

# ANTARCTIC

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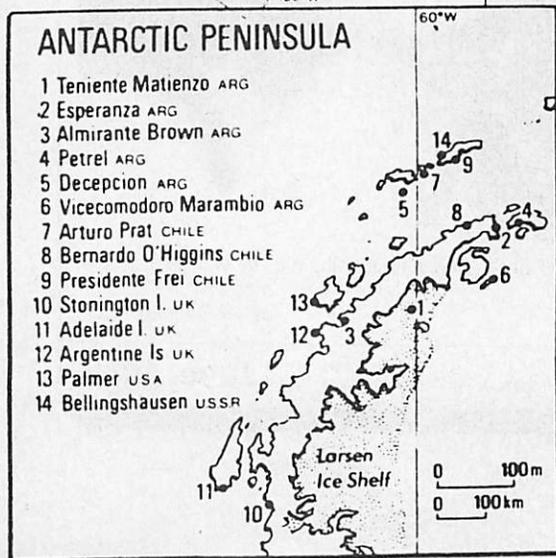
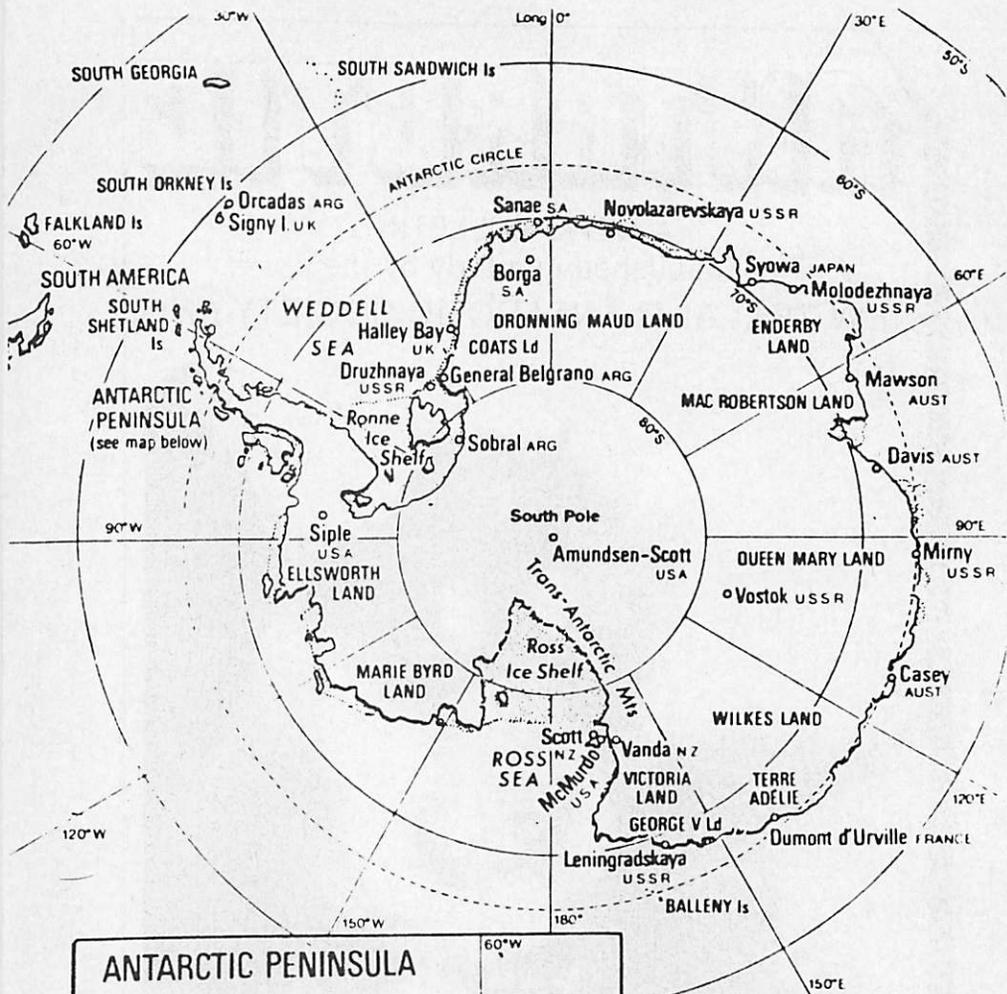
Footrot, youngest husky at Scott Base. Now nine months old, he will be at work next summer.

Photo by Michael Short

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**June, 1982**



# ANTARCTICA

0 500 1000 Miles

0 500 1000 Kilometres

#### ABBREVIATIONS

ARG ARGENTINA  
AUST AUSTRALIA

SA SOUTH AFRICA  
UK UNITED KINGDOM  
USA UNITED STATES OF AMERICA  
USSR UNION OF SOVIET SOCIALIST  
REPUBLICS

# ANTARCTIC

(successor to 'Antarctic News Bulletin')

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## **CONTENTS**

### **ARTICLES**

AERIAL PENGUIN COUNT 366-368

### **POLAR ACTIVITIES**

NEW ZEALAND 338-341, 347

UNITED STATES 342, 371-372

AUSTRALIA 343-347

UNITED KINGDOM 348-351

INDIA 352-355

SOVIET UNION 356-357

WEST GERMANY 357

SOUTH AFRICA 358

ARGENTINE 359-361

CHILE 361-363

JAPAN 363

ITALY 364-365

POLAND 375

### **SUB-ANTARCTIC**

FOREIGN TRAWLERS 368-369

### **GENERAL**

TRANSGLOBE 369-370

ANTARCTIC SOCIETY 372

OBITUARIES 373-375

BOOKSHELF 376

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# NEW ZEALAND PLANS FOR SEASON

Three international projects — an extensive drilling programme in the Taylor Valley, observations on Mt Erebus, and studies of coal-bearing formations in Victoria Land — are included in New Zealand's Antarctic research programme for 1982-83. These projects will be carried out by New Zealand, United States, Australian, and Japanese scientists.

Next season some 160 scientists and support staff will take part in the programme during the summer months. Research staff will come from government departments, mainly Ministry of Works and Development, New Zealand Geological Survey, Geophysics Division and Soil Bureau, Department of Scientific and Industrial Research, and four universities, Canterbury, Victoria, Waikato, and Auckland.

Most of the New Zealand science projects will be carried out in the McMurdo Sound region and the dry valleys. The only remote field party will be a Geological Survey team which will operate in the Terra Nova Bay region of the Northern Victoria Land. A United States Navy ski-equipped Hercules aircraft will make a landing on the ice to put the team in position.

Some ornithological research may be conducted along the coast of Northern Victoria Land and at Cape Hallett. This project is part of New Zealand's contribution to the three-year International Study of Antarctic Seabirds (ISAS).

## DRILLING PLANS

An extensive drilling programme will be carried out in the Lower Taylor Valley. A New Zealand drilling crew using New Zealand equipment, will attempt to core sediments laid down during the various epochs of Ross Sea glaciation.

United States and New Zealand logistic support will be provided for the project which will probably be con-

tinued in the 1983-84 season. It is essentially a refinement of the Dry Valley Drilling Project (DVDP) completed in the mid 1970s. Investigations will be made by scientists from the United States Geological Survey and the University of Maine, Victoria University of Wellington, and Waikato University.

Preliminary scientific observations and buildup of logistic support will be continued next season to prepare for the 1983-87 offshore drilling project, Cenozoic Investigations of the Ross Sea. This project is an extension of the Dry Valley Drilling Project (DVDP 15 — 1975) and the McMurdo Sound Sediment and Tectonic Study (MSSTS — 1979) which probed seafloor sediments near the western shore of McMurdo Sound from a drill rig mounted on a sea-ice platform.

For the final term of the three-year International Mt Erebus Seismic Study (IMESS) which began in the 1980-81 season, New Zealanders from the Chemistry Division, D.S.I.R., and Victoria University of Wellington will join a vulcanological expedition to work on the slopes and at the summit of the volcano. The expedition will include scientists from Japan, the University of Alaska, and the Institute of Mining and Technology, New Mexico.

## COAL STUDIES

Two Australian coal geologists from the New South Wales Antarctic Coal Measures Study Group have been invited by the Geological Survey to join two survey geologists in a detailed study of

coal-bearing formations within the Beacon Supergroup of Mt Fleming and Shapeless Mountain in Victoria Land. This project will continue in the 1983-84 season, and at some stage New Zealand drilling equipment may be used to core the coal-bearing seams.

Other New Zealand research projects in the McMurdo Sound and dry valley areas will cover upper atmosphere physics, meteorology, fish physiology, marine biology, ornithology, soil studies, medical micro-biology, geophysical surveys, hydrology, glaciology, and geochemistry. Long-term seismic, geomagnetic, ionospheric, and meteorological programmes at Scott Base will be maintained next winter by three technicians in the winter team of 11.

