

# ANTARCTIC

A NEWS BULLETIN

published quarterly by the  
NEW ZEALAND ANTARCTIC SOCIETY (INC)



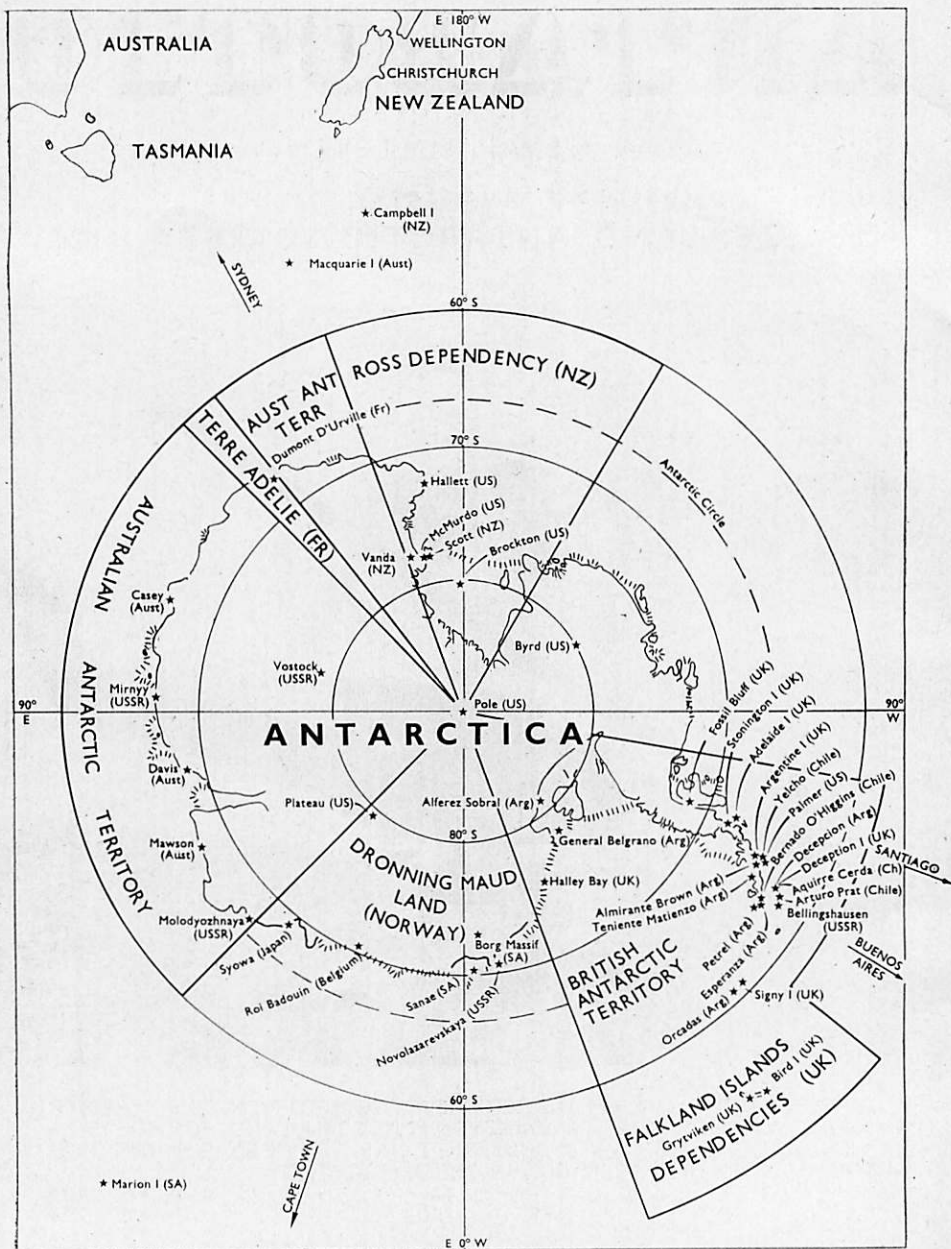
A UNITED STATES NAVY HELICOPTER CREW WAITS TO PICK UP SCIENTISTS AT WORK IN ONE OF THE DRY VALLEYS OF VICTORIA LAND. FOR THE LAST 20 YEARS THE NAVY'S VXE6 SQUADRON HAS PROVIDED SUPPORT FOR AMERICAN SCIENTIFIC RESEARCH IN THE ANTARCTIC.

U.S. Navy Photo

Vol. 7 No. 5

Registered at Post Office Headquarters,  
Wellington, New Zealand, as a magazine.

March, 1975



# "ANTARCTIC"

(Successor to "Antarctic News Bulletin")

Vol. 7 No. 5

77th ISSUE

March, 1975

Editor: J. M. CAFFIN, 35 Chepstow Avenue, Christchurch 5.

Address all contributions, enquiries, etc., to the Editor.

All Business Communications, Subscriptions, etc., to:

Secretary, New Zealand Antarctic Society (Inc.), P.O. Box 1223, Christchurch, N.Z.

## CONTENTS

### POLAR ACTIVITIES

NEW ZEALAND .....	133 - 143
UNITED KINGDOM .....	150
UNITED STATES .....	152 - 159
JAPAN .....	160
SOVIET UNION .....	162

### GENERAL

VICTORIA UNIVERSITY .....	144 - 146
WAIKATO UNIVERSITY .....	148
CANTERBURY UNIVERSITY .....	147
THE READER WRITES .....	163
OBITUARY .....	164 - 167

Inflation and the world economic situation have begun to affect scientific research in Antarctica. The United States National Science Foundation may have to reduce its expenditure next season; the British Antarctic Survey has been forced to economise already, and has closed Antarctic Peninsula bases.

Research programmes can be continued on a reduced scale. Economies can be made in the use of transport which is now a more costly item because of the world fuel crisis.

It is not likely that all the nations involved in Antarctic research will abandon it altogether. But there is one danger. Some nations might begin to count the cost, and conclude that exploitation of the continent's resources would provide a better return than research.

# ERUPTIONS ON EREBUS STOP CRATER STUDY

Violent eruptions from an explosive vent in the inner crater of Mount Erebus prevented the New Zealand-French-United States expedition from achieving one of the major objectives of its scientific study of one of Antarctica's two active volcanoes. After more than three weeks on the mountain, the expedition abandoned on December 23 the planned descent into the inner crater to collect samples of gas and lava. The violence and frequency of the explosions made the proposed descent too dangerous.

Although the expedition was unable to descend into the inner crater of Erebus, it was 90 per cent successful. Bad weather, low temperatures, and damage to equipment by a lava bomb hurled from the inner crater, did not prevent the scientists from obtaining valuable results. They monitored the activity in the inner crater, and made detailed vulcanological measurements and observations.

Three scientists from the Victoria University of Wellington expedition worked on Erebus. Dr R. R. Dibble obtained a valuable harvest of seismological recordings from the inner crater, and four around the rim. Mr P. R. Kyle, who has spent four summers doing field work for his petrographic and chemical study of the McMurdo volcanics, made a series of geological observations, and Mr H. R. Keys, who has mapped and collected saline deposits in the McMurdo region during earlier expeditions, obtained samples of crystallised sulphates, chlorides and others salts.

## GAS SAMPLINGS

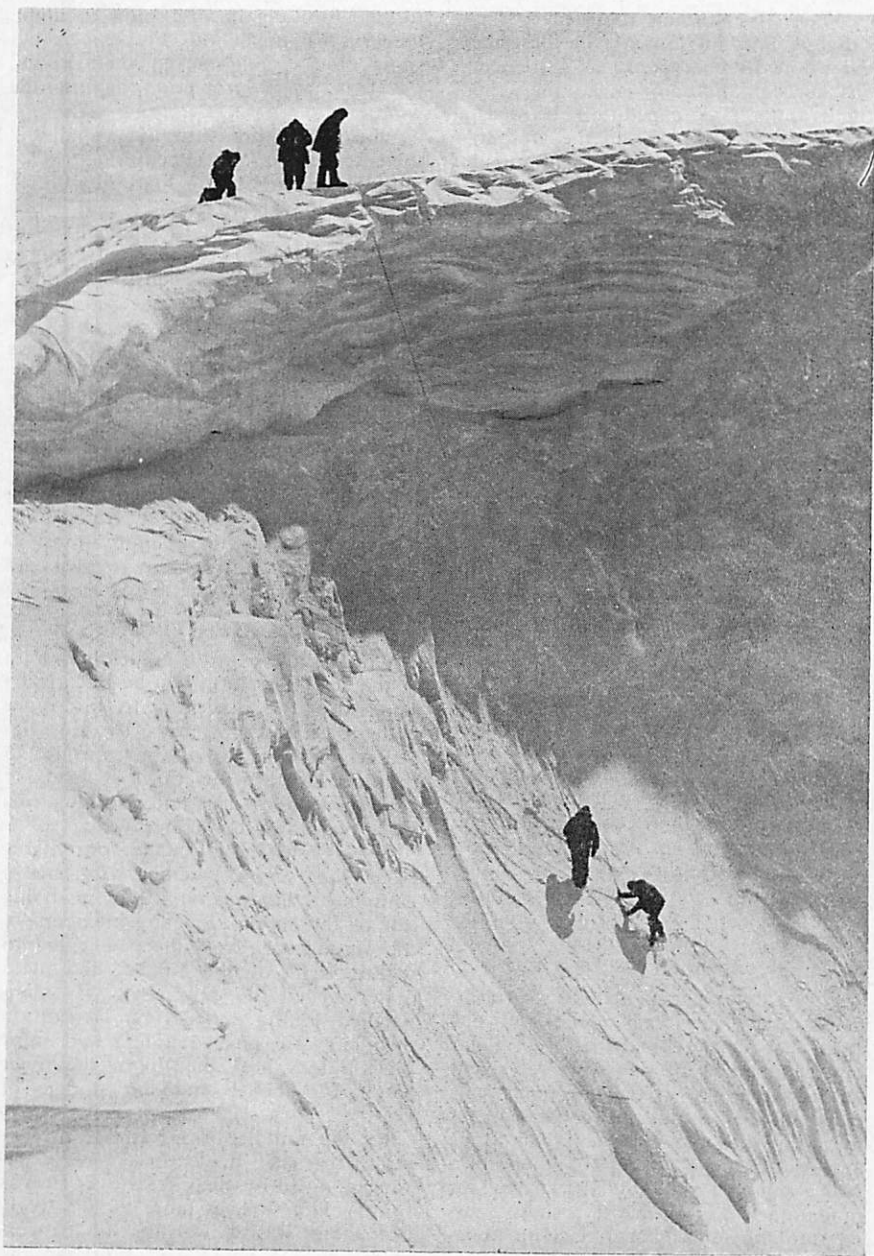
Dr W. W. Giggenbach, a geochemist from the Department of Scientific and Industrial Research, who explored the main crater of Erebus in 1972, made a series of gas samplings. One of the Frenchmen, Dr F. Le Guern, made a series of samplings of gas containing radio-active radon gas, and other gases, to make isotopic measurements. Dr J. C. Sarbroux measured the speed of the gas outflow with a new British-designed instrument.

In addition to its scientific studies, the expedition established the height of Erebus at 12,464ft. Since James Clark Ross named the mountain in 1841 its height has been estimated at 12,500ft to 13,500 ft. Two surveyors from the New Zealand Lands and Survey Department, Messrs J. Williams and J. Rotheray, camped on the mountain for three weeks, beginning last November, worked out its height within 5ft either way, and mapped the summit and the main and inner craters.

Dr H. Tazieff, one of the world's leading vulcanologists, who led the French party, has described Erebus as the vulcanologists' Mount Everest. He would like to attempt the descent into the inner crater again, and so would the leader of the expedition, Mr S. M. Norman. But another expedition next season is unlikely unless there is a considerable decrease in the activity of the inner crater.

## FUTURE PLANS

Mr R. B. Thomson, superintendent of the Antarctic Division, D.S.I.R., says that early next season monitoring equipment will be put on Erebus, and visual observations will be made as well. If there is a significant decrease in the amount of volcanic activity, the Antarctic Division will consider putting another team on the mountain to get inside the inner crater. But a decision depends on the observations made by the winter team at Scott Base.



Members of the Erebus expedition at work in the volcano's main crater. They are putting in a ropeway to give access to the inner crater.

U.S. Navy Photo

When Mr Norman returned to New Zealand late in January he described the whole Erebus project as a tremendous success. In addition to the scientific results, the expedition learned a great deal about access to the volcano's two craters, living on a 12,450ft mountain, and logistics.

