shetlands, and was erected by Captain Edward Dallmann to commemorate the visit of the German Polar Navigation Company's expedition on March 1, 1874. Dallmann was sent south by the company in 1873 to look for new whaling grounds.

On November 18 Dallmann reached the South Shetlands in the steam whaler Gronland. His ship made history by being the first propeller-driven vessel to cross the waters of the Antarctic ocean.

Although Dallmann was disappointed in his hopes of finding valuable right whales, he brought back a full cargo of seal oil to Germany. He made extensive discoveries among the small islands and reefs off the coast of Graham Land, and was the first to make clear the insular character of the Palmer Land archipelago.

FIRST GRAVE

Twenty-five years later C. E. Borchgrevink's South Cross Expedition, the first to winter on the continent, reached Cape Adare in Victoria Land. There are two historic monuments at Cape Adare—the hut Borchgrevink and his men built in February, 1899, and the grave of the expedition's Norwegian biologist, Nicolai Hanson. This is the first known grave in the Antarctic.

Borchgrevink's expedition included Norwegians, two Englishmen, an Australian, and two Lapps. He was a young Norwegian school teacher in Australia when he first became interested in the Antarctic. But because Cape Adare is in the Ross Dependency, the maintenance and preservation of the hut and Hanson's grave are the responsibility of New Zealand, not Norway. New Zealand is also responsible for eight other historic monuments in the Ross Dependency.

STONE SHELTER

The huts built on Ross Island by Scott and Shackleton are well known, as is the cross on Observation Hill erected in January, 1913, in memory of Scott's party which died on the return from the South Pole in March, 1912. Less well known are the remains of a stone shelter on Inexpressible Island, Terra Nova Bay, built by Victor Campbell's Northern Party of Scott's last expedition. The party of six spent the winter of 1912 in the shelter, and a nearby ice cave.

Belgium was the first nation to begin exploration of Antarctica again after the discoveries of Ross, Wilkes, and D'Urville in the 1840s, but there is no monument to commemorate the expedition led by Adrien de Gerlache in the Belgica. When the Belgica became trapped in the pack ice of the Bellingshausen Sea early in March, 1898, those aboard her were the first to winter in the Antarctic. They were prisoners in the ice until the spring of 1899.

Surprisingly, the list of approved historic monuments includes only one at the South Pole where there has been a permanent scientific station for nearly 20 years. It is a flag pole erected in

December, 1965, by the first Argentine overland polar expedition.

In 1947 the Chileans erected a wooden cross and a statue of the Virgin of Carmen near the base in Discovery Bay, Greenwich Island, in the South Shetlands, named after one of their naval heroes, Arturo Prat. Nearby is something incongruous—a metal plaque of the Lions International organisation. Fortunately, it is not an historic monument.

There is almost a miniature history of the last 100 years of Antarctic exploration in the list of 43 monuments identified and described by the governments of 11 nations. These were recommended for approval in 1972 by the seventh consultative meeting of representatives of the Antarctic Treaty nations. They are:

(1) Flag mast erected in December, 1965, at the South Geographical Pole by the first Argentine overland polar expedition.

(2) Rock cairns and plaques at Syowa Station (Lat. 69° 00min S., Long. 39° 35min E.) in memory of Shin Fukushima, a member of the 4th Japanese Antarctic Research Expedition, who died in October, 1960, while performing official duties. The cairn was erected on January 11, 1961, by his colleagues. Some of his ashes repose in the cairn.

(3) Rock cairn and plaque on Proclamation Island, Enderby Land, erected in January, 1930, by Sir Douglas Mawson. (Lat. 65° 51min S., Long. 53° 41min E.). The cairn and plaque commemorate the landing on Proclamation Island of Sir Douglas Mawson with a party from the British, Australian and New Zealand Antarctic Research Expedition of 1929-31.

BUST OF LENIN

(4) Station building to which a bust of V. I. Lenin is fixed, together with a plaque in memory of the conquest of the Pole of Inaccessibility by Soviet Antarctic explorers in 1958. (Lat. 83° 06min S., Long. 54° 58min E.)

(5) Rock cairn and plaque at Cape Bruce, MacRobertson Land, erected in February, 1931, by Sir Douglas Mawson. (Lat. 67° 25min S., Long. 60° 47min E.) The cairn and plaque commemorate the landing on Cape Bruce of Sir Douglas Mawson with a party from the British, Australian and New Zealand Antarctic Research Expedition of 1929-31.

(6) Rock cairn at Walkabout Rocks, Vestfold Hills, Princess Elizabeth Land, erected in 1939 by Sir Hubert Wilkins. (Lat. 68° 22min S., Long. 78° 33min E.) The cairn houses a canister containing a record of his visit.

(7) Stone with inscribed plaque, erected at Mirny Observatory, Mabus Point, in memory of driver-mechanic Ivan Khmara, who perished on fast ice in the performance of official duties in 1956. (Lat. 66° 33min S., Long. 93° 01min E.)