Vanda Station in the Wright Valley will again serve as a logistic and search and rescue base for field parties in the dry valley region during the season. Field stations at Cape Bird on Ross Island and Lake Fryxell in the Taylor Valley will also be used by New Zealand research teams.

Once again New Zealanders will work with Japanese scientists in the dry valleys. Support will be provided from Vanda Station for Dr T. Torii's team which will continue geochemical studies of dry valley lake system.

To maintain the safety and efficiency of the New Zealand programme surveyors from the Lands and Survey Department and Post Office riggers will work at Scott Base and in other areas during the season. An Antarctic Division snowcraft and survival team will conduct courses for United States and New Zealand research and support staff, air crews, and icebreaker crews.

#### BASE REBUILDING

Another stage in the Scott Base rebuilding programme which began in the 1976-77 season, will be started early next season by construction teams from the Ministry of Works and Development and the New Zealand Army. They will begin work on Stage 4, the command centre. Internal fittings will also be completed in Stage 3B, the kitchen and mess block which was completed to the shell stage last season.

Royal New Zealand Air Force Hercules aircraft of No. 40 Squadron will contribute to the United States — New Zealand logistic pool with Operation Ice Cube flights, and RNZAF helicopter crews will be attached to the United States Navy's VXE-6 Squadron to fly on support missions. New Zealand Army cargo handling teams will operate during the main airlift in Christchurch and at Williams Field near McMurdo Station.

## Scott Base O.I.C.



A police inspector will be officer-in-charge of New Zealand's Antarctic research programme at Scott Base next season. He is Mr John M. Thurston, of Wellington.

Mr Thurston, who is 36, is a district operations inspector, and has served in the Police Force since 1963. He has experience of working on snow and ice in search and rescue operations.

Three other police officers have worked with the New Zealand programme in past seasons. Sergeant Hugh Webb, of Wellington, was deputy officer-in-charge at Scott Base in the 1980-81 season, and Constable Ted Robinson, of Christchurch, held the same post in the 1979-80 summer. Constable Max Tunnicliffe, of Auckland, was an Antarctic Division field assistant earlier.

## Mineral resources regime meeting

Representatives of the 14 Antarctic Treaty nations attended a special consultative meeting in Wellington this month to work out an agreed regime for the regulation of the orderly exploration and exploitation of Antarctica's mineral resources and the preservation of the continent's unique environment. Elaboration of a regime to cover mineral resources was agreed to by the 11th consultative meeting in Buenos Aires last year, and New Zealand's invitation to hold the meeting from June 14 to June 25 was accepted.

Nations represented at the meeting, which was opened by New Zealand's Minister of Foreign Affairs (Mr Warren Cooper) were the 12 original signatories of the Antarctic Treaty — Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, Soviet Union, United Kingdom, and United States — and Poland and West Germany.

New Zealand's representatives are Messrs C. D. Beeby, Assistant Secretary, Ministry of Foreign Affairs, and W. R. Mansfield, head of the Legal Division.

Alternate representatives are: Messrs C. M. Palmer, Department of Scientific and Industrial Research; J. J. W. Bailey, director of administration, D.S.I.R.; J. T. E. Gilbert, Assistant Commissioner, Commission for the Environment; P. R. Dingwall, Lands and Survey Department scientist; C. R. Keating, First Secretary, New Zealand Embassy, Washington; B. J. Fowke, assistant director (petroleum exploration), Ministry of Energy; D. J. MacKay, assistant head, Legal Division, M.O.F.A.

Advisers are: Dr D. Kear, Director-General, D.S.I.R.; Mr P. H. C. Lucas, Director-General, Lands and Survey Department; Dr T. Hatherton, director, Geophysics Division, D.S.I.R.; Dr R. P. Suggate, director, Geological Survey; Mr A. G. Summers, Deputy Secretary (oil and gas), Ministry of Energy; Mr R. F. Shallcross, section head, Treasury;

Mr J. D. L. Richards, head, South Pacific and Antarctic Division, M.O.F.A.; Mr R. B. Thomson, superintendent, Antarctic Division, D.S.I.R.

There are two special advisers. They are Sir Holmes Miller, chairman, Ross Dependency Research Committee, and Professor G. A. Knox, chairman, New Zealand National Committee for Antarctic Research.

A mineral resources regime is expected to be on the lines of the international regime for the conservation and management of Antarctica's marine living resource which was agreed to in 1980 after three years of discussions by representatives of the Antarctic Treaty nations and others. The Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR) was signed by 15 nations, and came into force on April 7 this after ratification by eight nations. New Zealand was the eighth to do so.

A meeting was held in Hobart last year to establish a commission and scientific committee which will oversee the future harvesting and conservation of most species found in the Antarctic marine ecosystem. The first meeting of the commission, which will be based in Hobart, was held from May 25 to June 11 this year. New Zealand representatives at the meeting were Messrs D. J. MacKay, assistant head of the Legal Division, Ministry of Foreign Affairs, and D. A. Robertson, Ministry of Agriculture and Fisheries.

A five-year memorandum of understanding to establish a co-operative science programme has been signed by the United States National Science Foundation and the Polish Academy of Sciences. The programme, agreed to on December 11 last year, is planned to include joint research projects and exchange visits of scientists. Poland has one Antarctic station — Arc-towski — on King George Island in the South Shetlands.

## Cape Crozier trips before winter

Before the last few weeks of daylight ended seven New Zealanders at Scott Base made two journeys to Cape Crozier about 70km east of the base. The first was late in March, the second early in April. They were made while the winter team was adjusting to the shorter days and increasing darkness.

First to head for Cape Crozier on March 29 were Chris Choros (senior laboratory technician, Lower Hutt), Rick Walshe (electrician, Granity), Grahame Morgan (chef, Paekakariki), and Allister Babington (Post Office technician, Invercargill). They left the base at 8.45 a.m. in a snotrak with a sledge in two. No problems were encountered on the route which was out towards Williams Field and then towards Cape MacKay. The snotrak travelled at eight to 10 m.p.h. and sank no more than 4in in the snow. Seven hours and a quarter after leaving the base the party arrived at Igloo Spur.

Camp was made between Igloo Spur and The Knoll (368m) which surmounts Cape Crozier. On March 30 the four men looked about the area on foot. They broke camp at 1.30 p.m. and were home again at 8.15 p.m.

When the second team left for Cape Crozier at 7.45 a.m. on April 5 it followed the same route as the first. Keith Martin (engineer, Hastings), Peter Wheeler (science technician, Thames) and Gary Bowcock (dog handler, Paparoa), encountered very cold weather and strong winds of 30 to 40 knots when they camped at The Knoll.

On April 6 the three men around the area, including the stone igloo built in 1911 as a field camp for the Emperor penguin study by Wilson, Bowers, and Cherry-Garrard. Because of deteriorating weather they headed for home at mid-day and reached Scott Base at 8.15 p.m.

After the last members of the summer support staff left the winter team had a taste of rather bleak weather, and a rapid drop in temperature to minus 26.6 deg Celsius, the minimum for February.

A 26-hour storm started a breakout of the ice at the base front door on March 16 at 10.30 p.m. By the next morning there was clear water instead of ice to look out on. Then on the afternoon of March 18 three killer whales arrived and the local Weddell seal population hurriedly left the water for the safety of the ice where they remained for the rest of the day. After the whales departed the ice returned and broke out several times.

March ended with a minimum temperature for the month of minus 42 deg, and a peak gust of 60 knots. After the sun graced the horizon for the last time for four months on April 24 the darkness increased. The lowest temperature for the month was minus 45.8 deg, and the highest minus 12 deg. A wind gust of 47 knots was recorded.



## New home for Scott Base hut

After 25 years in Antarctica one of the original buildings at Scott Base is to have a new home. The old mess building has been presented to the Ferrymead Trust in Christchurch.

A block, as the building has been known, will be brought back to New Zealand next summer. It will be restored and maintained among other historic buildings at Ferrymead.

As the New Zealand Antarctic Society will be associated with the establishment of the hut on its new site members, and subscribers to "Antarctic," who have worked and related material are needed so that a block, which contained the mess room, kitchen, radio room, and leader's office, can be restored to its original condition both inside and out. Photographs and other material can be sent to branch secretaries.

# Ice drilling planned at South Pole

Drilling of a 500-metre hole near the Amundsen-Scott South Pole Station, and retrieval of the ice core for analysis, is one of the glaciological projects in the United States Antarctic research programme planned for the 1982-83 season. Last summer glaciologists recovered a 203-metre core at the South Pole, the bottom ice of which was about 2000 years old.

Research projects planned for next season depend on the finance available. Present proposals are for 80 projects, the same number as last season, in which more than 270 scientists are expected to take part. They will work in the Antarctic Peninsula region, near McMurdo Station, and in Northern Victoria Land.