Activity in the inner crater was noted first by the party which flew to Erebus on October 15 to establish a base camp. When he returned to Scott Base Mr Norman reported that soft, rocky material was being hurled into the main crater from an explosive vent in the inner crater. Eruptions occurred four or five times a day, and material was flung 150ft high above the lip of the inner crater, which is 200ft to 300ft below the main crater.

### FIRST CAMP

Because of the dangers of altitude sickness the main body of the expedition acclimatised at a camp established on Fang Glacier on the north-east slopes of Erebus at a height of between 8500ft and 9000ft. The camp was below the summit camp and three miles away.

Helicopters of the United States Navy's VXE6 Squadron made four flights to the Fang Glacier camp on December 7 with 10 members of the expedition and their equipment. The sun was shining brilliantly and there was not a breath of wind. Six hours later swirling snow reduced visibility almost to zero, and the blizzard was whipped up by winds gusting from 60 to 70 miles an hour.

Fortunately the 10 men—six Frenchmen, three New Zealanders, and one American—had pitched their four polar tents and an A frame Army mess tent before the storm broke. The polar tents stood up well to the fierce battering of the wind, but the mess tent had to be anchored at the height of the storm with ropes carried by the party for mountaineering. In addition snow poured into the tent through lace-up openings, and food and equipment were deeply covered.

By noon on December 9 the storm died down briefly. Then the wind rose

to gale force again with snow at night. During the break the Frenchmen cut snow blocks and stacked them round the tents as a protection against the wind.

When the 36-hour blizzard ended, and the members of the expedition crawled out of their tents, the first job was to clear the snow from the mess tent. Then they were able to have their first hot meal for 24 hours. During the storm they ate chocolate, raisins, and other dried foods.

Two New Zealand scientists, Drs. Gigenbach and Dibble, were at the base camp about 500ft below the summit. They did not fare so well in the blizzard, and five of the seven tents at the site were blown down. By December 11 the weather had cleared, and the temperature had risen to a balmy minus 10deg Celsius. The next day a Navy helicopter, which had to operate almost at its upper limit, ferried the 10 men and their equipment to the base camp.

### HELICOPTER FLIGHTS

When all the expedition members were at the summit camp, they began preparations for the descent into the inner crater of Erebus. A flying fox was rigged from the rim of the main crater to the floor 300ft below to carry loads of equipment, and ropes and climbing aids were put down the crater wall.

A Navy helicopter made four flights from the summit camp with heavy equipment, landing on a tiny pad dug out of the scoria slope by members of the expedition. From the pad it flew to within 100ft of the rim of the main crater. Then the equipment was manhandled to the crater rim. Expedition members also erected a tent and snow block igloos near the lip of the inner crater for shelter and the storage of gear.

By the middle of December preparations for the descent were well advanced, aided by clear skies over Erebus for the first time in more than a week. But there was a warning of dangers ahead on December 19. Work in the main crater had to be stopped because of sulphuric gas from the explosive vent in the inner crater.



The main camp of the Mount Erebus expedition high on the slopes of the volcano. In the background across McMurdo Sound are what Scott called the Western Mountains, part of the Transantarctic Mountains.

U.S. Navy Photo

On December 20 members of the expedition began a round-the-clock watch on the inner crater to determine as closely as possible the pattern of volcanic activity in readiness for the descent. Two-man teams were assigned for six spells to note when the explosive vent became active, the severity of the explosion, the amount of material ejected, and the height to which it was hrown. The teams also monitored the activity of the inner crater's lava lake, and the gases produced in the crater.

Two New Zealand members of the expedition, Mr Kyle, and Mr M. Lambert, the New Zealand Press Association representative, were on watch on December 21 when the explosive vent suddenly erupted. The vent—about 50ft to 60ft deep—filled to the brim with lava in about 15 seconds, and then broke open with a roar like a battery of heavy artillery.

The two men were knocked flat by the blast, and then ran for shelter behind a wall of ice blocks 20 yards from the crater rim. Neither was injured. Small amounts of fibrous-like lava landed in the snow nearby, the rest falling back into the crater.

A setback to the expedition's gas sampling programme, the most important scientific exercise of the descent into the inner crater, occurred on December 20. Four boxes of gas sampling bottles broke free from the flying fox. Many bottles were smashed when the boxes broke open on the rocks of the steep slopes of the main crater.

Two members of the expedition, Drs Gigenbach and Sabroux, flew to Scott Base on December 22 to repair scientific equipment, including the gas sampling bottles and a machine used to analyse temperatures and gases. Bad weather delayed their return flight.

After a strong blast from the explosive vent on December 22 members of the expedition found that lava bombs from the inner crater had broken the main wire cable of the flying fox. One 50lb bomb wrapped itself round the cable, and the impact produced a whipping action which broke the cable in 10 places. It was replaced later in the day.

This explosion was the biggest for several days. The snow surface of the main crater was peppered with lava bombs thrown out from the vent. But worse was to come. The explosive vent, which previously had erupted only two or three times a day began to erupt more erratically and more violently, throwing out lava bombs into both craters, and even on the shoulders of the mountain.

### MAJOR ERUPTIONS

Early on Christmas Eve Mr Norman and Dr Tazieff announced their decision to abandon the planned descent into the inner crater. For eight hours before they had watched from the rim of the main crater more than half a dozen eruptions, several of them major. The eruptions hurled molten lava up to 1000 ft into the air, and splattered it over the floors of both craters. One lava bomb which landed on the floor of the main crater was estimated to weigh more than a ton.

Earlier had weather and the damage to the equipment had delayed the plans to make the descent into the inner crater on December 23. Although the decision to abandon the descent was made on that day, Mr Norman believed that when the weather cleared there might be a slim chance of a descent into the crater if volcanic activity decreased.

### WATCH RESUMED

When the weather cleared a 24-hour watch on the crater was resumed. Mr Norman decided that if activity in the crater showed no signs of abating in the first 24 hours there could be no descent. The watch began on December 27.

December 28 was the first clear day on Erebus since Christmas. Members of the expedition watched the inner crater.

The explosive vent was still erupting violently, and there was no chance of a descent.

The final decision to abandon any attempt to put men into the inner crater was made on December 29.

Altogether the expedition was on Erebus for three weeks and one day, including five days at the Fang Glacier acclimatisation camp. Its members encountered snow, high winds, and low temperatures. There were also the hazards of volcanic activity, which increased sharply before Christmas. One lava bomb of at least 200lb landed 100 yards from one of the tents in the summit camp.

There were only three or four windless days, and 14 were so bad that the men were confined to their tents, and working, reading or writing were impossible because of the cold. Temperatures ranged from minus 15deg to minus 37 deg, and averaged minus 25deg.

---

## Navigation Award to Dr Lewis

Dr David Lewis, the New Zealand-born adventurer who failed to circumnavigate the Antarctic Continent single-handed in his 32ft steel sloop *Ice Bird*, has been awarded the Royal Institute of Navigation gold medal — its premier award. The citation to the award says that Dr Lewis made a perfect landfall on his voyage from Australia to the Antarctic, which began in October, 1972, and his navigation appeared to have been faultless in atrocious conditions.

The institute's citation describes the voyage as a remarkable feat. Dr Lewis ended the first leg of his 17,000-mile journey on January 29, 1973, when he reached Palmer Station, the United States base on Anvers Island, off the Antarctic Peninsula.

The *Ice Bird* was repaired during the winter, and Dr Lewis began the second leg of the voyage on December 12. He abandoned his attempted circumnavigation on February last.



# REDUCED AIR SUPPORT FOR NZ RESEARCH PROGRAMME

New Zealand's Antarctic research programme last season was the biggest undertaken since Scott Base was established 18 years ago. Some 140 men and women worked at Scott Base and in the Ross Dependency; the largest number ever to visit Antarctica on New Zealand-sponsored programmes in one season.

Mr R. B. Thomson, superintendent of the Antarctic Division, Department of Scientific and Industrial Research, says it is unlikely that New Zealand will launch such a large programme in the immediate future. The loss of two Hercules aircraft by the United States Navy last season means that the New Zealand research programme will have limited air support for at least two seasons.

Also, it is unlikely that New Zealand will be involved again in two large international events simultaneously. These were the Dry Valley Drilling Project, and the Mt Erebus vulcanological expedition. These alone accounted for about 30 people, and New Zealand's logistic resources—transport, accommodation, and field equipment—were stretched to the limit.

Vanda Station, the small inland base in the Wright Valley, about 80 miles west of Scott Base, which has been a summer station since 1970, was occupied last winter. But unless there are sufficient scientific reasons for reopening it during the winter, it is likely to be used in future for summer research only, according to Mr Thomson.

## VICTORIA VALLEY

Established in 1968, Vanda Station will remain a summer station for a number of years yet, although not indefinitely. Mr Thomson says that the base has fulfilled not only New Zealand's scientific purposes but also those of the United States, Japan, and the Soviet Union. Very little work has been done in the nearby Victoria Valley, and the Antarctic Division might consider moving Vanda Station there once there is little left to do in the Wright Valley.

Vanda Station met the needs of field parties working in the dry valleys last season, and the station staff carried out magnetic and meteorological research. When the station was closed at the end of January about 300 people had used it. Normally it accommodates six to eight; on its busiest day of the season it accommodated 22.

Since the 1968-69 season Vanda Station has been the base for a glaciological and hydrological programme in the dry valleys. This has been part of a global study of climatic changes. The project has involved measurements of water balances, lake levels, and glaciers, and the data collected is expected to give an indication of whether the world is entering or leaving an ice age.

## FLOW INTO LAKE

Last season's programme was completed by a five-man team led by Mr T. Chinn, of the Ministry of Works and Development, Christchurch. The team monitored the water balance of the Wright Valley, including the inflow of water into Lake Vanda. It also checked the levels of Lake Vanda, and other important lakes in the dry valleys, made mass balance measurements of major glaciers to determine whether they are advancing or receding, and worked on snow pit studies on the glaciers.

An event eagerly awaited each season at Vanda Station is the first flow of water over the Onyx River weir into Lake Vanda. The water began to flow at 2.25 a.m. on December 10, and the occasion was marked by traditional celebrations. These began after Mr Chinn's team, the self-styled "Asgard Rangers," had reported the event by radio to Scott Base.

# Drilling through sea ice planned for next season

A major international project—drilling through the annual sea ice of McMurdo Sound—will be included in the New Zealand Antarctic Research Programme next season. The project had to be abandoned early last season because winter storms and high tides in McMurdo Sound broke up the ice, leaving no drilling platform.

Next season a New Zealand drilling team will drill two holes through the ice into the seabed in McMurdo Sound. The drilling will be done where the deepest sediments lie, but the precise location of the holes will not be decided until the results of a geophysical survey made from the United States Coast Guard icebreaker *Burton Island* last season are known.

Drilling of the holes in McMurdo Sound will mark the end of the Dry Valley Drilling Project, a three-year international programme developed by scientific organisations in the United States, Japan, and New Zealand. Since the project started New Zealand has been responsible for all drilling operations.

Because of the break-up of the ice in McMurdo Sound the start of last season's drilling programme on the shoreline of New Harbour at the eastern end of the Taylor Valley was delayed for several weeks. Also early in December the drilling rig collapsed when the New Zealand team had drilled to 1076ft at a site on the Commonwealth Glacier, 60 miles west of Scott Base, in the Taylor Valley. This hole was the deepest ever drilled on the Antarctic Continent.

## CHANGES MADE

Changes were made during the season in the drilling programme, which ended in January. Plans to drill on Black Island, which projects through the Ross Ice Shelf between Brown and White Islands, south of Ross Island, were abandoned. Also the team did not return to deepen the hole drilled in the 1973-74 season on Ross Island, near the earth sciences laboratory at McMurdo

Station. At the time the hole—about 1247ft—was the deepest to have been drilled on land in the Antarctic.

Drilling began at the end of October, the site at New Harbour being about a mile and a half from the 1973-74 season site. The drill was at 608ft when salt water penetrated the hole and froze the casing.

Early in December the drilling rig collapsed soon after the drillers reached 1076ft. After the rig had been repaired it was transferred to a site near an unnamed lake west of Canada Glacier in the Taylor Valley. The lake was later named Lake Leon for the supervisor of the drilling team, Mr Leon Olliver. Drilling at the Lake Leon site was completed early in January. The hole was drilled to a depth of 610ft, and basement rock was encountered at 544ft.

## WATER IN HOLE

Then the team returned to Don Juan Pond in the Wright Valley, about 80 miles west of Ross Island. In the 1973-74 season the drillers began drilling through sediment on the west side of the pond, but had to stop drilling because water started to rise in the drill hole, and might have contaminated the pond.