(8) Metal monument-sledge at Mirny Observatory, Mabus Point, with plaque in memory of driver-mechanic Anatoly Shcheglov who perished in the performance of official duties. (Lat. 66° 33min S., Long. 93° 01min E.)

(9) Cemetery on Buromskiy Island, near Mirny Observatory, in which are buried Soviet, Czechoslovakia and GDR citizens, members of Soviet Antarctic Expeditions, who perished in the performance of official duties on August 3, 1960. (Lat. 66° 32min S., Long. 93° 01 min. E.)

(10) Building (magnetic observatory) at Dobrowolsky Station, Bunger Hills, with plaque in memory of the opening of Oasis Station in 1956. (Lat. 66° 16min S., Long. 100° 45min E.)

(11) Heavy tractor at Vostok Station with plaque in memory of the opening of the station in 1957. (Lat. 78° 28min S., Long. 106° 48min E.)

(12) Cross and plaque at Cape Denison, George V Land, erected in 1913 by Sir Douglas Mawson on a hill situated 300 metres west by south from the main hut of the Australasian Antarctic Expedition of 1911-14. (Lat. 67° 00min S., Long. 142° 42min E.) The cross and plaque commemorate Lieutenant B. E. S. Ninnis and Dr X. Mertz, members of the expedition, who died in 1913 while engaged in the work of the expedition.

(13) Hut at Cape Denison, George V Land, built in January, 1912, by Sir Douglas Mawson for the Australasian Antarctic Expedition of 1911-14. (Lat. 67° 00min S., Long. 142° 42min E.) This was the main base of the expedition.

(14) Remains of rock shelter at Inexpressible Island, Terra Nova Bay, constructed in March, 1912, by Victor Campbell's Northern Party, British Antarctic expedition, 1910-13. (Lat. 74° 54min S., Long. 163° 43min E.) The party spent the winter of 1912 in this shelter and a nearby ice cave.

(15) Hut at Cape Royds, Ross Island, built in February, 1908, by Ernest Shackleton. (Lat. 77° 38min S., Long. 166° 07min E.) Restored in January, 1961, by Antarctic Division of New Zealand Department of Scientific and Industrial Research.

(16) Hut at Cape Evans, Ross Island, built in January, 1911, by Captain Robert Falcon Scott. (Lat. 77° 38min S., Long. 166° 24min E.) Restored in January, 1961, by Antarctic Division of New Zealand Department of Scientific and Industrial Research.

ROSS SEA PARTY

(17) Cross on Wind Vane Hill, Cape Evans, Ross Island, erected by the Ross Sea Party of Ernest Shackleton's Trans-Antarctic Expedition, 1914-16, in memory of three members of the party who died in the vicinity in 1916. (Lat. 77° 38min S., Long. 166° 24min E.)

(18) Hut at Hut Point, Ross Island, built in February, 1902, by Captain Robert Falcon Scott. (Lat. 77° 51min S., Long. 166° 37min E.) Partially restored in January, 1964, by the New Zealand Antarctic Society, with assistance from the United States Government.

(19) Cross at Hut Point, Ross Island, erected in February, 1904, by the British Antarctic Expedition, 1901-04, in memory of T. Vince, a member of that expedition who died in the vicinity. (Lat. 77° 51min S., Long. 166° 37min E.)

(20) Cross on Observation Hill, Ross Island, erected in January, 1913, by the British Antarctic Expedition, 1910-13, in memory of Captain Robert Falcon Scott's party which perished on the return journey from the South Pole, March, 1912. (Lat. 77° 51min S., Long. 166° 40min E.)

(21) Stone hut at Cape Crozier, Ross Island, constructed in July, 1911, by Edward Wilson's party (British Antarctic Expedition, 1910-13) during the winter journey to collect Emperor penguin eggs. (Lat. 77° 32min S., Long. 169° 18min E.)

(22) Hut at Cape Adare built in February, 1899, during Southern Cross Expedition led by C. E. Borchgrevink. (Lat. 71° 17min S., Long. 170° 15min E.) There are three huts at Cape Adare, two date from Borchgrevink's expedition, and one from Scott's Northern Party, 1910-11. Only the southernmost Borchgrevink hut survives in a reasonable state of repair.

(23) Grave at Cape Adare of Norwegian biologist Nicolai Hanson, a member of C. E. Borchgrevink's Southern Cross Expedition, 1899-1900. (Lat. 71° 17min S., Long. 170° 15min E.) This is the first known grave in the Antarctic.

(24) Rock cairn, known as Amundsen's Cairn, on Mount Betty, Queen Maud Range (Lat. 85° 11min S., Long. 163° 45min W.), erected by Roald Amundsen on January 6, 1912, on his way back to Framheim from the South Pole.