Before the first winter flights late in August to prepare for the opening of the season in October, a mid-winter mail and supply drop will be made on or about June 21 by a United States Air Force Starlifter. The first drop, which will include fresh fruit and vegetables, will be made for the Americans and New Zealanders wintering on Ross Island. If conditions are suitable a second drop will be made at the South Pole Station.

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*Plans for a major earth sciences research programme in the Beardmore Glacier area of the central Transantarctic Mountains are being considered by the United States National Science Foundation for the 1983-84 season. A large camp at 84deg S/170deg E similar to those in Northern Victoria Land, the Ellsworth Mountains, and the Darwin Glacier area, has been suggested, and field parties would be supported by helicopters and motor toboggans.*

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Last winter a mail and supply drop was made to the South Pole Station for the first time ever. There are 17 Americans, including two women, and a Soviet exchange scientist at the Pole this year, 90 men and women at McMurdo Station, and 10 men at Scott Base. To make the flight to the Pole the Starlifter will need to be refuelled between Christchurch and McMurdo Station.

United States Navy VXE-6 Squadron Hercules aircraft will make six flights in late August to prepare for the United States and New Zealand scientific programmes. Passengers on these flights will include technicians, construction workers, and others, who will prepare for the major airlift by Hercules and Starlifter aircraft which begins early in October.

Next season scientists will carry out biological research in the Antarctic Peninsula area, working from Palmer Station and the research vessel Hero, on krill, fish, benthic organisms, and birds. Biological research in the McMurdo Station will include marine ecosystems, ice algae, birds, and Weddell seals, physiological and biochemical studies of seals and Antarctic fishes, and freshwater and terrestrial ecology.

Glaciologists will collect ice and snow samples from the slopes of Mt Erebus to obtain a record of the volcano's chemical and particle discharges, and earth science projects will be continued near McMurdo Station and in Northern Victoria Land.

A second solar telescope, which was tested last season, will be erected at the South Pole. At Siple in Ellsworth Land the antenna used for upper atmosphere investigations of VLF radio waves will be extended.



## ANARE REPORTS

# Marine geoscience cruise and resources

Results of an Antarctic marine geoscience research programme carried out last season by Australian scientists in the Prydz Bay region between Davis and Mawson Stations, and on the Gaussberg-Kerguelen Ridge beneath the sea north of Davis, are expected to have a direct bearing on the assessment of the mineral resources potential, particularly of offshore oil, from this part of Antarctica. Although results of the project have still to be evaluated in detail one finding already suggests that theories on the formation of the Gaussberg-Kerguelen Ridge may have to be revised.

A biologist from the People's Republic of China, Lu Peiding, an auroral physicist, Dr N.I. Voloshinov from the Soviet Union, and a Fijian communications officer, Jowell Buli, are among the 26 members of the winter team at Davis this year. The 1982 team is the largest ever to winter at the station.

Dr Voloshinov was the Soviet exchange scientist at Mawson in 1979 when he studied aurora-related ionospheric currents. He was the last of the winter team to arrive at Davis, being landed by helicopter from a Soviet ship in the first half of April.

Casey has a winter team of 34, including a glaciologist, Xie Zichu, from the People's Republic of China, and a New Zealand diesel mechanic, Gerry Hamilton, Havelock North. This is the largest number to winter at Casey or nearby Wilkes Station (now closed) since operations began in the area in 1957.

Originally the Casey team numbered 35, as reported in the June issue of "Antarctic." One of the four plumbers, Colin Mercier, had to return to Australia on the Nanok S in March for personal reasons.

Mawson has a woman medical officer, Dr Julie Campbell in its team of 33. She is the second woman to winter at an Australian station. Dr Louise Holliday wintered at Davis last year.

Valuable data on the structure and evolution of sedimentary basins offshore from Antarctica was collected during the expedition which worked aboard the research and supply and supply ship Nella Dan for 11 weeks. The research programme was conducted under the auspices of the Australian National Antarctic Research Expeditions (ANARE). This was the first time in more than 50 years that Australia has conducted a major seabed sampling programme in the ocean around Antarctica.

Dr Patrick Quilty, the Antarctic Division's deputy director (research) was leader of the expedition which returned from the Australian Bureau of Mineral Resources, who ran the seismic and magnetometer surveys on board the Nella Dan. A scientist from the University of Melbourne was responsible for the bottom sampling programme, and Antarctic Division staff and an oceanographer, Mr Yan Zide, from the People's Republic of China, conducted oceanographic research.

Prydz Bay and the Gaussberg-Kerguelen Ridge were selected for study because they are two of the geologically least-known areas in the world. Geologists have long been interested in both areas because their formation and evolution are believed to be closely connected with continental drift. The Gaussberg-Kerguelen Ridge is a major

feature on the Earth's crust — a massive undersea mountain range three to four thousand metres high. The Prydz Bay-Lambert Glacier region is considered to be a prime hydrocarbon exploration area. ("Antarctic," June, 1982).

In the Prydz Bay region a major seismic programme was conducted to establish the thickness and structure of the sediment and old basement rocks beneath the bay. A short seismic line was also run across the southern end of the Gausberg-Kerguelen Ridge.

Data was collected in the Prydz Bay region over a distance of some 6000km along the ship's track while magnetic data was recorded for more than 8000km. In addition samples of submarine sediments and organisms were dredged at 50 locations. These will provide organisms for study by biologists, and may also yield clues to the types of rocks buried beneath the Antarctic ice

sheet which are carried by glaciers from the interior and deposited on the ocean floor.

An investigation of a series of seamounts (mountains on the sea floor which do not quite reach the surface) on the Gausberg-Kerguelen Ridge south-east of Heard Island was part of the cruise programme. These seamounts were thought to be extinct volcanoes and dredging was to have taken place along their sides.

But despite extensive search it was found that the seamount did not exist. When results of the study are evaluated in detail theories on the formation of the Gausberg-Kerguelen Ridge may have to be revised.

Other routine programmes included three-hourly sampling for water temperature, salinity, oxygen content, and phytoplankton abundance. Studies of the physical structure of the ocean to depths up to 200m were also conducted.

## Third expedition may winter near Rauer Islands

A third Antarctic research expedition organised by the Oceanic Research Foundation will leave Sydney early in November this year and return early in 1984. The expedition's ship will be frozen in, probably near the Rauer Islands about 100km from Davis, and a group of five or six scientists will carry out a summer and winter programme.

Dr David Lewis, who led the two previous expeditions organised by the foundation, will lead the third. Experience gained on the 1981-82 summer expedition to the Commonwealth Bay area will be used to organise the third expedition in which a smaller group will remain longer in Antarctica.

Present plans are for the expedition to leave Sydney on November 14 and return in March, 1984. The preliminary scientific programme, which is being arranged in conjunction with Australian National Antarctic Research Expeditions (ANARE) includes a bird and animal census, shallow water bottom dredging,

meteorological observations, and studies of the interactions of a mixed group in isolation.

A group of six dome-shaped and ice-polished islets, the Rauer Islands (68deg 51min S/77deg 50min E) lie between the Sorsdal Glacier Tongue and Ranvik Bay in the south-east part of Prydz Bay. They were discovered and roughly charted in February, 1935 by a Norwegian expedition. Early in 1937 they were mapped in greater detail from the air by a second Norwegian expedition.

Since then Soviet scientists from Mirny have worked in the area. When Davis was established in 1957 parties from the base made land journeys to the islands. Later visits were by helicopter.



# Private expedition's work in Antarctica

By

Karen Williams and Harry Keys

Five New Zealanders, all with previous Antarctic experience sailed to the continent on a 21-metre steel schooner last summer. Dot Smith, Paul Ensor, Jeni Bassett, Harry Keys and Karen Williams plus another seven crew members, all Australians, made the trip.

It was the Oceanic Research Foundation's second expedition to the Antarctic and the third trip for the ORF president, skipper/navigator, Dr David Lewis. The foundation organised and financed the purchase and refit of the yacht and the cost of the expedition through donations and sponsorship, notably from the Sydney businessman Dick Smith.

The expedition sailed from Sydney on December 12 with 2158 nautical miles of ocean to cross before reaching the coast of George V Land. Surprisingly, the worst weather we experienced on our southward passage was two days of gale force winds. After a three-week voyage aboard our floating home the Dick Smith Explorer, we arrived at Cape Denison in Commonwealth Bay, (Latitude 67°S), in early January. The 1911-14 Australasian Antarctic expedition, led by Douglas Mawson, made its headquarters here, and during its stay discovered the area was blasted consistently by phenomenally high winds. For now, all was quiet at the home of the blizzard.

We motored into the small horseshoe-shaped boat harbour on a beautiful windless evening. Several mooring lines run ashore soon secured the Explorer against the powerful katabatic winds we felt sure would soon be blowing down off the continent. But for eight consecutive days we had calm conditions. Hardly believing our luck, we started immediately on our scientific programme.