The Don Juan Pond second hole was drilled to a depth of about 247ft. Basement rock was encountered at 43ft. Most of the sediment, about 40ft in depth, was sand but there were some salty clay layers.

A site in the North Fork of the Wright Valley was drilled to complete the season's programme. The hole was drilled in a dry basin about two miles and a half west of Lake Vanda. Drilling stopped at just over 250ft, and basement rock was encountered at 93ft.



A Christchurch veterinary surgeon, Mr D. Marshall, starts the annual medical check of the Scott Base huskies. His helpers are Messrs J. Stevens (left), of Christchurch, and M. Wing (right), of Taupo.

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

## Husky pups born on Christmas Day

Christmas Day at Scott Base last year was marked by the birth of seven husky pups. Their mother, a five-year-old bitch named Vaska, had given birth to two litters previously.

Vaska, descended from a long line of Scott Base dogs, traces her ancestry from Australian origins. Her mate, Apolotok, was also born at Scott Base, although one of his parents was of British origin. Because of the degree of inbreeding in the Scott Base dogs two new dogs were obtained from the British Antarctic Survey base on Adelaide Island. They travelled by air to McMurdo Station in a B.A.S. Twin Otter aircraft leased by the Americans to ferry field parties working on the Ross Ice Shelf project.

When the season started the Scott Base team of 19 dogs was suffering from a long period of inbreeding. The new breeding line was started with the dog and the bitch flown from Adelaide Island.

After the arrival of the two large litters of pups at Christmas, the British bitch, Anthe, produced a litter. When the weak and poorly built dogs had been culled, the base was left with 12 good pups — a nucleus for future breeding, and the makings of a sledge team.

By next season the husky population is likely to be even larger. Two more bitches are pregnant and will give birth this winter.

## PLANS TO REBUILD SCOTT BASE

Scott Base, New Zealand's main scientific station in the Antarctica since 1957, has become shabby, cramped and inadequate for the scientists and field support staff who have to work there each season. Sketch plans and estimates of costs for rebuilding the base to meet New Zealand's needs for the next 20 years are now being prepared. In 1957 Scott Base, regarded as a model base for a small expedition, cost £39,663. Now rebuilding would probably cost at least \$1,000,000.

When it was first built the base was intended to house about 20 men. It is adequate for the 12 men who occupy it each winter, but it becomes seriously overcrowded each summer because of the expansion of New Zealand's research programme in recent years. While the base is not run down, it has deteriorated in the last 18 years, and maintenance costs have increased.

Lack of adequate laboratory space for the scientists, and accommodation in the summer are the most pressing problems. Normally there is sleeping accommodation for 40 men, but in the summer more than 60 have to be accommodated. In recent seasons the overflow has been accommodated in steel bunks or on stretchers in the storeroom, once a Royal New Zealand Air Force hangar. On occasions some staff have had to sleep outside in tents.

Working areas and storage space are restricted, and if personal accommodation is limited, recreation space is almost non-existent. The base has a tiny recreation room, but no separate lounge. The messroom doubles for this purpose, and also contains the library.

Scott Base is the last of the Antarctic stations built for the International Geophysical Year that is still in existence. Since it was established in January, 1957, all the other nations involved in scientific research in the Antarctic have rebuilt their bases completely or substantially. The last new building added to the Scott Base complex was erected in 1961.

A report on the future of the base was prepared for the Department of Scientific and Industrial Research in 1970. It covered the state of the build-

ings, physical requirements, and locality. Plans for rebuilding the base in stages over a period of five years were in preparation in 1973, and in December of that year an architect and two building services officers from the Ministry of Works spent two weeks studying the base.

This season the Minister of Justice (Dr Martyn Finlay) visited the Antarctic as the New Zealand Government's representative at the dedication of the new Scott-Amudsen South Pole Station. He made a private visit to Scott Base, and when he returned to New Zealand, he expressed his concern at the condition of the base and the cramped working conditions. He will discuss the subject with the Minister of Science (Mr C. J. Moyle) whose department is responsible for Scott Base.

Scott Base now covers 10,000 square feet. Present proposals are for a two-storey structure covering 17,000 square feet with improved facilities for male and female staff.



The Antarctic Division of the Department of Scientific and Industrial Research has appointed its first woman information officer, Miss Helen Cooke, of Auckland, who has been journalist with newspapers and a woman's magazine. She is the division's fourth information officer. Her predecessors were the Antarctic historian, the late Mr L. B. Quartermain, and Messrs H. F. Griffiths, and R. J. Stanley.

# Geological evidence links Tasmania with Antarctica

Rocks and fossils which indicate that Tasmania was joined to Victoria Land in the Cambrian period 500 to 600 million years ago were discovered this season by a major New Zealand geological expedition to the Bowers Mountains in Northern Victoria Land. The expedition, divided into two parties which worked independently, and spent two months in the field, was the main event of the New Zealand Antarctic Research Programme this summer.

Before the expedition scientists had, for some time, accepted that Antarctica and Australia were once much closer together, and shared a common sea life. But there have been many differences on the precise points of fit.

Previous rock comparisons indicated that the Bowers Mountains might have been linked with Tasmania, South Australia, New South Wales or Victoria. Dr M. G. Laird, of the New Zealand Geological Survey, Christchurch, who led one field party, said on his return that the rocks of the Bowers Mountains turned out to have many similarities with those of Tasmania, and were quite dissimilar to those elsewhere in Australia.

## FOSSIL STUDIES

Dr Laird's party's discoveries were supported by fossil information collected in the same region by the other party led by Dr R. A. Cooper, of the Geological Survey, Lower Hutt. This party's work was assisted considerably by Dr J. Jago, department of applied geology, South Australian Institute of Technology, Adelaide. He is an expert on Tasmania's rocks and fossils from the Cambrian period, and knew the Tasmanian sequence well enough to determine that the fossil sequence in the Bowers Mountains was similar to Tasmania's.

Dr Cooper's party brought back to New Zealand 1000lb of rocks containing fossils of 1in long or smaller brachiopods and trilobites, the former a shell-fish similar to some bivalves, and

the latter a primitive extinct arthropods like wood lice. These are now being studied, and Dr Cooper says there is enough work to be done on them to keep three men busy for three years.

Similar fossils were found in the Evans Neve area of the Bowers Mountains in the 1971-72 season by a party led by Dr Laird. This season Dr Cooper's party found well-preserved fossils in good condition in a dozen main localities.

Dr Cooper said that analysis of the latest finds would contribute greatly to the geological knowledge of Antarctica, and would tell a lot about the life that existed there. Also the discoveries would open the door to many different kinds of research that could not have been followed otherwise.

Although the most important potential result of the expedition was the possible link with Tasmania, it was not the only major achievement of the field parties. It was the first time any of the Antarctic basement sedimentary rocks had been studied in such detail. As a result there is probably more known about the geology of the Bowers Mountains than some parts of Australia and New Zealand.

## PUZZLE SOLVED

One of the main aims of Dr Laird's party was to investigate the thickness of the sedimentary sequence. Previous descriptions suggested that it was about 25,000 metres thick—almost as thick as the earth's crust.



New Zealand geological party's camp on the Leap Year Neve in the Bowers Mountains of Northern Victoria Land.

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

Dr Laird said that this was rather puzzling, and the party had to discover whether the sequence was really as thick as it had been described or whether it was complicated in some way. This was the case—the sequence had been folded considerably and repeated, and the thickness was actually only about 7,000 metres.

Dr Laird's party also spent some time studying pre-Cambrian rocks, and its discoveries should add to the knowledge of them. Samples of all rock units were collected by Dr A. Wodzicki, of the Geological Survey, Lower Hutt. He hopes to be able to determine the age of non-fossiliferous sequences by radiometric means.

During the 60 days the parties spent in the field they travelled more than 1000 miles collectively, using five sledges and three motor toboggans each. They met only once to compare notes and to rendezvous with a re-supply flight.

#### FEW DAYS LOST

Only six days out of the 60 were lost

because of bad weather. Temperatures were amazingly high for the area—slightly above freezing point on some days. Because the snow started melting sledge travel became difficult, and at times the scientists had to wade knee-deep in icy mush.

Dr Laird said that only about five per cent of the Bowers Mountains area was free of snow cover. Another complication was that one exposed outcrop could be separated from another by five miles of glacier. Gauging the geology of the snow and ice-covered area between the exposed rock sequences depended a great deal on "directed" guesswork.

Despite these difficulties Dr Laird is confident that the information collected by the parties will form an accurate picture of the geological development of the Bowers Mountains. It will also contribute a tremendous amount to the International Geological Correlation Project sponsored by U.N.E.S.C.O. to examine the geological relationship between Australia, Antarctica, and New Zealand.

## VICTORIA UNIVERSITY

# Scientific work on Erebus and in McMurdo Sound

An average of 1000 volcanic earthquakes a day was recorded on Mount Erebus in 26 days by scientists of the Victoria University of Wellington expedition who took part in the New Zealand, French, and American scientific study of the active Antarctic volcano last season. In addition to seismic studies on the mountain the expedition's scientific achievements included discovery of the world's most southerly sea water, and an oceanographic seismic survey of McMurdo Sound and Terra Nova Bay.

Last season was the 19th in which scientists from the university have worked in the Antarctic. There were 11 members in the expedition, and field parties worked on Mount Erebus, the Ross Ice Shelf Sea, and in the Taylor and Wright Valleys, and the Transantarctic Mountains. One team worked from the United States Coast Guard icebreaker Burton Island in the Ross Sea. Teams were in the field between November 14 and February 4, and were supplemented by field assistants from Scott Base.

Three scientists took part in the Erebus expedition. Mr P. R. Kyle continued his petrographic study of the McMurdo volcanics, Dr R. R. Dibble recorded seismic activity, and Mr J. Keyes continued the mapping and collection of saline deposits in the McMurdo region. The scientific results of their work, and that of other members of the expedition, are outlined in the report which follows.

Mount Erebus contains a permanent convecting lava lake of anorthoclase phonolite (kenyte) composition. The lake, one of only three permanent lava lakes in the world, has expanded in size since 1973. The other lakes are in Ethiopia and Zaire (and because of political situations in those countries are inaccessible to vulcanologists). Erebus is unique in being the only phonolite lava lake—the others are basaltic.

Although the lava lake could not be sampled because of dangerous eruptions in the inner crater, bombs were fre-

quently thrown out on to the main crater floor and crater rim, and could be sampled. The only difference between such material is probably the loss of volatile gases from the bombs.

Three slow motion type seismographs and an ink chart recorder of seismic power were used by Dr Dibble to record seismic activity. They were placed at five sites: three surrounding the main crater at a radius of one kilometre; one in the ice cave near the expedition's camp at a radius of .5km; and one near the main crater centre.

Twenty-six days of recording were obtained between December 3 and 31, including 12 days with simultaneous recordings at all five sites. No volcanic tremor was recorded, but an average of 1000 volcanic tremors a day was recorded. In 24 hours of documented visual observation of the inner crater, all earthquakes in the higher level were explosion earthquakes corresponding with explosions of either the main vent or the laval lake.

### LAVA BUBBLES

Some smaller earthquakes were accompanied by eruptions, but those accompanying the bursting of large bubbles in the lava lake were too small to be recorded. Safe periods for the descent into the inner crater could not be predicted from the seismic recordings. As yet, the type and location of the explosions and eruptions cannot be recognised from the seismograms because they are all different.

However, the general level of activity over long periods could undoubtedly be followed by means of a radio telemetry seismograph at the southernmost of the five sites, recording at Scott Base. This would aid the planning of future expeditions to the volcano.

Salt and soil samples were collected at Mount Kempe in the Royal Society Range, Table Mountain in the Taylor Valley, Knobhead on the Ferrar Glacier, Lake Bonney, Black Island, the Mount Erebus summit plateau and crater area, and the Fang where the Erebus expedition had its acclimatisation camp. Soil temperature and moisture profiles were measured in many different localities in these areas.

### SALT MOVEMENT

Systematic sampling on and about mudflows and flooding experiments, all on Black Island, may produce a semi-quantitative estimate of the rate of salt movement to the surface in this particular location. Further correlations may be made between the rates of salt accumulation and recent glacial history after investigations of the series of moraines documented in 1969 by P. Vella.

Coloured and black zones and layers in glacier ice, sampled in previous years, were investigated at the Fang, at Knobhead, and on the Kempe Glacier. At the latter location the layers appeared to be composed of fine basalt scoria.

A study of the salts and sublimates of Mount Erebus, started in 1972-73, was completed around the summit plateau area. Salts and sublimates were sampled more extensively inside the main crater, and at two places on the inner crater wall.