ISLAND PLAQUE

(25) Hut and plaque on Peter I Oy, built by the Norwegian, Captain Nils Larsen, in February, 1929, at Framnaesodden. (Lat. 68° 47min S., Long. 90° 42min W.) The plaque is inscribed "Norvegia-ekspedisjonen 2/2 1929."

(26) Abandoned installations of Argentine Station General San Martin on Barry Island, Debenham Islands, Marguerite Bay, with cross, flag mast, and monolith built in 1951. (Lat. 68° 08min S., Long. 67° 08min W.)

(27) Cairn with plaque on Megalestris Hill, Petermann Island, erected in 1909 by the second French expedition led by J. B. Charcot. (Lat 65° 10min S., Long. 64° 10min W.) Restored by

the British Antarctic Survey in 1958.

(28) Rock cairn at Port Charcot, Booth Island, with wooden pillar and plaques inscribed with the names of the first French expedition led by J. B. Charcot which wintered here in 1904 aboard Le Francais. (Lat. 65° 03min S., Long. 64° 01min W.)

(29) Lighthouse named Primero de Mayo erected on Lambda Island, Melchior Islands, by Argentina in 1942. (Lat. 64° 18min S., Long. 62° 59min W.) This was the first Argentine lighthouse in the Antarctic.

(30) Shelter at Paradise Harbour erected in 1950 near the Chilean base Gabriel Gonzales Videla to honour Gabriel Gonzales Videla, the first Head of State to visit the Antarctic. (Lat. 64° 49min S., Long. 62° 51min W.)

(31) Memorial plaque marking the position of a cemetery on Deception Island (Lat. 62° 59min S., Long. 60° 34min W.) where some 40 Norwegian whalers were buried in the first half of the twentieth century. The cemetery was swept away by a volcanic eruption in February, 1969.

(32) Concrete monolith erected in 1947, near Arturo Prat Base on Greenwich Island. Point of reference for Chilean Antarctic hydrographic work. (Lat. 62° 29min S., Long. 59° 40min W.)

(33) Shelter and cross with plaque near Arturo Prat Base, Greenwich Island. (Lat. 62° 30min S., Long. 59° 41min W.) Named in memory of Lieutenant-Commander Gonzales Pacheco, who died tragically while in charge of the station in 1960.

NAVAL HERO

(34) Bust of the Chilean naval hero Arturo Prat erected in 1947 at the base of the same name on Greenwich Island. (Lat. 62° 30min S., Long. 59° 41min W.)

(35) Wooden cross and statue of the Virgin of Carmen erected in 1947 near Arturo Prat Base on Greenwich Island. (Lat. 62° 30 min S., Long. 59° 41min W.) There is also nearby a metal plaque of Lions International Club.

(36) Metal plaque at Potter Cove, King George Island, erected by Edward Dallmann to commemorate the visit of his German expedition on March 1, 1874. (Lat. 62° 13min S., Long. 58° 42min W.)

(37) Statue of Bernardo O'Higgins, erected in 1948 in front of the station of the same name. (Lat. 63° 19min S., Long. 57° 54min W.) to honour the first ruler of Chile to envision the importance of Antarctica.

(38) Hut on Snow Hill Island built in February, 1902, by the main party of the Swedish South Polar Expedition, led by Otto Nordenskjold. (Lat. 64° 24min S., Long. 57° 00min W.)

(39) Stone hut at Hope Bay built in January, 1903, by a party of the Swedish South Polar Expedition. (Lat. 63° 24min S., Long. 56° 59min W.)

(40) Bust of General San Martin, grotto with a statue of the Virgin of Lujan, and a flag mast at Base Esperanza, Hope Bay, erected by Argentina in 1955; together with a graveyard with stele in memory of members of Argentine expeditions who died in the area. (Lat. 63° 24min S., Long. 56° 59min W.)

EARLY GRAVES

(41) Stone hut on Paulet Island built in February, 1903, by C. A. Larsen, Norwegian captain of the wrecked vessel "Antarctic" of the Swedish South Polar Expedition led by Otto Nordenskjold, together with the grave of a member of that expedition. (Lat. 63° 35min S., Long. 55° 47min W.)

(42) Area at Scotia Bay, Laurie Island, South Orkney Islands, in which are found: stone hut built in 1903 by the Scottish Expedition led by W. S. Bruce; the Argentine Meteorological and Magnetic Observatory, built in 1905; and a graveyard with seven tombs (dating from 1903). (Lat. 60° 46min S., Long. 44° 40min W.)

(43) Cross erected in 1955, at a distance of 1300 metres north-east of the Argentine base General Belgrano at Piedrabuena Bay, Filchner Ice Shelf. (Lat. 77° 49min S., Long. 38° 02min W.)

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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 Dependancy, and has been involved in the establishment of a national Antarctic centre at the Canterbury Museum, Christchurch.

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 address see below. The yearly membership fee is NZ$3.00 (or equivalent local currency). Membership fee, overseas and local, including "Antarctic", NZ$6.50.

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