A photographic comparison was the basis of a local study of continental ice-sheet margins. We planned to compare photographs of present ice margins with those taken 70 years ago by Mawson's photographer, Frank Hurley. We took pictures at about 20 locations and were

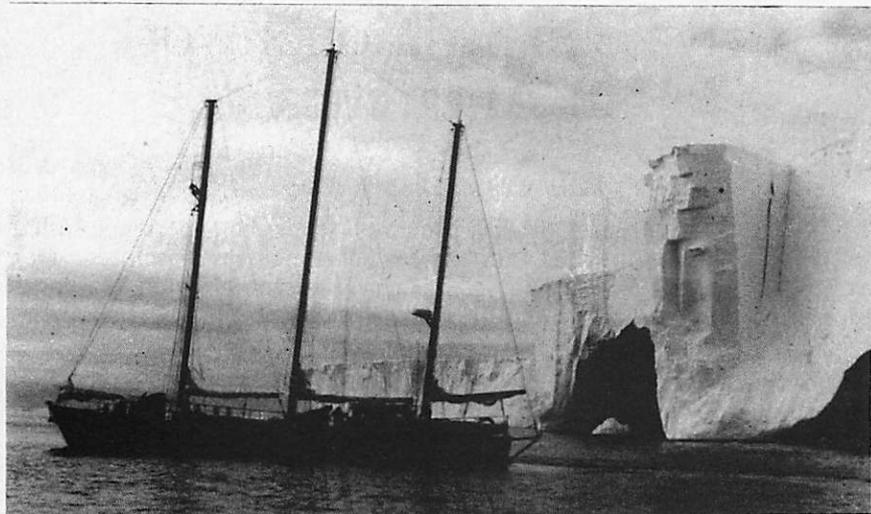
able to detect small changes since 1912. In general, there seems to have been a small retreat of the ice edge. Also it is readily apparent that significant physical weathering has taken place on rock outcrops in the vicinity.

Another project was to measure lake depths and make temperature profiles of the five small lakes at Cape Denison. We found them to be shallow and to contain unstratified fresh water. The deepest and warmest lake was only three metres deep and up to 5.4 deg Celsius in temperature.

Crystalline marine salt deposits were sampled at Cape Denison and other Commonwealth Bay locations for later analysis.

## PENGUIN COUNT

Supplementing a continuous ship-board programme of bird and whale observations biologists Jeni Bassett and Paul Ensor mapped the sprawling Adelie penguin colony at Cape Denison and counted the chick population. With help from other expedition members they completed the first census of Adelie chicks (25,000) on the Mackellar Islets, three kilometres north of Cape Denison. It was here we saw a lone Chinstrap penguin among the Adelies. Jeni and Paul also searched for the nesting sites of other seabirds, locating and counting



**Dick Smith Explorer, the Oceanic Research Foundation's schooner, hove to beside the Mertz Glacier Tongue. Studies of iceberg decay were carried out in and around the caves in the background.**

Photo by Harry Keys, courtesy of Fairfax Group.

snow petrels, storm petrels, skuas and fulmars. Towards the end of our stay they spent many windy hours trying to catch fish for ANARE biologists.

Mawson's hut still appears to be structurally sound although it is showing signs of wear and tear. Blowing snow can filter through cracks in the wooden planking and the interior of the hut is almost completely choked with snow and ice; including the workroom which was cleared by an ANARE party in 1978. A four metre-long snow tunnel was dug before open space was found in the living area. However, even here long icicles hang from the ceiling and hoar frost glistens on the walls.

Mawson's tiny room is still accessible and a few other bunks remain clear but of the expedition relics only a few books and magazines, some provisions and the odd bottle or tin are visible. What can be seen is more tantalising. For New Zealanders who had seen the living museums of Scott and Shackleton on Ross Island, this historic hut was a little disappointing.

### STORMY WEEK

After a week-long storm with winds gusting above 60 knots we were eager to leave Cape Denison. As we sailed out of

Boat Harbour into Commonwealth Bay the Explorer touched an uncharted rock — a reminder of the dangers of sailing in poorly charted Antarctic coastal waters. We spent the next four weeks in the D'Urville Sea, in the vicinity of the South Magnetic Pole.

Iceberg research dominated this period. It took us east to the Mertz Glacier and then west to the French base of Dumont d'Urville, a distance of 260 km. We were investigating the mechanisms and rates of iceberg decay, as part of general feasibility studies for the utilisation of icebergs for fresh water: About 100 bergs were described in detail. More than 50 hours were spent working up close to the bergs from inflatable boats so detailed observations and measurements of freshly exposed ice surfaces could be made. Sea temperatures and salinity were measured and water currents around icebergs were tracked using dye.

Dumont D'Urville was our last stopover. The French were extremely friendly and treated us with great hospitality during the two weeks we anchored off their island base. While here, our radio operator, Don Richards, made radio contact with Lady Fiennes,

of the Transglobe expedition, who was transmitting from Alert on Ellesmere Island in the Canadian Arctic.

Research work continued. A berg grounded nearby in a channel between two islands provided an ideal opportunity for an ablation study as its position simulated an iceberg under tow. In addition, a crew member had seen it roll over, and on subsequent days we were able to measure its melt rate as a new waterline developed. The study showed waterline ablation to be generally the fastest process of decay, occurring at a rate of up to 30 cm a day in water of minus 1 deg C.

At the base itself, Jeni and Paul

assisted French biologists to identify krill species found in the stomachs of penguins. They also passed on Paris Museum tag numbers recorded from seals and skuas sighted in Commonwealth Bay. These had been tagged originally at the French base.

With pancake ice warning of the onset of winter we reluctantly set sail northwards in late February. On the homeward voyage we encountered rough seas and a series of storms. The worst, a Force 11 squall accompanied by 10 m waves made most of us wish we were back on dry land. We soon were; on March 15 the Explorer arrived in Sydney.

## Party did not build rock shelter

In 1972 a list of historic monuments in Antarctica, printed as an annex to the report of the seventh consultative meeting of the Antarctic Treaty nations, referred to the remains of a rock shelter on Inexpressible Island, Terra Nova Bay. The members of the Northern Party of Scott's 1910-13 expedition were said to have spent the winter of 1912 in this shelter and a nearby ice cave.

Sir Raymond Priestley, one of the party, who wrote its story in "Antarctic Adventure," referred only to an ice cave in which the six men lived. There is nothing in this book or other Antarctic literature to suggest that the party built a rock shelter.

There is a simple explanation of the erroneous description — two photographs taken in the 1962-63 season have different titles. One, taken by W. R. Logie, which appears in "South" by Graham Billing and Guy Mannering, shows a sledge, an ice axe, and a boot on exposed rock. The caption in the book says the picture is of a Scott expedition depot, Inexpressible Island.

An identical colour slide — showing sledge, ice axe, and boot — which has not been reproduced, has a different title. It refers to an old sledge left at Cape Geology by Scott's Western Party.

W. R. Logie, who is given the credit for the photograph of a depot on

Inexpressible Island reproduced in "South," led a party which visited Granite Harbour, the Western Party's base, on October 25, 1962. The New Zealanders were interested to see an ice axe, several pairs of boots, and old fuel cans left by Griffith Taylor's party in 1912.

## Marine boundaries

An agreement providing for maritime boundaries in areas where the entitlements of Australia and France under present international law in respect of the continental shelf and 200-nautical mile zone would otherwise overlap was signed in Melbourne on January 4 by the Australian Minister for Foreign Affairs (Mr T. Street) and the French Ambassador (Mr Pierre Carraud). One boundary is in the Southern Ocean between Heard and McDonald Islands, and the Kerguelen Islands.

An agreed dividing line runs from 53deg 14min 07sec S/67deg 03min 20sec E to 49deg 24min 07sec S/76deg 42min 17sec E between the Australian fishing zone around Heard Island and the French Exclusive Economic Zone around Kerguelen. It also divides areas of continental shelf over which each country respectively exercises sovereign rights.

## BAS NEWS

# Effects of invasion on five stations

Almost all the British Antarctic Survey's summer research activities had been completed when Argentine forces invaded the Falkland Islands on April 2 and South Georgia the next day. The invasion was a considerable blow to BAS; communications with stations and ships was disrupted, and meteorological recordings maintained at Grytviken since 1905 were interrupted.

Now the four southern stations are self-supporting again, but there are no winter teams on South Georgia at Grytviken, and on Bird Island. Thirteen BAS men rescued when South Georgia was repossessed on April 25 returned home on April 30.

There are 58 men at the four stations this winter. Thirteen are at Faraday in the Argentine Islands, 13 at Rothera on Adelaide Island, 19 at Halley, and 13 Signy in the South Orkneys. Three biologists were to have wintered on Bird Island for the first time, and eight men at Grytviken.