Warm ground temperature profiles were measured at several locations both inside and outside the main crater. The highest temperature measured was only 79.6deg C. This was .9deg C lower than that of the same fumarole in early January, 1973.

### SEDIMENT STUDIES

Glacial sediment studies included investigation of cores from the Dry Valley Drilling Project, a journey to the Crary

Ice Rise near the head of the Ross Ice Shelf, and work on Table Mountain and the snout of the Taylor Glacier.

The discovery of two layers of ground moraine separated by river gravels at 1800m on Table Mountain indicates two distinct periods of temperate glaciation separated by a warm period. Previously only one such glaciation prior to five million years ago had been postulated to account for the scattered high level moraines in the Trans-antarctic Mountains.

As reported elsewhere in "Antarctic", sea water was discovered in a rift on the Crary Ice Rise. The rift, about 15m deep and 2m wide, has a floor of ice 10cm thick, which can easily be broken. The water beneath is salty, and has the same freezing point and salinity as normal sea water. The rift is 500km south of the southern margin of the Ross Sea.

About 120 samples were taken from cores drilled by the Dry Valley Drilling Project. Another 100 were taken from around Table Mountain, Taylor Glacier, and New Harbour for comparative study.

### DRILLING SITES

More information on the structure and thickness of sediment in McMurdo Sound was obtained from the oceanographic seismic survey carried out from the icebreaker *Burton Island*. The results of the seismic profiling programme will also indicate the best sites for the Dry Valley Drilling Project to drill through the annual sea ice into the bed of the sound next season.

A very thorough profiling programme was carried out in Terra Nova Bay and McMurdo Sound. It was aided by good profiling weather—low wind speeds, open water further west and south than usual, and few major equipment faults.

Preliminary investigation of the results in Terra Nova Bay appear to show two major glaciations to have shaved the sediment cover off to about 450m and 650m below present sea level, possibly caused by extended grounding of the Ross Ice Shelf. There was later deposition of more than 300m of glacial moraine in places. An unusually deep



area was found in Terra Nova Bay (1300m); total sediment thickness here exceeds one kilometre.

In McMurdo Sound there are many infilled valleys with sediment thicknesses up to 500m. These layers seem to dip at between  $\frac{1}{2}$ deg and 2deg to the west in the northern part of the sound, whereas in the southern part acoustic bedrock (basalt?) has little sedimentary cover and a rugged topography. Hence on first appraisal it seems that better results from drilling would be obtained as far north as the condition of the winter ice permits.

### VALLEY FIORD

Sediments considered to have had their origin within a fiord in the Taylor Valley were described and sampled in detail. These were the "silty till deposits"—the bedded polymictons. At 10 measured sections (maximum 30m thickness) in the valley, rather similar fine sediments and inclusions, interbedded with coarse sands, pebbly sands, and very coarse unsorted material (till) are recognised below 300m elevation.

These sediments are considered to have originated in a similar manner (but are probably younger) to those named as basal silts (propsect till) in the Upper Wright Valley. Cores from the Dry Valley Drilling Project hole on the Commonwealth Glacier showed that as predicted, the bedded polymicton and till sediments were appreciably thick—in fact some 300 metres.

A minimum age for the formation of the Taylor Valley "fiord" may be determined from radiometric ages of the few tuff beds recognised, and also from secondarily transported basalt scoria.

In the Lake Vids region the Victoria Drift and Insell Drift were examined over a wide area for comparison with the established basal silt till of the Wright Valley. Natural outcrops were found to be limited. However, a probable fine-grained tuff bed was sampled.

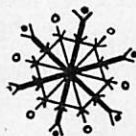
Twenty-one stratigraphic sections were measured between the Royal Society and Olympus Ranges. Detailed sampling for mechanical and chemical analysis was performed at each locality.

### OLD FORMATION

Near 600 paleocurrent measurements were taken on appropriate structures within the New Mountain Sandstone, the oldest formation in the Beacon Supergroup. Detailed statistical analysis of this data will show any lateral and vertical changes in transport direction within the sandstone.

Evidence for major rafting by dolerite sills was found at New Mountain. Previously the sill was thought to split the Terra Cotta Sandstone. It was established that in fact the whole of New Mountain has been rafted 3km west by the peneplain sill.

Samples of basement granites were taken for radio metric dating. They came from the basement contact at New Mountain, Mount J. J. Thompson in the Taylor Valley, and Mount Odin in the Wright Valley.



## NEW BATHTUB TAPS

One of the prized facilities at Scott Base is a bathtub, which, for many years, was claimed to be the only one on the Antarctic Continent. Two years ago someone removed the taps.

When the lack of taps was discovered instructions were given for new ones to be obtained. Forms were duly filled in for the requisitioning of two bath taps in the approved manner. This summer they arrived—two years later.

The bath now has its taps, but it is not used because the men at the base take showers. It remains as a relic, and has been retained because it can be used for quickly warming anyone who gets overexposed.

## Census shows little change in Cape Bird penguin rookeries

There has been no significant change in the numbers of Adelie penguins in the three rookeries in the Cape Bird region of Ross Island since the last census five years ago. This was indicated by a total count of 36,246 nests made between November 27 and December 2 last year by a biologist working with the University of Canterbury research programme during the 1974-75 summer season.

Five biologists and two geographers were involved in the programme. Two women, Miss Joy Woods and Mrs Jo Knight and three men, Paul Sagar, Chris Paulin, and Grant Knight were the biologists. Dr Robert Kirk and David Harrowfield were the geographers.

The Cape Bird station was opened on October 22 by Mr Sagar and Mr W. C. King, a field assistant from the Antarctic Division, D.S.I.R. Because of the mild winter the main hut and wet laboratory were in good condition, and little snow had to be shovelled clear.

Scientific equipment arrived on November 2, and Mr Sagar was able to continue for the third season his studies of the common bottom dwelling amphipod (*Paramoera walkeri*). These shrimp-like crustaceans are the most abundant shallow-water marine life in the region, and are a major food source for the many bottom-dwelling fish.

On November 9 Mr Paulin arrived to begin his study of the breeding success of Adelie penguins in the area. This involved daily checks of more than 300 mapped nest sites to determine egg numbers, eggs lost, eggs hatched, and chicks reared. Then he completed his census of the three rookeries between November 27 and December 2.

Miss Woods and Mr and Mrs Knight arrived on December 16. Miss Woods intended to study the fecundity of a microscopic fresh-water rotifer in a temporary salt water lake. This study had to be curtailed because poor snow falls in the previous winter had not

raised the lake level sufficiently. However, she was able to carry out diurnal studies on a permanent lake to ascertain factors affecting the rotifer's behaviour.

The Knights studied the nutrient input from streams in the area. Two of these were of particular interest because one flows through a penguin rookery, and in the process flushes away large amounts of guano that forms a thick layer round the penguin nest sites. The other stream drains the scoria-covered hillside and descends in a waterfall to the beach.

Having completed their work, Miss Woods and Mr Sagar returned to Scott Base in the helicopter which brought Dr Kirk and Mr Harrowfield to Cape Bird on January 13. Dr Kirk and Mr Harrowfield had aerial photographs taken the previous day of Priapullos Point, about three kilometres south of the Cape Bird hut, and planned a survey of the origin of the point and its development.

Because of the loss of two United States Navy Hercules aircraft on January 15 and the consequent shortage of air transport back to New Zealand, the Cape Bird station had to be closed earlier than expected — on January 21.

Despite the early closing of the station, and the inevitable loss of work time because of the weather, the summer was rewarding for both the biologists and the geographers. They were not the only ones to have a good summer at Cape Bird; the McCormick skuas and the Adelie penguins also had a successful season.

## WAIKATO UNIVERSITY

# Many traces of minerals found by party in Brown Hills area

Many traces of low-grade sulphides of iron, lead, and zinc, and traces of copper, were found by scientists from the University of Waikato last season when working in the Brown Hills area of the Trans-antarctic Mountains, 150 miles south of Scott Base. Later in the season members of the university party established that salt deposits below the bottom of Lake Bonney in the Taylor Valley might be at least eight million tons. Drilling in the 1973-74 season indicated at least two million tons.

Traces of mineralisation in the Brown Hills area were discovered accidentally when six members of the expedition went for a Christmas Day walk on frozen Lake Wilson, which is about six miles in side Australian Antarctic territory. Copper staining was found in a moraine, and further investigation showed that many rocks in the moraine had sulphide mineralisation.

United States scientists at McMurdo Station later confirmed the mineralisation. Samples have been brought back to New Zealand for analysis. Next season an economic geologist may visit the Brown Hills to make detailed field examinations.

Dr C. Hendy, leader of the expedition, who is a geochemist, emphasised that the discovery did not necessarily mean there was an ore body or, even if one were found, that it would prove economic. There were clues to suggest a possible ore body but no conclusions could be drawn.

Dr T. R. Healy, another member of the party which made the discovery, said it was geologically right to find such mineralisation in the Trans-antarctic Mountains. It was somewhat surprising that no discoveries had been made previously.

In the 1973-74 season the University of Waikato expedition made a detailed bathymetric and sediment survey of Lake Bonney. Although the extreme

salinity of the lake was known previously, the party discovered and mapped a very large deposit of halite (common salt) below the lake bottom. Drilling indicated that the salt occurred uniformly over the flat floor of the eastern lobe of the lake, and that the deposit was at least two million tons.

Further investigations last season revealed that there could be at least eight million tons of salt beneath the bottom of the lake, and according to Dr Hendy, as much as 30 million tons. In the 1973-74 season drilling yielded 2ft thick cores of large sodium chloride crystals instead of sediments; last season the scientists found that the salt deposit was even deeper.

Lake Bonney's salt is worth millions of dollars at present prices, but Dr Hendy says that there are problems for anyone who thinks it can be exploited commercially. These include the extreme cold and difficult terrain of the area, and finding a way to transport the salt before it melts.

Ordinary table salt has no moisture content. The Lake Bonney salt has two molecules of water to every molecule of salt. At temperatures above minus one degree Celsius the salt just melts away.



## Sea water found in ice shelf

Sea water beneath the Ross Ice Shelf 770 kilometres from the South Pole was discovered in a rift on the Crary Ice Rise last December by two New Zealand scientists, Dr P. J. Barrett and Mr R. D. Powell, of the Victoria University of Wellington expedition were in the area, 700 kilometres south-south-east of Scott Base to investigate a patch of dirty ice discovered by geophysicists from the University of Wisconsin in the 1973-74 season.

Dr Barrett and Mr Powell were flown to the Crary Ice Rise area by a Hercules aircraft of the United States Navy's VXE6 Squadron. In their search for the dirty ice from which they wanted to obtain rock samples the two men used a team of 11 dogs from Scott Base. This was the first time in about 10 years that scientists had used a dog team for field work.

Although the Victoria University team did not achieve its main objective—it was unable to locate the dirty ice—the discovery of sea water so far into the Ross Ice Shelf was probably a far more important achievement, according to Dr Barret. The investigation of the dirty ice had been expected to provide data on the character of sediment trapped in the ice of the shelf.

The most significant aspect of the discovery of the sea water was that it contained some reddish-brown filamentous algae. How the algae got there is not known, but the results of the analysis of samples of it and the sea water are expected to be of great value and interest to oceanographers and marine biologists. This was the first time the sea water beneath the Ross Ice Shelf had been sampled.

Originally the glacial sediment studies were to be made from cores obtained in the drilling of holes through the seabed of McMurdo Sound. The Dry Valley Drilling Project team had to postpone this week. Dr Barrett and Mr Powell then continued the ancillary programme of sediment and pebble sampling from known sediment environments.

The aim was to obtain baseline data to help interpret data from cores obtained during the DVDP operations.

On this programme the team worked at Table Mountain, which is south of the junction of the Ferrar and Taylor Glaciers, and on the Taylor Glacier. They discovered a strata at 1800 metres on Table Mountain which indicated two distinct periods of temperate glaciation, separated by a warm period.



## Old Byrd station antenna

A satellite tracking antenna abandoned when Byrd Station was closed in 1972 was flown to New Zealand last season for installation at the auroral station operated by the Department of Scientific and Industrial Research at Lauder, Central Otago. The antenna—a 16ft diameter parabolic dish—and its ancillary equipment were given to New Zealand by the United States National Science Foundation.

Mr A. F. Creswell, supervisor of the telemetry station at Lauder, and two members of the Scott Base summer support staff, Messrs K. P. Riddell and K. J. Dawson, flew to Byrd Station at the end of last year. With American assistance they spent three days dismantling the antenna and packing it in readiness for the flight back to New Zealand, the cost of which was met by the National Science Foundation.

## B.A.S. ACTIVITIES

# Adelaide Island as base for operations in south

In future the British Antarctic Survey will base all its operations south of Marguerite Bay on Adelaide Island. Early this month the Stonington Island base, first established in 1946, was closed, having been occupied for 21 years altogether. It may be used for some field parties.

As a further economy measure the Fossil Bluff advance base in George VI Sound will be closed for the winter after 1975. The transfer of the Adelaide Island base to a new site at Rothera Point, 40 miles to the north-east is also being considered.

The Royal Research Ship John Biscoe arrived at South Georgia early in December and spent several weeks assisting field parties in several localities. She also worked with H.M.S. Endurance on a survey of the seabed at the south-eastern end of the island.

After calling at the Falkland Islands, the John Biscoe landed geologists and geophysicists on islands in the South Shetlands to continue their long-term investigation of the Scotia Arc. Deception Island, which had erupted in 1967, 1969 and later, appeared to be quiescent.

At the beginning of January the ship proceeded to the west coast of the Antarctic Peninsula and relieved the Argentine Islands base. As ice still blocked access to Marguerite Bay, she returned to the South Shetlands and landed field parties on King George Island.

In mid-January the R.R.S. Bransfield visited the Argentine Islands. She relieved the American Palmer Station — taking in men and supplies — and then continued south to Adelaide Island. While in Marguerite Bay, she reconnoitred the access to Rothera Point, which is being considered as a possible alternative to the present Adelaide Island base site.

At the end of the month she returned to South Georgia to continue the transport of field parties. Then she carried

out a geophysical run to the South Orkney Islands before proceeding to Halley Bay, where she arrived on February 8.

Unloading was hampered by lack of a suitable landing site, and by bad weather, rough seas and pack ice. It took several weeks to complete.

The present Halley Bay base, which was finally occupied last season, continues to operate satisfactorily as a static geophysical observatory, most of the possible overland field work having been completed. The Argentine Islands base is also a static geophysical observatory, but on South Georgia, the programme includes life sciences and earth sciences as well as geophysics, and field work is in progress in a number of areas. In the South Orkneys, a wide range of programmes is being run from the Signy Island biological laboratory. Most of the programmes are confined to Signy and inshore waters.

In the southern part of the Antarctic Peninsula field work from the Marguerite Bay bases (Adelaide Island and Stonington Island) and from Fossil Bluff in George VI Sound, had to be curtailed at the beginning of the summer, as the Bransfield was late in delivering supplies. She was delayed by storm damage sustained while crossing the Atlantic.

The chief disruption was caused by a shortage of aviation fuel which limited

the air support to field parties. Unfortunately, the B.A.S. programme was less flexible than usual, because one of the two Twin Otter aircraft was committed to a mid-season United States-British glaciological project on the Ross Ice Shelf.

This aircraft was flown to McMurdo Station by way of Siple and Byrd Stations on November 15. The programme was completed satisfactorily and the aircraft returned to Adelaide Island by way of the South Pole on December 29.

Another Twin Otter, on hire from a Canadian firm, flew to McMurdo Station late in December to continue the work. It landed to re-fuel at Adelaide Island British Antarctic bases between 1944 and 1948.

At Adelaide Island, the snow landing strips continue to deteriorate alarmingly, lack of snow cover after a series of relatively mild seasons having revealed innumerable crevasses. Priority is therefore being given to find new landing sites at Rothera Point, 40 miles to the north-east. Preliminary reports are not very favourable, but indicate that the sites would be greatly preferable to those at the present site.

### MILD WEATHER

Re-assessment of Doumer Island, as a ship-aircraft landing facility, has confirmed that, although not ideal, it is a great improvement on the Anvers Island site which has also deteriorated. A number of men was landed at Doumer Island by the Biscoe at the beginning of the season, and flown south to Marguerite Bay when persistent ice still prevented access by sea.

Much of the Antarctic Peninsula has experienced exceptionally mild weather and, in December, the Argentine Islands reported temperatures up to plus 6deg C (plus 43deg F) and 35mm (1.5in) of rain! This has accelerated the melt and large areas of the ice-capped islands are now brown with mosses and lichens.

Field work this season has progressed in a number of localities near George VI Sound and in Palmer Land. Glaciologists have continued work on Spartan Glacier,

north of Fossil Bluff, and other parties have worked at the south-western end of the sound and on the east coast of the peninsula.

A number of senior B.A.S. staff visited the bases this season. Among them were Dr Raymond Adie (deputy director), Mr Nigel Bonner (head of life sciences), Dr Charles Swithinbank (head of earth sciences) who is continuing his programme of radio echo ice-depth sounding, Dr John Dudeney (head of the ionospheric section) and Mr William Sloman (head of administration).

### IMAGERY MAPS

Seven pairs of 1:250,000 line maps and photomaps of the Antarctic Peninsula were produced last year by the Directorate of Overseas Surveys from satellite imagery provided by the United States Geological Survey. These, which were the first maps to be produced on such a large scale from satellite imagery, are proving extremely useful as field sheets. They have a planimetric accuracy comparable to the conventional 1:250,000 sheets, the resolution being about 80m.

The imagery gives no idea of height but topographical information provided by the shadows has been supplemented by spot heights. Production of the sheets required detailed interpretation and the development of new methods of reproduction, some features being reproduced photographically. It will now be possible to produce further sheets quickly and cheaply as more imagery becomes available.

### NEW BUILDING

The B.A.S. administrative office moved to temporary premises in the centre of Cambridge in mid-January, but the scientific divisions, which are at present scattered around the country, will not be transferred until their particular sections of the new building are ready for occupation. Work on the new building was held up by exceptionally wet weather in the autumn, but is now progressing satisfactorily and should be completed by the middle of 1976.

# Three U.S. winter stations now manned by civilians

Scientists of seven nations took part in the United States Antarctic research programme during the 1974-75 summer season. There were 80 research projects in the programme, and about 300 scientists, mostly from the United States, but also from New Zealand, Australia, France, Britain, Japan, and the Soviet Union, passed through McMurdo Station. They worked at McMurdo, South Pole, Siple, and Palmer Stations, at remote field sites, and aboard research vessels in Antarctic waters.

When the summer season ended on February 19 with the departure of two United States Navy Hercules aircraft from McMurdo Station, 86 Americans remained to spend the winter in Antarctica at the four winter stations. Forty-seven Navy men and six civilian scientists and technicians will work at McMurdo Station until it is re-opened in September.

Three other American winter stations are manned by civilians. There are 17 at the new Amundsen-Scott South Pole Station until November, and five at Siple Station, 1350 miles from McMurdo Station, at the foot of the Sentinel Mountains in Ellsworth Land. Palmer Station on Anvers Island off the Antarctic Peninsula has a winter team of 11.

Since 1955 the United States Navy has provided logistic support for the scientific projects conducted under the auspices of the National Science Foundation. For the first time it does not have a winter crew at the South Pole. Since 1957 it has maintained the research station there in co-operation with scientists of the National Science Foundation. But in November, 1974, the last Navy winter crew left the original Amundsen-Scott South Pole Station, which now remains closed under 40ft of snow and ice.

Navy support operations began early in October, and for the first time in years no major blizzards hampered the season's activities. With fine weather, the Hercules ski-equipped aircraft and helicopters of the Navy's VXE Squadron were able to fly almost at will, transport-

ing men and supplies to the inland stations, and putting scientific parties into the field.

Completion and dedication of the geodesic dome complex at the new Amundsen-Scott South Pole Station on January 9, was the major event of the season. This station, which cost \$7 million, was built for the National Science Foundation over the last five summer seasons by Navy Seabees (Mobile Construction Battalion 71).

A simple ceremony marked the formal opening of the new station. It took place in fine weather about 5.45 p.m. The sky was clear, there was no wind, and the temperature was minus 10deg Fahrenheit. There were 25 visitors, who had flown from the United States, and the Pole population rose to 75.

One woman attended the ceremony. She was Mrs Ruth Siple, widow of Dr Paul Siple, who took part in the construction of the first station in 1956, and was the scientific leader in 1957. Congressman J. J. Pickle represented the United States Government, and Norway was represented by Dr T. Gjelsvik, director of the Norwegian Polar Research Institute, and president of the Special Committee for Antarctic Research. New Zealand's representatives were the Minister of Civil Aviation (Dr Martin Finlay) and Mr R. B. Thomson, superintendent of the Antarctic Division, Department of Scientific and Industrial Research.

Dr H. Guyford Stever, director of the National Science Foundation, read a letter from President Ford in which he said that the dedication of the new station

was a rededication by the United States of the ideals of the Antarctic Treaty. By making the results of its South Pole research freely available, it reiterated its commitment to the objectives of the treaty. By making the station accessible to scientists of all nations, the United States reaffirmed its devotion to the ideals of co-operation which were characteristic of Antarctica.

Dr Stever presented President Ford's original letter to the station manager, Mr R. Wolak, for permanent display. Dr Gjelsvik presented a framed photograph of Roald Amundsen's tent at the Pole, and copies of the pair of boots the Norwegian explorer wore on his journey.

Warm weather and tidal action caused a large and early breakout of the ice

in McMurdo Sound towards the end of February. The breakout this year included part of the front edge of the Ross Ice Shelf measuring about 160ft thick. As the icebergs floated past McMurdo Stations parts of the Williams Field ski-way were sighted.

Most of the equipment used in Antarctic operations still has to be transported by sea because of its weight and bulk. In mid-January the veteran supply ship Private John R. Towle, was assisted through the ice in McMurdo Sound by the United States Coast Guard ice-breakers Glacier and Burton Island. She discharged 4,500 tons of cargo and food at the ice wharf in Winter Quarters Bay.



## *Mites found 370 miles from Pole*

Small, colourful organisms, believed to be mites, were found on the water of melt-pools in the Duncan Mountains, east of the Liv Glacier, by Ohio State University geologists working in the area last December. They were about 370 miles from the South Pole, and at a height of 2296ft.

One of the geologists, Mr Arthur Browning, made the first discovery on December 13 when he decided to drink from a small melt-pool. He saw a small flake on the water separate into spots and then reassemble. Examination through a hand lens showed that each spot had small, active legs.

The individual organisms were from two to three-tenths of a millimetre long. They had rose-pink front portions and legs, and the main mass of the body was dusky purple.

In the area where the organisms were found lichens grow around small puddles caught on schist bedrock in basins less than 18in across. The wind generally blows from the east along the Transantarctic Mountains.

When Mr Browning and the rest of the party, Messrs Ed Stump (leader), Phil Colbert, and Bob Oakberg, looked back up the arete they found more specimens on the surface of another puddle.

Similar organisms have been found at other high latitude locations, and in the coastal areas of Antarctica. New Zealand field parties have discovered terrestrial insects and mites close to the southern limit of fauna and flora.





# Hercules aircraft damaged near Wilkes Land ice dome

Air support for French glaciological research in East Antarctica has been costly for the United States Navy's support force. Near Dome C, an ice dome in Wilkes Land, lie two Hercules aircraft damaged in take-off accidents on January 15. Another Hercules crashed 125 miles south of Dumont d'Urville three years ago.

In the next two seasons an attempt may be made to tow the two aircraft, worth about \$17 million, 683 miles over the ice to McMurdo Sound for repairs which would allow them to be flown back to New Zealand. There are also plans to salvage what is left of the Hercules abandoned to the elements in 1971.

Loss of the two aircraft towards the end of last season did not cause a major upset to air operations. But the Navy's VXE6 Squadron was left with only three ski-equipped Hercules aircraft, and the transport of men and cargo to inland stations was seriously hampered. Alternative arrangements had to be made for the return of men who had spent the summer season in Antarctica. And before next season replacements will have to be found for the immobilised aircraft.

Since the 1971-72 season French scientists have been making glaciological studies in East Antarctica along a line between Carrefour, a small station on the icecap at 66deg 50min S/139deg 15min E, about 25 miles south of Dumont d'Urville, and the Soviet Vostok Station. Their research is part of the International Antarctic Glaciological Project in which Australia, France, the Soviet Union, and the United States are participants.

Late last year a camp was established at Dome C, an ice dome (area of maximum elevation) at 74deg 30min S/125deg E, which sits on some of the world's thickest known ice. Five French and American scientists were flown to Dome C from McMurdo Station on December 26 to collect shallow snow samples and obtain other data.

On January 15 a Hercules flew to Dome C to pick up the field party and

its samples. During takeoff a jato (jet assisted takeoff) bottle exploded. It damaged the fuselage and started a fire in the right inboard engine.

The aircraft skidded in a half circle as it came to a stop. The fire spread to the outboard engine, and destroyed the right wing. No-one was injured.