Disruption of the teleprinter link between the Cambridge headquarters and the stations and ships, which is routed through Stanley, was the greatest problem for BAS after the invasion of the Falklands. But emergency circuits via the ships were soon established to relay vital messages. Immediate help was also given by the Western German Georg von Neumayer Station and the United States Palmer Station.

Considerable anxiety was felt about the 13 BAS men at Grytviken, although 22 Royal Marines had been sent in to protect them, after the refusal of the Argentine party at Leith Harbour to leave. More than a week elapsed before it was learnt that the BAS men had been able to take refuge in the whalers' church — away from the fighting — and had been put on board an Argentine ship within hours of the conflict. They were eventually taken to Argentina and, after some uncertainty, were flown home on April 20.

Thirteen other BAS men and two women wildlife photographers, Cindy Buxton and Annie Price, were scattered at various field sites around South Georgia. (Four men were on Bird Island, two at Schlieper Bay, four on the Lyell Glacier and three had joined the women at St. Andrew's Bay.) The Bird Island party had adequate supplies and shelter for the winter, but the others were in an increasingly precarious position. It was a great relief when they were all rescued by the British forces which repossessed the island on April 25. They were flown home from Ascension Island, arriving back in Britain on April 30.

### FATE OF RECORDS

The fate of extensive scientific records, specimens and equipment at Grytviken is not known although some have now been flown back to Britain. Regrettably the valuable meteorological records which had been maintained continuously since 1905 were interrupted by the Argentine invasion. The state of the buildings at Grytviken is also not known, but damage to them appears to have been superficial.

Whether the outcome of the conflict over the Falkland Islands their future will have a direct bearing on BAS activities. The Falklands have always been a

vital staging post for British Antarctic activities, and South Georgia has played an important role as a fuel depot and source of fresh water as well as being one of the main centres of BAS scientific research.

A joint BAS — West German venture was carried out from the Royal Research Ship John Biscoe during the final months work on the Offshore Biological Programme (O.B.P.) in the 1981-82 season. The West German marine biologists including four women, were led by Professor G. Hempel, director of the Alfred Wegener Polar Research Institute, Bremerhaven. They were primarily interested in krill and fish in the vicinity of the Antarctic Peninsula and the Scotia Arc.

After five transects of the Bransfield Strait, the John Biscoe moved into Drake Passage. She then proceeded some distance south down the west coast of the Antarctic Peninsula and was working a station off the Biscoe Islands on February 20 — the 150th anniversary of the discovery of the islands by John Biscoe.

### STATION CALLS

Turning north again, the ship visited Presidente Frei/Teniente Marsh and Arctowski Stations on King George Island, rounded the tip of the Antarctic Peninsula and then carried out another transect from the Weddell Sea to South Georgia.

Although it is too early for the results to have been assessed the season appears to have been very profitable, and a large quantity of useful acoustic data has been obtained. The next phase of the O.B.P. is wholly to be a winter cruise in 1983.

Having completed the season's O.B.P. work the John Biscoe picked up summer field workers from Bird Island and returned to Grytviken, arriving there on March 3. Field parties on South Georgia were revisited, and the ship delivered more stores to Bird Island, before going back to Signy (South Orkney Islands) to deliver more fuel.

After being held up by gales she returned to the Falkland Islands on

March 16. Then she picked up a relief detachment of Royal Marines to replace the small garrison stationed in the Falklands and finally left Port Stanley on March 29. She arrived at Grimsby on April 29, having disembarked the West German Party at Bremerhave two days earlier.

### GEOLOGY STUDIES

In mid-February the R.R.S. Bransfield picked up the last group of summer visitors, including the BAS director, Dr Richard Laws, and Sir Donald Logan (Natural Environment Research Council) from Mar del Plata, Argentina. She then took more men and supplies to Signy. The next task was to pick up two geologists who had had a successful season working on James Ross Island, and carried out a geophysics traverse en route for the University of Birmingham.

Geological landings were made on Dundee Island and, subsequently, on the west coast of the Antarctic Peninsula, to determine the structure and metamorphic history of the most ancient rocks in relation to the adjacent volcanic arc. Severe weather and moving ice prevented the ship from reaching Faraday, and forced her to shelter near Palmer Station before continuing south to Rothera. She spent three days at Adelaide Island, delivering supplies to Rothera and allowing the visitors to inspect the station, and also to rendezvous with H.M.S. Endurance which was continuing hydrographic work in the area.

Turning north once more, the Bransfield was able to deliver fuel to Faraday on March 10, conditions having improved slightly. She then returned to Rothera. Gales continued to hamper cargo handling but the work was finally completed on March 17. A memorial service was held at Rothera for the two men who had died in a crevasse accident on Adelaide Island in May, 1981.

Before the departure from the area the Bransfield was able to visit the Argentine base General San Martin and the old British station on Stonington Island. This base was closed several years ago.

On the way north further geological and biological landings were made, and Faraday and the old Port Lockroy station were visited briefly. Back in the South Shetland Islands, calls were made at Presidente Frei/Teniente Marsh and Bellingshausen Stations, and the ship proceeded to Punta Arenas, arriving there in late March. She disembarked summer visitors and home-bound parties and returned to the Falklands. Then she had to go back to Punta Arenas to pick up mechanical spares for Faraday.

After the invasion of the Falkland Islands and South Georgia, the Bransfield, which was then at Faraday in atrocious weather, was instructed not to make her final visit to South Georgia. Keeping well to the south she sailed east of South Sandwich Islands before turning north for home. She arrived back at Southampton on May 11.

Plans for a full earth science programme in the 1982-83 season can now proceed because of the delivery of the first of the two new Twin aircraft and the arrival of the second one sharply. These replace the two destroyed by the gale at Rothera in November last year.

One earth science project next season will be a U.S.-BAS investigation of the boundary between Greater and Lesser Antarctica, based on the Ellsworth Mountains. The investigation will extend to the base of the Antarctic Peninsula and Thurston Island.

As the aircrafts were out of action during most of the 1981-82 summer, several geologists were diverted to work in more easily accessible areas. Two did very useful work on Signy Island.

Since the Advanced Ionospheric Sounder (A.I.S.) a computer-controlled radar for remote sensing of the ionosphere, was deployed at Halley in January last year, it has operated with reliability and success. Routine sounding programmes have been maintained continuously throughout the year, with more intensive soundings being made for special study periods. One of these involved A.I.S. measurements simultaneously with overpasses of the NASA Dynamics Explorer satellites. The bulk of the first year's data was returned to Britain by the Bransfield.

The mini-computer associated with the A.I.S. has been used to carry out some initial analyses of data at Halley. Summaries of these were sent over the slow-speed telex link from Halley to Cambridge, where further interpretative work was carried out. Co-ordinated campaigns with another A.I.S., recently installed at Siple Station, are planned for 1982.

At Faraday, five ozone sonde ascents were successfully accomplished by BAS in conjunction with NASA to coincide with overpasses of the Nimbus 7 and Solar Mesosphere Explorer satellites in March. A number of other studies are also greatly benefiting from the combined use of satellite and ground-based data. These include investigations of the plasmopause, auroral zone and magnetosphere.

### SERVICES TEAM

There have been several Services expeditions to South Georgia and the northern part of the British Antarctic Territory in the last 22 years. The latest, consisting of 16 men led by Lieutenant R. E. Veal, R. N., turned its attention to the magnificent mountains and glaciers of South Georgia. It arrived at the island on H.M.S. Endurance in mid-December 1981 and set up a base camp at Moltke Harbour in Royal Bay. By Christmas it had established an advance base at 457m on the Ross Glacier.

Throughout January two teams explored the south-eastern end of the island. The first crossed the Ross Pass and travelled via two glaciers to Larsen Harbour, Paradise Beach and Trollhul. Severe weather was encountered which forced it to remain tentbound for eight days. Nevertheless, the team was able to reconnoitre the mountains and carry out a number of biological projects. It also did glaciological work, which included the collection of snow and ice cores for pollution studies and a survey of glacier fronts.

Meanwhile, the second team backpacked to Gold Harbour via two glaciers and later reached Cape Charlotte and Iris Bay. An attempt to reach the south-eastern extremity, Cooper Bay, was

thwarted by a heavily crevassed glacier. A glaciological survey was made of Iris Glacier, and penguin and sea-bird censuses were carried out along the coast.

A wide variety of specimens, both terrestrial and marine, were collected for several universities and museums, and changes in human physiology and psychology under extreme conditions were monitored.

Mountaineering was also to have been an important part of the programme but was curtailed by persistent severe weather. (In February, travel was possible only on (four days.) However, an ascent was made of Mount Brooker (1828m) and several first ascents of lesser peaks.