Another Hercules which had left McMurdo Station on a flight to Byrd Station responded to the call for help, and flew direct to Dome C. After picking up the five passengers and five crew members, it began its takeoff without jato bottles.

During the long takeoff run the nose ski collapsed, puncturing the fuselage, and the cargo compartment filled with swirling snow. The lower nose fuselage buckled in several places before the aircraft came to a stop. Again no-one was injured.

A third Hercules was sent to Dome C with a rescue team from McMurdo Station after a report of the first accident. It returned the passengers and crew to McMurdo Station several hours later without incident. The scientists' snow samples were recovered on a later flight.

A special technical evaluation team flew to the accident site at 74deg 40min S/123deg 50min E on January 26 to assess the damage to the two aircraft, and to report on how they could be re-

covered. Its preliminary survey indicated that they could be repaired but not where they were. They could be towed over the ice to McMurdo Station where they could be prepared for flights to New Zealand for final repairs. Towing and repairs would probably take two seasons.

No decision has been made yet to adopt these recommendations. Surveys would have to be made to find a practicable route over which bulldozers could tow the aircraft from Dome C to McMurdo Station. This would mean a

major traverse next season to the accident site.

Recovery of what is left of the \$3.5 million Hercules which crashed on December 4, 1971, after a supply mission to a French traverse party 125 miles from Carrefour would be more difficult. It crashed in rough terrain which is not suitable for air operations without a ski-way on the icecap.

Next season a French party might make a traverse to the area to prepare a ski-way. This would enable aircraft from McMurdo Station to operate more safely.

## NUCLEAR POWER PLANT DISMANTLED

Antarctica's only nuclear power plant, established in 1962, and shut down in 1972, no longer exists. The reactor vessel which held the nuclear core, was shipped back to the United States last season. Only three buildings remain on the site on the slopes of Observation Hill overlooking McMurdo Station.

Nuclear power provided heating and lighting at McMurdo Station for more than 10 years. The plant was operated from March, 1962, to September, 1972, when it was closed because of possible corrosion. Since then power has been supplied by diesel generating plant.

An inspection of the plant in 1972 revealed that insulation containing chlorides around the reactor piping system had become wet. No corrosion cracking was found, but the high cost of a full inspection — at least \$US1.5 million — resulted in the decision to dismantle the plant and remove it.

For the last three summers a special unit of 20 men has been dismantling the plant. This will cost less than \$1 million. The nuclear core, turbine, generator, steam piping, and condensers, were removed in the 1973-74 summer.

Last season the United States Navy's decommissioning team dismantled the reactor vessel, which contained the

nuclear core, and the spent fuel tank. A safety analysis of the carriage of waste nuclear materials by ship was made before the plant's primary system, including the reactor vessel encased in a concrete "coffin," was placed aboard the supply ship Private John R. Towle. The Towle called at Lyttelton on her way back to the United States.

Next season a civilian contractor will be brought from the United States to check the surrounding land for radioactive "infection." If any contaminated soil is found under and around the reactor vessel, it will be shipped to the United States. There it will be placed with radioactive waste from the plant in a nuclear "graveyard" in Georgia.

Once the area on Observation Hill is declared sterile the National Science Foundation will probably take over the three buildings left on the site. They will be moved down to the main area of McMurdo Station.

Since the dismantling began regular checks have been made of air and water for traces of radioactivity. Reports on these checks at McMurdo Station, which is about three miles from Scott Base, have been sent regularly to the New Zealand authorities.

# Two icebreakers break out from pack in Weddell Sea

Two icebreakers trapped in ice up to 25ft thick in the Weddell Sea early this month faced the prospect of imprisonment for the winter. But after nearly a week the United States Coast Guard's Glacier, and the Argentine Navy's General San Martin won their race against the swiftly approaching winter, and broke through to open water, on March 11.

Another Coast Guard icebreaker, the Burton Island, was caught in the pack ice, but only for a day, late in February. She was heading north after a voyage into the unexplored eastern part of the Amundsen Sea. Later she was sent to aid the Glacier and the General San Martin.

Both the Glacier and the General San Martin were held in the ice about 18 miles apart in the Erebus and Terror Gulf near the north-eastern tip of the Antarctic Peninsula. The Glacier was 36 miles north of Seymour Island, and the General San Martin 24 miles. Because of engine trouble the Argentine icebreaker, which had been supplying bases off the Antarctic Peninsula, became wedged in thick ice on February 25.

The Glacier was on her way back to California after oceanographic work in the Weddell Sea when she and the Burton Island were called to assist the General San Martin. While the Burton Island stood by in open water 12 miles away, the Glacier began to break through the ice towards the General San Martin.

## PROPELLER DAMAGE

After several hours of ice-breaking, a slow rocking vibration in the ship's propellers was reported. The Glacier was stopped, and a diver discovered that two blades on the starboard propeller had been sheered off by the thick ice.

When it appeared that the Glacier might be forced to remain in the ice for the winter, plans were made to conserve fuel and food supplies. Eight civilian scientists and three high school sea cadets were transferred by helicopter to the Burton Island despite a snowstorm and bitterly cold weather.

Ninety men of the Glacier's crew of 211 volunteered to remain aboard for the winter. Later 37 men and 13 scientists, including five from the Burton Island, were flown in the Glacier's helicopters to a nearby island, and then to the Argentine Air Force base, Vice-Comodoro Marambio, on Seymour Island. From there they were flown to the United States. Eight men were also lifted off the General San Martin as a precautionary measure.

## SLOW PROGRESS

By March 9 the Glacier, with the use of only one of her two propellers, was about four miles from the open sea. The General San Martin had also been able to turn in the ice, and make slow progress along a lead, heading west to the north side of Seymour Island where the ice was not so thick.

Early on the morning of March 11 the Glacier freed herself from the ice, and reached the open waters of the Antarctic Sound. A gale the day before with 35-knot winds, blowing snow, and zero visibility, shifted the ice a little to the ship's advantage, but disrupted evacuation flights. The General San Martin, which was further south, struggled free a few days later, and resumed her mission.

Early in February the Burton Island left McMurdo Sound with a team of surveyors and scientists on a reconnaissance of Pine Island Bay and Lindsey Island, off the Walgreen Coast of Marie Byrd Land. Delay to the icebreaker Staten Island, and heavy ice in the area, caused the survey—part of a study for a deep-water port in the area—to be cancelled in the 1973-74 season.

Three weeks before she left McMurdo Sound the Burton Island suffered minor damage when she and the Glacier were engaged in breaking a channel in the ice to McMurdo Station. She was escorting the supply ship Private John R. Towle up the sound. The Private John R. Towle smashed into her stern and punched a hole 2ft wide in her side at main deck level.

### ISLAND STUDY

With a team of specialists from the United States Geological Survey and the National Science Foundation aboard to study a group of islands in Pine Island Bay, the Burton Island reached 70deg S/105deg W on February 13, and began probing the margin of the pack ice in overcast, foggy weather. She used her helicopters for reconnaissance before moving into the pack.

Satellite photographs showed a large area of open water between the coast and the 20-mile wide band of pack ice. Aerial photography revealed later the group of islands at the entrance to Pine Island Bay.

With the aid of the ship's two helicopters aerial and ground surveys were made of two practically ice-free islands, and adjacent areas. On one island there was a large penguin rookery, and the

survey team also found lichens and mosses, and large numbers of skuas on the melt-water lakes.

When the Burton Island left the area to head north, she encountered difficult ice conditions with tightly packed floes, and rifting where the pressure forced the ice into ridges. For a day she backed and rammed the close pack, making only a few hundred yards' progress.

The helicopters were launched and flew ahead of the ship to locate areas of weakness and potential leads in the ice. With their guidance the Burton Island was able to break loose and force her way through the pack to open water.

Added to the complications of breaking out of the ice pack was the illness of one of the crew who developed suspected appendicitis on the voyage north. As there was no doctor aboard the Burton Island a call for help was sent to the Glacier. On her way round the Antarctic Peninsula she picked up the doctor at Palmer Station on Anvers Island.

When the two icebreakers rendezvoused, the doctor was flown to the Burton Island. He decided that there was no need for an immediate operation on the sick man. Soon after the two icebreakers were called on to assist the General San Martin.

---

## South Georgia stamps bring £4500

A block of 30 Falkland Islands surcharged 2d stamps sent from South Georgia in 1923 by a young oceanographer to his former mathematics master was sold for £4,400 at auction in London early this year. Sir George Deacon, director of the National Institute of Oceanography from 1949 to 1971, who first sailed to the Antarctic at the age of 21, bought the stamps when he was on South Georgia.

In those days South Georgia was a Falkland Islands dependency, and the whaling industry, operated mainly by Norwegians, was thriving. Evidently the supply ship failed to take into account

the needs of the local post office at Grytviiken. The postmaster took his own measures and surcharged the stamps to the value of 2½d. Mr Deacon as he was then, spent 6s 3d and sent the surcharged block to Mr I. A. G. Carpenter, of Leicester, with whom he shared an interest in philately.

Mr Carpenter, who is now 90, decided to part with his treasure, and sent the block of stamps to be auctioned by a leading firm of stamp dealers.

South Georgia now has its own stamp issue. It is unlikely to suffer any more postal crises. Its population has now fallen to 22.

# Scientists learn more of east Antarctic ice sheet

In the last four seasons scientists of three nations have flown thousands of miles over Antarctica to learn more about the ice sheet which covers nearly 98 per cent of the continent. They have used airborne radio-echo sounding equipment to measure the thickness of the ice, to map its contours, and to discover what lies beneath it.

These aerial surveys of ice thickness and base rock topography have been made in East Antarctica as part of the International Glaciological Project — a programme of glaciological studies of the ice sheet in which Australia, France, the Soviet Union, and the United States participate. The ice sensing programme has been conducted by the Scott Polar Research Institute, and has included scientists from the United States National Science Foundation, and the Technical University of Denmark.

In the first three seasons of ice sensing the scientists discovered in East Antarctica mountain ranges 10,000ft high, valleys 4000ft below sea level, and extensive plains and lakes. Data from recent flights has revealed the existence of three ice domes (areas of maximum elevation) — not one as previously mapped. Dome C at 75deg S 125deg E sits on some of the world's thickest known ice — more than 13,776ft.

All the ice sensing missions have been flown in a United States Navy Hercules aircraft. It is fitted with radio-echo sounding equipment developed by the Scott Polar Research Institute. The antennas suspended beneath its wings were designed and manufactured by the electromagnetic laboratory of the Technical University of Denmark.

Scientists have made their discoveries by flying low over the ice sheet — usually about 3000ft. Radio signals are bounced back from the surface, from the internal layers of the ice, and from the base rock. In this way it is possible to measure and record continuously the geophysical features of the ice sheet and the shape of the continent below. Photo mapping equipment is used also to build

up a more complete picture of the ice sheet and any unusual features.

Last season's projects were conducted by Dr Gordon de Q. Robin, director of the Scott Polar Research Institute, Dr David Drewery, and American and Danish scientists. They flew more than 80,000 miles over the continent. Areas of particular interest were Marie Byrd Land, Adelie Land, the Ross Ice Shelf, the Trans-antarctic Mountains, and part of the Polar Plateau 600 miles from McMurdo Station.

Two lakes were discovered under the ice of the Polar Plateau in East Antarctica, and the bedrock was studied also. On the Marie Byrd Land missions detailed soundings were made to find how the ice was flowing towards the Ross Ice Shelf from Byrd Station.

Another area of investigation was the glaciology of the Ross Ice Shelf. The scientists used equipment developed by Mr Chris Neal, of the Scott Polar Research Institute, to study the bottom of the ice shelf.

Studies made in the 1973-74 season by scientists engaged in the Ross Ice Shelf Project revealed that the glacial ice was moving in streams through the shelf to the edge where it melted eventually. Last season use of the new equipment enabled the scientists to learn how the streaming affected the bottom layer of ice.

Last year the Scott Polar Research Institute mapped ice contours of part of East Antarctica, using data from recent radio-echo sounding flights. With the additional information obtained last season the institute will be able to show more details of this area, and also make an initial map of Marie Byrd Land.

# McMurdo Sound cod might be future source of profit

Fishing for science in the icy waters of McMurdo Sound may lead eventually to fishing for profit. An American scientist who has spent the last four Antarctic summers studying freezing resistance in some fishes will try to determine next season whether there are sufficient numbers of *Disostichus Mawsoni*, popularly known as Antarctic cod, in McMurdo Sound to support a commercial fishery.

Since the 1971-72 season Dr A. L. DeVries, of the Scripps Institution of Oceanography, and other scientists, including his wife, have spent several months catching fish in McMurdo Sound, fishing through holes in the annual sea ice. The fish they have caught have been used in the investigation of the glycoprotein "anti-freeze" in fishes' blood which allows them to exist in the sub-zero temperatures of Antarctic waters.