The various parties reassembled in early March and were picked up by the *Endurance* on March 15. In spite of the harsh weather the expedition was able to bring back some useful scientific records and specimens.

A new map of the British Antarctic Territory south to 82°S, with South Georgia and the South Sandwich Islands, at a scale of 1:3,000,000 was

published at the end of 1981. The first BAS sheet using satellite mapping at a scale of 1:500,000 has also been produced. (All previous BAS satellite maps were at a scale of 1:250,000). In addition, two further sheets of the BAT geological map series at a scale of 1:500,000 have now appeared. These cover Alexander Island and northern Palmer Island.

### STAMP ISSUES

Because of sea ice and logistic problems several philatelic schedules had to be altered. The Falkland Islands Dependencies reindeer stamps (see "Antarctic," December, 1981) were eventually released at Grytviken, South Georgia, on January 29, and the British Antarctic Territory Gondwana series (see "Antarctic," March, 1982) at Rothera on March 8.

Another Falkland Islands Dependencies series, depicting insects and other arthropods, was released at Grytviken on March 16. The six species portrayed were selected to illustrate the range of form, taxonomic diversity and colour prevalent in such small animals.

## Royal Navy remembers polar veteran

Preparations to send a task force to the South Atlantic after the Argentine invasion of the Falkland Islands did not prevent the Royal Navy from remembering the birthday of an old comrade who served with Captain Scott nearly 72 years ago. The Royal New Zealand Navy also remembered former Chief Petty Officer William Burton, last of all the men who sailed south in the *Terra Nova*.

Bill Burton, who lives in Christchurch, was 94 on April 7. The First Sea Lord, Admiral Sir Henry Leach, wished him many happy returns of the day and extended sincere congratulations on behalf of the Royal Navy.

New Zealand's Chief of Naval Staff, Rear-Admiral K. M. Saull, sent his best wishes on behalf of the Royal New Zealand Navy, and his own. The First Sea Lord's message, which came

through the British High Commission in Wellington, and Rear-Admiral Saull's message, were both conveyed to Bill Burton and his family by Commander C. R. Vennell, Resident Naval Officer, Christchurch.

Two other veterans of early Antarctic expeditions will celebrate their birthdays in November. Dick Richards, the last member of the Ross Sea Party of Shackleton's Imperial Trans-Antarctic Expedition (1914-17) and of the expedition, will be 88 on November 14. He is an Australian and lives near Melbourne.

A New Zealander, Eric Webb, who was born in Lyttelton, and now lives in England, will be 93 on November 23. He is the sole remaining member of Mawson's Australasian Antarctic Expedition (1911-14) in which he served as chief magnetician.

## OPERATION GANGOTRI

# Weather station left in Queen Maud Land

Code-named Operation Gangotri, India's first expedition to Antarctica, which cost about \$US2.1 million, spent only 10 days on the continent. A landing was made on the Prince Olav Coast of Queen Maud Land in the early hours of January 9 at 70deg 3min S/41 deg 2min E not far from Japan's Syowa Station.

A base camp was established on the ice 1½km inland at 69deg 59min S/11deg 7min E. Before the expedition departed it established a solar-powered unmanned weather station named Dakshin Gangotri 80km to the south. (Dakshin in Sanskrit means South, and Gangotri is the spot where the Ganges originates.)

Between December 6 when the expedition sailed from Goa aboard the chartered Norwegian research ship Polar Circle and its return on February 21 scientists carried out a wide range of oceanographic studies in the Southern Ocean south of the Antarctic Convergence, and also in the Indian Ocean. Seismic surveys and echo-sounding revealed the presence of an unrecorded seamount. It was named Mount Indira after the Indian Prime Minister (Mrs Indira Gandhi).

Operation Gangotri was organised by the Department of Ocean Development, which was created by Mrs Gandhi in July last year. The National Institute of Oceanography (NIO), one of the institutes under the Council of Scientific and Industrial Research acted as the lead organisation for the expedition. Twenty-one scientists and technicians took part in the expedition. They came from the Geological Survey of India (GSI), Indian Meteorological Department, National Physical Laboratory, Indian Institute of Magnetism, and the Indian Navy.

For support operations from the Polar Circle and in Antarctica the Indian Navy provided two French-built Alouette helicopters, three pilots and two mechanics, a doctor and a medical

orderly, and a photographer. Commander D. S. Brar, who led the naval team, was the expedition photographer.

Leader of the expedition was Dr S. Z. Qasim, Secretary to the Department of the Environment, and formerly director of NIO in Goa, who previously worked in the Arctic with an international expedition. The two deputy leaders were Dr H. N. Siddiqi, an NIO marine geologist, and Mr C. P. Vohra, deputy-director of GSI, and one of the first Indian mountaineers to climb Mt Everest.

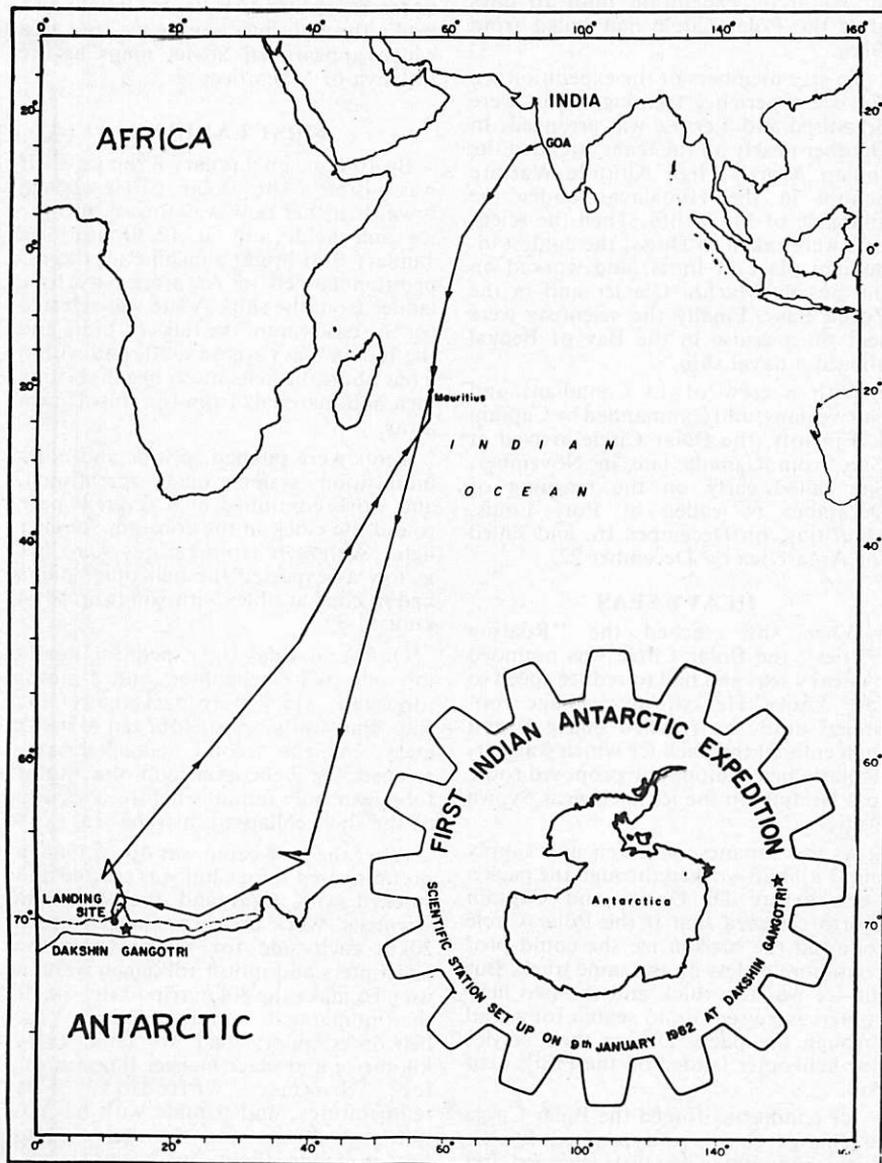
### **SECRET PLANNING**

Operation Gangotri was organised in four months and planned in secrecy. After the 600-tonne Polar Circle, registered in Canada, was chartered for the expedition Indian delegations went to Norway and met scientists with Antarctic experience and representatives of the Norwegian Polar Institute. Later the Norwegian Government was informed of India's plans as the expedition intended to work in Queen Maud Land which is in the sector claimed by Norway.

Norway, one of the original Antarctic Treaty nations, is reported to have assisted the expedition and maintained secrecy. It provided two technicians to operate some of the specialised

# FIRST INDIAN ANTARCTIC EXPEDITION

6 th. Dec. 1981 to 21st. Feb. 1982



Map of the cruise track. Inset: Emblem of the expedition.

Norwegian equipment aboard the Polar Circle, and made only one condition: that the ship's captain should be from the Norwegian Navy. Other Antarctic Treaty nations were not advised by the Indian Government that it had launched an Antarctic expedition until 10 days after the Polar Circle had sailed from Goa.

To give members of the expedition sea and ice experience training camps were organised and a cruise was arranged. In October nearly all the team attended the Indian Army's High Altitude Warfare School in the Himalayas under the guidance of Mr Vohra. Then the scientists were taken to Drass, the coldest inhabited place in India, and worked on the nearby Machoi Glacier and in the Zojila Pass. Finally the scientists were sent on a cruise in the Bay of Bengal aboard a naval ship.

With a crew of 13 Canadians and Norwegians, and commanded by Captain J. Fjortoft, the Polar Circle arrived at Goa from Canada late in November. She sailed early on the morning of December 6, called at Port Louis, Mauritius, on December 16, and sailed for Antarctica on December 22.

### HEAVY SEAS

When she reached the "Roaring Forties" the Polar Circle was pounded by heavy seas and had to reduce speed to four knots. Her stormy passage continued until she reached 60deg S and then entered the pack ice which was particularly heavy along the proposed route to a landing on the ice shelf near Syowa Station.

As the Japanese research and supply ship Fuji had worked through the pack a week before Dr Qasim and Captain Fjortoft agreed that if the Polar Circle followed the broken ice she could proceed more or less on the same track. But the ice was too thick and the two helicopters were sent up to search for a lead through the pack. During their sorties one helicopter landed on the Fuji's helipad.

Ice conditions forced the Polar Circle to change course and proceed further west. She met with little success and finally headed towards the Soviet station,

Molodezhnaya, still forcing her way through heavy pack.

Guided by helicopter to relatively ice-free areas the Polar Circle began to make better progress through the pack although her speed was reduced to between three and five knots. Finally she broke through into a large ice-free area which appears on Soviet maps as the Polynya of Magnificence.

### FIRST LANDING

By 10 a.m. on January 8 the ice-shelf was visible. The Polar Circle moved towards it, her bow was forced into the ice and held, and at 12.30 a.m. on January 9 in bright sunshine all the expedition landed in Antarctica by rope ladder from the ship. A site was selected for the base camp, the flags of India and the Indian Navy were raised, and within a few hours the helicopters began shifting men and materials from the ship 1½ km away.

Tents were pitched, power and communications systems made operational, and work continued at a feverish pace round the clock in the constant summer light. Although temperatures were not as low as expected the helicopter pilots had to cope at times with winds up to 54 knots.

On the first day the expedition nearly lost one of its helicopters and a motor toboggan, which were packed near the ship. Part of the ice-shelf began to break away, but the second helicopter crew rescued the helicopter and the motor toboggan only minutes before a section of the shelf collapsed into the sea.

After the base camp was operational a prefabricated refuge hut was erected and stocked with food and fuel, and the scientists' work area was flagged up to 20 km each side for safety when the helicopters and motor toboggan were in use. To make the 80 km trip to the site of the unmanned weather station the helicopter pilots had to land every kilometre and place marker flags on the ice. Storms, whiteouts, low temperatures, and trouble with navigation instruments and the ship's radio beacon made flight operations hazardous for the newcomers to Antarctica.

When the refuge hut was completed the expedition set up the unmanned weather station Dakshin Gangotri. During a reconnaissance flight a site was found near a lake surrounded by hills free of ice. The Indian flag was raised there, and the helicopters transported men and materials from the base camp.

While the station was being assembled the scientists studied the fresh waters of the lake, recording their productivity and nutrient content. Before the operation was completed and the team left the Antarctic "oasis" a brass plaque bearing the names of the 21 members of the expedition and their departments was fixed to a rock with a special cement designed to withstand extremely low temperatures.

With weather reports from Dakshin Gangotri and Molodezhnaya, which the Indians visited during one of their helicopter sorties, the scientists continued their observations at the base camp. These included upper and lower atmosphere studies, radiation experiments, investigations of the composition and chemistry of the ice, and observations of the behaviour of high and very low frequency radio waves in the Antarctic atmosphere.

When the expedition left Antarctica on January 19 the Polar Circle again had to break her way out of the ice. It took her three days of hard work trying different routes before she reached open water.

On her way back to Goa the Polar Circle had to slow down and change course several times to avoid a severe cyclone, and was pounded again by heavy seas. Another cyclone was reported when the ship was close to Mauritius. She changed course again and spent 24 hours keeping well away from the path of the cyclone.

Late in the afternoon of February 9 the Polar Circle reached Mauritius. The last leg of her voyage to Goa was without incident. February 21 was a hot day and as she sailed into port she was greeted by a warm sea breeze. It, like her, had come all the way from Antarctica.

**Footnote.** India's association with Antarctica began in the 1960-61 season

when a 30-year-old meteorologist, Lieutenant Ram Charan, went south to Wilkes Station. Lieutenant Charan was at Wilkes Station in late December and early January as an Indian Government observer with Australian National Antarctic Research Expeditions (ANARE).

## Israeli Antarctic "claim"

Israel's flag flew in Antarctica last summer, but not to reinforce any territorial claim. The flag was placed on the ice by Mr Didi Menuisy, an Israeli satirical columnist and world traveller as a jibe at the policies of the Israeli Prime Minister (Mr Menachem Begin).

Mr Menuisy, who writes for a publication called "Yediot Aharonoit," was a passenger on a tourist cruise to the Antarctic Peninsula last season. He was quoted in "The Times" as saying that Mr Begin could now extend Israeli law to Antarctica instead of the Golan Heights.

Although "The Times" had a photograph of Mr Menuisy planting the flag watched by a Weddell seal, his account does not indicate where he "annexed" part of Antarctica. He is reported as having left the flag on the mainland about 274m from a Soviet meteorological and mineral research station on the coast near Graham Land.

According to "The Times" Mr Menuisy was told by a Soviet scientist that the area was a no-man's-land, and there was no authority to prevent him from planting his flag and staking a claim. The cruise ship *World Discoverer* made three Antarctic cruises last season, but there have been no reports that tourists went ashore and reached 75deg S to visit the Soviet summer station, *Druzhnaya I* on the Ronne Ice Shelf.



SAE-27

## Second summer station established

Establishment of a second summer station, Druzhnaya II, at the base of the Antarctic Peninsula, was one of the projects in the 1981-82 programme of the 27th Soviet Antarctic Expedition (SAE-27). Originally Druzhnaya II was planned for the 1980-81 season but it could not be established because the Kapitan Markov encountered difficult ice conditions in the Weddell Sea. Instead two summer field camps, Geolog and Shelf, were set up on the Filchner Ice Shelf.

Eight hundred scientists and support staff took part in the summer and winter programmes of SAE-27. Of these 150 were flown south by Ilyushin-18D aircraft to the main Soviet station, Molodeznaya. The aircraft used the permanent airstrip about 30km from the station near Vechernyaya Mountain.

Six ships headed by the Mikhail Somov, flagship of the Soviet Antarctic fleet, transported men and supplies to the seven permanent stations, and the main summer station, Druzhnaya I on the Filchner Ice Shelf, which has been used each summer since 1975-76. Druzhnaya I was re-opened in December by the Vassili Fedosseiev and the Pioneer Estoniya.

Last season the Mikhail Somov left port two months earlier than usual for a two-month expedition into the Weddell Sea. Command by Captain F. Pesyakov, she sailed from Leningrad on September 8 on her 11th Antarctic voyage. She called at Montevideo early in October to pick up a party of United States scientists.

Twenty-six scientists, 13 from each country, took part in the joint expedition, the object of which was to explore a polynya, an area of ice-free water in the pack ice of the Weddell Sea that was first spotted by satellites in 1973. ("Antarctic," December, 1981). The American team included two women, and a New Zealander, David Woodroffe, of the Lamont-Doherty Geological Observatory, Columbia

University, who took part in an oceanographic study of the Ross Sea aboard the United States Coast Guard icebreaker in the 1979-80 season.

Although satellite reports did not disclose a polynya last winter, daily Soviet satellite photographs received during the Mikhail Somov's cruise suggested a slight decrease in ice concentration near 66 deg S/05deg E with expanding and contracting leads in the general area of where the polynya might have been. The absence of a polynya did not affect the carrying out of programmes in physical oceanography, air-sea-ice interactions, sea ice dynamics, marine biology, and marine chemistry.

During the 1980-81 season geologists of SAE-26 who worked at Vostok Station began drilling project designed to reach one of the large lakes beneath the ice cap. Evidence of the presence of such lakes was obtained by radar surveys.

The geologists found in ice cores, from the drill hole, pollen, spores, and micro-organisms that would have provided food for life forms in the buried waters.