Last season the scientists caught 480 Antarctic cod, some weighing up to 160lb. Most of the fish were measured, tagged, and thrown back into the sea. Next season, as an ancillary project to his major research, Dr DeVries hopes to catch some of the tagged fish to see how fast they have grown, and whether their numbers are sufficient to support a fishery.

Dr DeVries says that those who have eaten Antarctic cod describe the taste as being a cross between lobster and crab. The flavour is good, and cod cooked after being frozen for a year tastes like freshly caught fish. Dr DeVries has taken 300lb of cod back to California for further scientific analysis, and some of it will be used to test the palates of dinner guests.

Commercial exploitation of the Antarctic cod is not part of the ancillary project. Dr DeVries says that when he has obtained an indication of the fish population in McMurdo Sound, some

fishing firm will have to decide whether commercial exploitation would be worthwhile.

In their research last season Dr DeVries and his wife used 12 black cod from the Portobello marine station on Otago Peninsula, near Dunedin. These fish, which are related to the Antarctic cod, are found in sub-Antarctic waters. They were taken south to find what effect sub-zero temperatures would have on them, and whether they would synthesise their own glycoprotein.

When the temperature in their tank at McMurdo Station was lowered to that approaching the temperature of the water in McMurdo Sound, the New Zealand cod were unable to adapt to the cold by any biological process of their own.

In another experiment several of the New Zealand cod were given a transfusion of glycoprotein isolated from blood samples taken from the Antarctic cod. It was then found that when the water temperature in the tank was lowered to minus 1.8deg, the fish were not distressed and were able to withstand the cold. The low temperature was maintained for only two days, and the scientists did not determine whether the fish would retain their resistance to freezing for any length of time.

Eight of the New Zealand black cod are being kept alive at McMurdo Station this winter. They will be used for continued research next season.

**JARE 15**

# Yamato Mountains team finds many meteorites

More than 80 meteorites were collected in the Yamato Mountains area, 300 kilometres south-south-west of Syowa Station, by a geological party towards the end of last season. Meteorites were first found in the area in 1969, and again in 1973 when they were named Yamato. This was the first time so many — 82 altogether — had been discovered at the same time.

Four men of the 15th Japanese Antarctic Research Expedition (JARE 15) led by a geologist, Dr Keizo Yanai, left Syowa Station on October 30 to make a geological survey of the Yamato Mountains, and to collect meteorites. They established a base camp near the range on November 24 and began their search.

In an area extending over nine square kilometres the team found 82 meteorites, five of them more than 10 centimetres across. The biggest was shaped like a pumpkin. It was 20cm in diameter and weighed four kilograms.

All of the meteorites were scattered over the surface of the ice. Seventeen of them were discovered within a radius of 50 metres.

Before the Japanese discoveries in 1969 only six meteorites had been discovered in Antarctica. One was found in 1952 by a French team near the east

of Adelie Land. A Soviet team found two near Novalazarevskaya, on the Princess Astrid Coast of Queen Maud Land in 1961, and an American team found three in 1964 in the Thiel Mountains, and near the Neptune Range.

A Japanese team found nine meteorites near the Yamato Mountains in November, 1969. Another Japanese team discovered 11 in the same area in November, 1973.

Dr Takeshi Nagata, director of the National Institute of Polar Research in Tokyo, says the concentration of meteorites in the Yamato Mountains area apparently resulted from a meteorite shower. He and other scientists believe the finds will be of particular value. Such snow-preserved specimens are kept much freer from the natural chemical action than those on the earth's surface elsewhere.

---

## *Future cost of U.S. research*

Financial cuts in the United States Antarctic research programme might be necessary this year. Inflation and the present recession might make the cuts necessary, but Dr H. Guyford Stever, director of the National Science Foundation, says it is hoped to maintain the present level of expenditure. Last year the National Science Foundation spent between \$28 million and \$30 million on research in the Antarctic.

Dr Stever was in Christchurch early in January before he flew south to attend

the dedication of the new Amundsen-Scott South Pole Station. He said that the development of energy sources such as solar and geothermal power had taken a large part of the N.S.F. total budget last year of about \$750 million, and the Antarctic programme had been hard hit by the oil embargo. But if restrictions were imposed this year they would be made on a percentage basis over the entire N.S.F. programme, and no one field of research would be eliminated.

Although the National Science Foundation is concerned with energy research, it is not interested in locating fuel reserves in the Antarctic for commercial exploitation. There are definite indications of oil and natural gas in the

Antarctic, but Dr Stever was emphatic that the N.S.F. would not determine any exploitation policy—only supply information. "If there is any threat of gas or oil we immediately plug the hole," he said.

---

## Red roses and pineapples for Antarctic Christmas

Antarctic menus are no longer as simple as they were in the Heroic Age of exploration. Turkey and steak are not luxuries; fresh fruit, tomatoes, lettuces, and such seasonal delicacies as oysters and crayfish are accepted without comment.

Last Christmas the New Zealanders at Scott Base ate strawberries and pineapples, and there were red roses for each of the 13 women at McMurdo Station. This winter Americans on Ross Island will have trout and salmon on their menus.

Scott believed at first that only a very simple diet was needed in the Antarctic, and members of his first expedition had few delicacies except at Christmas and on Mid-winter's Day. His last expedition was far better provisioned.

Shackleton, however, was ahead of his time in the way he catered for his men. He fed them generously, for both psychological and medical reasons. They lived like fighting cocks in the hut at Cape Royds, and enjoyed such gastronomic treats as chicken, mushrooms, kidneys, mock turtle soup, roast veal, and bottle fruit.

But except for seal meat and penguin breasts, none of the food was fresh. The early explorers' successors are more fortunate. For the last 20 summers Americans and New Zealanders have enjoyed fresh fruit and vegetables delivered by air from New Zealand 2300 miles away.

New Zealanders at Scott Base had oysters and crayfish way back in 1956. Last year the fruit and vegetables delivered at Scott Base just before Christmas included a watermelon, strawberries,

peaches, apricots, Fijian pineapples, and coconuts.

Men and women at McMurdo Station had small pine trees flown south for their white Christmas. And the 13 women had a special gift—red roses—delivered by an ambassador. The roses were a Christmas present from the United States naval support force staff at Christchurch, and they were presented by the United States Ambassador to Canberra (Mr Marshall Green).

This winter Americans at McMurdo Station will have venison, pork, trout, and salmon to provide variety in their meals. On February 18 two United States Navy Hercules aircraft made the last flights of the summer season. Their cargo included two deer, three pigs, trout, salmon, graefruit, tangerines, lettuces 1200 dozen eggs, 2000 gallons of milk, and garlic.

Coconuts, and scallop and oyster shells were also listed on the cargo manifest. The shells were asked for by the cook so he could serve seafood more attractively.



## SOVIET NEWS

# Airlift of men and cargo to main research station

Scientists of the 20th Soviet Antarctic Expedition began work on the continent early in January. The expedition arrived in the supply ship *Ob*, and the research ships *Professor Vize* and *Professor Zubov* to take over from the winter teams at *Molodezhnaya*, *Novolazarevskaya*, and *Bellinghausen* Stations. Teams at *Mirny*, *Vostok*, and *Leningradskaya* Stations were relieved later in the month, and early in February.

Because of difficult ice conditions off the coast of *Enderby Land*, helicopters and AN2 aircraft had to lift men and cargo to *Molodezhnaya*, the main Soviet research station in Antarctica, from the *Ob* and the *Professor Vize*. They made scores of difficult flights, carrying the new team and more than 200 tons of urgent cargo more than 100 kilometres.

Since the relief operation IL14 aircraft have made the first flights to the *Cheremaker Oasis* in *Queen Maud Land*, to *Bereg Pravdy*, and to *Vostok Station*. At *Mirny* preparations were made for a new sledge and tractor expedition into the interior of the continent.

Near *Molodezhnaya* observations have begun on a new glaciological testing ground, and a site for an automatic radio meteorological station has been chosen near *Mount Lechebny*. Data from the planned programme of aero-meteorological and other scientific work at *Molodezhnaya* is being processed by the station's *Minsk 32* computer.

More details of scientific research carried out in the 1973-74 season are given in the U.S.S.R. national report to the Special Committee for Antarctic Research by the Soviet Committee on Antarctic Research. Report No. 16 refers to radio-location measurements of glacier thicknesses between the *Amery Ice Shelf-Mirny-the Pole of Inaccessibility* where the Russians had a temporary station in 1958—*Amery Ice Shelf*. Snow measurements and meteorological observations were also made during the summer traverses between *Mirny* and *Vostok*.

In the region of the *Amery Ice Shelf* the Russians made an aerial survey of the *Lambert Glacier* region. The purpose was to produce topographic charts at scales of 1:100,000 and 1:200,000. Geological mapping was carried out over an area of 30,000 square kilometres in the north-western area of the *Prince Charles Mountains*.

To study the sub-glacial relief and glacier depths complex geophysical studies were made on the *Amery Ice Shelf* and the *Lambert Glacier*, and adjacent slopes of the *Polar Plateau*. The area covered was 65,000 square kilometres, and the studies included gravimetry, magnetometry, and seismic sounding.

An aeromagnetic survey was made of the coasts of *Enderby Land* and *Mac-Robertson Land* along the line of Longitude 52deg to 68 deg E, and of *Princess Elizabeth Land* along the line of Longitude 82deg to 86deg E. The survey was made for surface and sub-glacial geological mapping over an area of 380,000 square kilometres.

Soviet geologists collected 1200 specimens of minerals for laboratory studies. They worked in *Mac-Robertson Land* on *Mounts Maguire*, *Stinear*, *Dummet*, *Ruker*, and *Reinbolt*. They made a leaf by leaf description of vertical sections of metamorphic strata of green slate, amphibolic, and granulitic facies in the area to a total depth of about 12,000 metres. Their studies will enable them to determine the stratigraphy, substance composition, and metamorphic conditions.

# THE READER WRITES

## Sidelights of Antarctic Research

Letters, preferably not longer than 5 to 600 words, are invited from readers who have observed some little-known facet of Antarctic life or have reached conclusions of interest on some Antarctic problem — Editor

### OVER AND UNDER

Sir,—Can something be done to remove Antarctic clichés from the reports of scientific activities on the continent? Radio, television, and the newspapers are the worst offenders, probably because they accept the language used by those who work in Antarctica each summer. Publications like "Antarctic," the "Polar Record," and the United States "Antarctic Journal," do their best to avoid popular jargon. But to the media the winter night is always long, the South Pole is at the bottom of the world, and the continent is always frozen. But the worst expression of all is used to describe the men who remain in the Antarctic for the winter. They "winter over." "Once upon a time they could be said to "winter under"—an equally objectionable expression. With the closing of the old Byrd Station, and the construction of the new South Pole station, "wintering under" is no longer possible.

Yours etc.,

GIVE THEM SOCKS

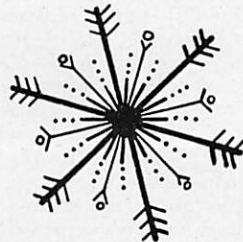
### A RARE BIRD

Sir,—Newspapers produced in the Antarctic and ships on their way south usually have a short life and a limited circulation. The Antarctic productions appear one winter, and are forgotten the next. There are exceptions—the issues of the "South Polar Times" produced by Shackleton and Cherry-Garrard during Scott's two expeditions, and Shackleton's book, "Aurora Australis." But the "South Polar Times" was reprinted later by English publishers in permanent form

The less elaborate publications, which have appeared intermittently at different bases during the last 50 years, are worthy of preservation if any survive. The Scott Polar Research Institute has one copy of the rare Adeline Annual produced by Sir Raymond Priestley at Cape Adare. Perhaps in Lyttelton or Christchurch there might still be a copy or copies of another rare bird—the "Antarctic Petrel," produced on board the Nimrod during her voyage from London to Lyttelton in 1907. Captain Rupert England was the editor, the ship's surgeon, Dr W. A. R. Michell, was the sub-editor, and the sketches were drawn by the biologist, James Murray. On the cover of the first number is a drawing of a petrel, and on the first page are a photograph of members of the expedition, and a drawing of King Edward VII by Seaman V. Berry. Among the contributions is an article on birds of the Southern Ocean illustrated by Murray. It is not yet too late to begin a search for this modest publication. There is only one resting place for it—the national Antarctic centre of the Canterbury Museum.

Yours etc.,

JAMES PIGG



**OBITUARY**

# Sir Philip Brocklehurst served with Shackleton

Two disappointments—one of them minor—were among the Antarctic experiences of Sir Philip Brocklehurst, the last survivor of Shackleton's first expedition in 1907-09, who died in England on January 28 at the age of 87. Because of badly frost-bitten feet he had to be left behind by his five companions on the first ascent of Mount Erebus in 1908, and failed to reach the summit. Then the effects of the frostbite ruled him out of his promised place in Shackleton's team for the attempt to reach the South Pole.

But this bitter disappointment and his injuries did not prevent Brocklehurst from playing a full part in the expedition's activities. He was a member of the western geological party which explored the Taylor Valley and ascended the Ferrar Glacier, and took part in a geological reconnaissance towards the northern slopes of Erebus.

Brocklehurst, who was one of the youngest members of the expedition—he was only 20 when he left England—was born at Swythamley Park, the family seat in Staffordshire. He was educated at Eton and Trinity Hall, Cambridge. In 1905 and 1906 he boxed for Cambridge as a lightweight, and it was because of Shackleton's strong interest in the sport that the two met in London in 1906.

Shackleton, at this stage, saw his expedition chiefly as an attack on the South Pole, and he promised to include Brocklehurst in the party of six which would make the attempt. There seems little doubt that Shackleton, in making his promise, was influenced by Lady Brocklehurst's guarantee of help when he had to put the idea of an expedition aside for lack of funds.

## SPORTING EVENT

To the young undergraduate an attack on the South Pole was a sporting event—like Shackleton he was a romantic rather than a scientific explorer—and he remained interested in the plans. When

he was selected as an assistant geologist he prepared himself for his task by taking courses in geological and survey work, and also undertook to help with the ponies.

Sir Raymond Priestley, who died last year, was a year older than Brocklehurst. They were the two youngest members of the expedition, and Shackleton gave them special attention because he was not sure how they would react to the peculiar conditions of life in the Antarctic. He kept a close but unobtrusive watch on them until he was satisfied that they were settling down.

Brocklehurst had his 21st birthday in the Antarctic, but there were no celebrations. On the night of March 7, 1908, he was confined to his tent in a camp at 8750ft on Erebus by a fierce blizzard. There was no birthday cake for the occasion, only a biscuit and a cake of chocolate in 36 hours.

## FIRST ASCENT

Two parties left the hut at Cape Royds on March 5 to make the first ascent of Erebus. They had food, ice-axes, and crampons, but no knowledge of the conditions they would meet on the slopes of the volcano or at its summit.

The main party, which carried food for 10 days, was led by Edgeworth David. With him were Mawson and Mackay—these three were the first to reach the South Magnetic Pole.

In the supporting party were Adams (as leader), Marshall, and Brocklehurst, carrying additional stores. They had provisions for only six days, but were told by Shackleton they could attack the summit of Erebus if Adams thought it could be done. He thought it could.

Hauling an 11ft sledge with a load of 560lb, the six novice climbers reached 5,630ft on the night of March 6. The next morning it was decided all six men would make an attempt on the summit. The sledge was left with a portion of its load, and the party pushed on, each man carrying a 40lb pack.

### FIERCE BLIZZARD

On the night of March 7 the party camped in a rock ravine at 8,750ft. A fierce south-easterly blizzard which developed during the night forced them to camp. When Brocklehurst crawled out of the three-man sleeping bag, he lost a wolfskin mitt, and the force of the wind swept him some way down the ravine.

By this time Brocklehurst, who wore ski boots for the climb, felt the cold attacking his feet. He did not think it was serious enough to change into finnesko.

Early on the morning of March 9 the six men resumed the ascent. By noon they were only 800ft below the rim of the main crater. During the day Brocklehurst suffered from altitude sickness.

That night the party camped 50ft below the crater rim on the north-west side of the main cone. Brocklehurst asked Marshall to examine his feet because he had lost all feeling in them. They were found to have been frost-bitten for some hours. Both big toes were black, and four more toes were frostbitten.

Circulation was restored with great difficulty, and Brocklehurst was given dry socks and finnesko stuffed with senne-grass. Then he was left in the three-man bag while the other five explored the old crater.

### RETURN JOURNEY

The next morning the same five crossed the floor of the old crater and reached the edge of the active crater. They began the return journey at 3

p.m. with Brocklehurst carrying his own pack. -He had to be helped on the way down to the March 7 depot but was able to carry on to the hut at Cape Royds which the party reached on March 11.

Originally Shackleton intended to have a party of six for the attempt to reach the Pole, and Brocklehurst had been earmarked for the journey. In the early stages of planning Adams and Marshall also seemed likely to go.

But the frostbite which kept Brocklehurst from the summit of Erebus ruled him out of the extended sledging journey. Marshall had to amputate his big toes on April 6, and because the Antarctic temperatures made wounds slow to heal, he had to rest until just before Mid-winter's Day.

Shackleton was forced to make his final choice of the Pole party mainly on medical grounds. Also with only four ponies left the number had to be reduced from six to four. Brocklehurst was bitterly disappointed but cheerfully accepted Shackleton's decision that he was not fit to make an extended journey, because of the loss of his toe, and his health after the operation.

### SUPPORT PARTY

But Brocklehurst shared fully in the preparations for the southern journey. On September 19, he, Bernard Day, and Adams, took the Antarctica's pioneer motor-car and a sledge carrying 750lbs of stores to within a quarter of a mile of Glacier Tongue. The Arrol-Johnston, hauling supplies for the party going to the Western Mountains, covered 30 miles at speeds of three to 15 miles an hour across the sea ice in McMurdo Sound.

When Shackleton's motor transport led off the great journey early on October 29, taking the sledges on to the bay ice, Brocklehurst was in the supporting party with Day, Joyce, Armytage, Marston, and Priestley. The car reached Glacier Tongue, but was halted by soft snow, and Brocklehurst and Priestley helped Day to take it back to Cape Royds.

November 3 saw the real start of the journey towards the Pole. Before the two parties left Hut Point Brocklehurst

photographed Shackleton's group with its sledge flags and Queen Alexandra's Union Jack flying.

Although the Southern Party and the supporting party took it in turns with the man-hauling, the men could not equal the ponies, and Shackleton decided to send the supporting party back earlier. On the return journey to Hut Point Brocklehurst had another attack of frostbite. He was wearing ski boots again while the others had finnesko, and had trouble with his feet for some time afterwards.

### RETURN TO EREBUS

Less than a fortnight after the supporting party returned to Cape Roys Brocklehurst was on his way back to Erebus. He and his companions, Murray, Priestley, Marston, and Joyce, set out on November 23 to make a geological reconnaissance towards the northern slopes of the mountain.

A threatened blizzard, which had delayed their departure, blew up while the men were camped with one tent on Misery Nunatak, five miles from Cape Roys. They spent three miserable days in the crowded tent, and abandoned the ascent.

Brocklehurst's last journey was to the western mountains of South Victoria Land. Day and Marston took the Western Party 16 miles in the car—its last Antarctic journey — on December 1. Then Brocklehurst, Armytage, and Priestley sledged on to the foot of the Ferrar Glacier and Butter Point.

Afer leaving more food for the Magnetic Pole Party at the Butter Point depot the three men sledged back to Cape Roys. They then loaded up five weeks food for themselves, and set off again on December 9. During their journey they ascended the Ferrar Glacier, explored the Kukri Hills, and discovered a large, open, moraine-strewn valley, the Taylor Valley of the modern map. There Brocklehurst climbed to the top of New Harbour Heights (Mt Barnes).

When the party returned to the Butter Point depot on New Year's Day, 1909, there was no sign of the Magnetic Pole

### NO SIGN OF PARTY

party. There was still no sign of it on January 11 so they went north along the coast to the Taylor Valley. On January 14 they returned to Butter Point.

In accordance with Shackleton's instructions the three men camped at Butter Point to await the Magnetic Pole party. They had been told to stay until January 25, and then make contact with the Nimrod or return to Cape Roys.

By January 23 the party was in a desperate position. The firm ice near Butter Point on which they had camped the night before was adrift and moving north to the open sea. As Priestley recorded in his diary, the party had 15 days' provisions and oil (half rations), and one chance in a thousand of being picked up by the Nimrod.

But at 11.30 p.m. Brocklehurst looked out of the tent to see if they was any change. He was amazed to see their floe within a few hundred yards of the fast ice. By 4 a.m. the next morning the floe had touched the fast ice at Butter Point.

The men rushed over the floe to the fast ice. Then they moved to Butter Point, had a meal, and slept. Next morning there was open water where the floe had been. And 10 or 12 miles out was the Nimrod.

Priestley used his shaving mirror as a heliograph to signal the ship. An hour's flashing brought a reply, and later in the afternoon the party was picked up.

### WAR SERVICE

Brocklehurst, who held a commission in the Derbyshire Yeomanry before he went to the Antarctic, served in the 1st Life Guards during the First World War, was wounded, and rose to the rank of lieutenant-colonel. Later he was attached to the Egyptian Army from 1918 to 1920. In the Second World War he commanded the 2nd Regiment, Arab Legion Desert Mechanised Brigade, from 1941 to 1942. Then he was with the British Council in Palestine and Transjordan from 1943 to 1944.

## Hugh Blackwall Evans was last of the ten men of Cape Adare

Seventy-five years ago Hugh Blackwall Evans was one of the first men to spend a winter on the Antarctic Continent. On February 8 the last of the 10 members of Borchgrevink's Southern Cross Expedition of 1898-99, died in hospital at Vermilion, Alberta, less than three months after his 100th birthday. He had been in bad health most of last year but maintained his interest in Arctic and Antarctic affairs to the end.

Evans was the oldest of the handful of survivors of the Heroic Age of exploration in Antarctica. Although he spent nearly all his life in Canada, he was born in Aylburton, England, on November 19, 1874, the son of the Rev. Edward Evans.

After several years in Canada, where he went at the age of 16, Evans returned to England in 1897. Then he went to Australia and joined a sealing expedition to Kerguelon Island where he spent 11 weeks.

When he returned to England Evans joined Borchgrevink's expedition as an assistant zoologist on the strength of his life-long interest in taxidermy. He was one of the 10 men who landed at Cape Adare on February 17, 1899, and remained there until February, 1900.

As Borchgrevink and L. C. Bernacchi relate in their books, Evans had some narrow escapes from death during the winter. He was the man who helped to maintain the party's morale by his apparently unlimited fund of stories which he told on stormy days. And when Nicolai Hanson, the zoologist, became ill, Evans took on the zoological work and taxidermy.

After the Southern Cross picked up the nine men left at Cape Adare—Hanson had died on October 14, she sailed towards McMurdo Sound. Evans was one of seven men who landed on Franklin Island.

Later, when the Southern Cross skirted the Ross Ice Barrier, a small party—Bernacchi, Fougner, Johansen, Evans—made a short sledge journey over the ice to Latitude 74deg 34min S

When he returned to England Evans hoped to join the National Antarctic Expedition but because of delays he went back to Canada. Because of domestic responsibilities he was unable to go south again in the relief ship *Morning* under the command of William Colbeck, a close friend who was with him at Cape Adare.

For many years Evans farmed in Canada. He retired to Vermilion, and after his wife died in 1968 at the age of 91, he was cared for devotedly by his eldest daughter, Miss Eleanor Evans. She and her sister, Mrs Jessie Stephen, helped to nurse their father during his last illness.

Hugh Evans celebrated his 100th birthday in hospital, but his daughters and the staff, and friends all over the world made it a happy occasion. The Queen sent the traditional telegram for those who reach 100, and personal greetings were received from well-wishers in Britain, New Zealand, Australia, the United States, Norway, South Africa, and the Soviet Union.

Miss Evans recalled later two gifts which gave her father the greatest pleasure. One was a recording of the music of the barrel organ which Parry took to the Arctic aboard the *Hecla* in 1819 when he attempted to make the North-West Passage. The other came from the writer, L. Harrison Matthews.

It was a card which had on it a hand-drawn Emperor penguin with a crown bearing the figure 100, suspended above its head, and the dates 1874 and 1974 in colour on either side. An inscription below read: "To Hugh Blackwall Evans—the Emperor of the Antarctic."

# **“ANTARCTIC”**

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

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

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

## **The New Zealand Antarctic Society (Inc.)**

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

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

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

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

### **New Zealand Secretary**

Mrs B. Hale. P.O. Box 1223, Christchurch.

### **Branch Secretaries**

Canterbury: Mrs E. F. Cross, P.O. Box 404, Christchurch.

Wellington: Mr G. D. Sylvester, P.O. Box 2110, Wellington.



Printed at the Raven Press, 241 Cashel Street, Christchurch