When SAE-26 ended 303 scientists and support staff remained in Antarctica for the 1981 winter. Headed by Vladimir Shamont'yev, they were distributed among the seven stations as follows: 149 at the headquarters, Molodezhnaya in Enderby Land; 61 at Mirny on the Queen Mary Coast; 25 at the inland station Vostok (78 deg 28 min S); 26 at Novolazarevskaya on the

Princess Astrid Coast; 21 at Bellingshausen on King George Island in the South Shetlands; 12 at Leningradskaya on the Oates Coast; and nine at Russkaya, Cape Burks, on the Hobbs Coast.

About one-third of the 1981 winter team had previous polar experience either in Antarctica or on one of the Soviet drifting ice stations in Arctic Basin. Nikolay K. Dmitriyev, chief at Mirny, spent his eighth season in Antarctic last winter; Il'dus Kh. Andreyev (construction worker), Vladimir n. Vasil'yev (meteorologist), and Yuriy V. Bryukhno (radio operator) were all in their sixth season.

Vostok, known as the coldest place on earth, lived up to its reputation last winter. The temperature dropped to minus 80 deg Celsius. All the six coastal stations experienced strong winds. At Russkaya winds of up to 115 knots were recorded.

Research activities during the winter included observations in aerometeorology, geophysics, oceanography, hydrography, and polar medicine. Upper atmosphere studies were conducted by traditional methods, and with meteorological rockets. Meteorologists also prepared weather forecasts and ice maps for Soviet fishing vessels in the Southern Ocean.

## Polarstern will go south this year

West Germany's new research and supply ship is expected to make her maiden voyage to Antarctica in the coming season. The Polarstern was launched and named at Kiel on January 25, and is being fitted out at Rendsburg for delivery during the last quarter of this year.

Built at a cost of DM220 million (\$NZ108 million) for the West German Ministry for Research and Technology the 3900-tonne Polarstern (Polar Star) will be used by the Alfred Wegener Institute of Polar Research, Bremerhaven, for research programmes in the Arctic and Antarctic. She will be operated for the institute by the Hamburg shipping firm Hapag-Lloyd Transport and Service Company.

With a crew of 36 the Polarstern will be equipped to carry 106 people, including scientists and support staff for the Georg von Neumayer and Filchner Stations in the Weddell Sea area, and polar field stations. She has the capacity to break through ice 1.5m thick, and will be equipped with two helicopters and a launch.

Fitted with a wide range of equipment, and with a large area allotted to laboratories and workshops, the Polarstern, which is 118m long, has been designed to work in the Arctic and

Southern Oceans, and in the pack ice. She will carry groups of scientists drawn from oceanography, biology, fisheries research, geology and geophysics, glaciology, atmospheric and marine chemistry, meteorology, and the engineering interaction between ice, sea, and atmosphere, Antarctica's ecological system, and the seabed in polar regions.

In future seasons the Polarstern will also be deployed with international expeditions. In addition she will assist West Germany's Antarctic Treaty partners by transporting scientific working parties, relief teams, and general supplies to their Antarctic stations.

Hapag-Lloyd will be responsible for staff and technical matters, movements, and the logistics of research voyages.



SANAE 23

# Research in mountains south of Sanae

Geological research in the Ahlmann Ridge mountains and the Borg Massif was carried out by summer field parties from Sanae III on the Fimbul Ice Shelf in Queen Maud Land last season. The South African National Antarctic Expedition programme also included studies of the Ross seal in the King Haakon VII Sea from the research and relief ship Agulhas. During the voyages of the ship between Cape Town and Sanae III in December and January intensive magnetic surveying was carried out in the area north-west of Maud Rise.

SANAE 23, the relief expedition team led by Mr J. F. du Plooy left Cape Town on December 29 aboard the Agulhas. The ship was off the Fimbul Ice Shelf on January 7, and the relief team and supplies were ferried to the base by the ship's two Puma SA330 helicopters.

On January 17 the Agulhas sailed for the King Haakon VII Sea. There research was carried out in the pack ice on the population biology and dynamics, and feeding ecology of the Ross seal. The ship was off Sanae III again on February 1, and sailed for Cape Town by way of Bouvet Island on February 16, arriving on February 25.

During the summer season three geological field parties supported by the Puma SA330 helicopters operated in the Ahlmann Ridge mountain range and the Borg Massif. The parties were flown to Grunehogna, the geological base in the Ahlmann Ridge mountains 215km south of Sanae III.

Two parties continued the collection of samples for isotopic dating and geochemical studies. The third party initiated a sedimentological study in the Borg Massif. A geochemical study of samples of basalt from the Kirwan Escarpment collected by previous expeditions was also begun.

Geodetic doppler receivers were deployed again at points on the ice shelf

during the summer. This project forms part of an international programme to determine the geoid in Antarctica. Knowledge of the geoid-spheroid separation is an essential prerequisite for survey operations planned for the inland areas.

Research in other disciplines is being continued this winter by the SANAE 23 team. These include air glow, aurora, cosmic rays, ionospheric physics, geomagnetism, magnetospheric physics, meteorology, and seismology. Some recording programmes are carried out in conjunction with British, American, and Argentinian stations.

When the Agulhas sailed for Cape Town she left a winter team of 16 men at Sanae III. In addition to the officer-in-charge, Mr du Plooy, there are three meteorologists, C. G. van Schalkwyk (senior), P. van R. Prinsloo and A. P. Prinsloo; five physicists, A. J. van Tonder (cosmic rays), R. I. M. Fisher (ionosphere and air glow), J. B. Rabie (geomagnetism), J. B. Clarke (micro-pulsations), A. J. Johnson (whistlers and seismology); an electronics technician, T. P. Chowles; two diesel mechanics, I. H. Shaw (senior) and W. J. J. van Rensburg; two communicators, A. M. Moore and M. A. Schmidt; a radio technician, T. Momberg; and a medical officer, Dr J. A. van Rooyen.

## ARGENTINE SEASON

# Mineral search in South Shetlands

Argentina maintains eight permanent Antarctic stations between 74deg W and 25deg W and 60deg S to 90deg S. Another station, Corbeta Uruguay, in the South Sandwich Islands is slightly north of 60deg S but is classified as an Antarctic station.

Four of the stations are on the Antarctic Peninsula, three in the Weddell Sea area, one in the South Orkneys, and one in the South Sandwich Islands. Five are operated by the Army — Belgrano II and III, Esperanza, San Martin, and Primavera — and two, Almirante Brown and Corbeta Uruguay, are described as scientific stations under the direction of the Argentine Antarctic Institute (IAA). Vicecomodoro Marambio on the island of the same name (Seymour Island) is an Air Force base, and Orcadas, the meteorological station on Laurie Island in the South Orkneys, is operated by a naval detachment.

To support the winter and summer stations, and the scientific research programmes organised by IAA, Argentina uses the icebreaker and research ship Almirante Irizar, the transport Bahia Aguirre, and the survey ship Gurruchaga. Air support is provided by Hercules C130-E, Fokker F-28, and Twin Otter DHC-6 aircraft, and Bell UH-1H, Sikorsky S-61R and S-31 Alouette 2 helicopters. Last season two Chinook helicopters were used in the programme. One crashed during operations from Marambio, and had to be replaced by another Bell helicopter.

More than 90 scientists and technicians took part in last season's research programme which was carried out at the permanent stations, other stations and refuges occupied for the summer only, and from ships and aircraft. Twelve institutions and agencies took part in the programme under the general direction of IAA. These included the Universities of Poitiers and Slough, the United States Aeronautics and Space Administration, and the West German Space Agency, which were all concerned in international co-operative programmes.

Two oceanographic projects were planned by IAA to be carried out aboard

the Almirante Irizar during her voyages south last season. They were for the measurement of the physical and chemical parameters in sea water, and the establishment of the degree of pollution of the Southern Ocean by petroleum hydrocarbons. The effect of petroleum hydrocarbons on the metabolism of Antarctic phytoplankton was studied at Almirante Brown last summer and continued this winter. Winter measurements of sea water in the Argentine Basin, Scotia Sea, and Drake Passage during July and August were also planned.

Studies of environmental radioactivity for the National Atomic Energy Commission (CNEA) will be continued at Antarctic stations throughout the year. These include the collection of water from melting snow, marine algae, and penguin bones for the determination of Strontium 90. Scientists at Marambio continued for CNEA the monitoring of natural and artificial ionising radiations.

Geologists and glaciologists from eight institutions worked on the Antarctic Peninsula, in the South Shetlands, and on Vicecomodoro Marambio, James Ross, and Vega Islands, and the Larsen Ice Shelf. Two mineral research exploration projects were carried out in col-

laboration with IAA by Fabricaciones Militares (FM), the national military equipment manufacturing organisation.

One IAA/FM team worked from a field camp in Folsa Bay on Livingston Island in the South Shetlands. It explored mineral areas by test drilling. The other team used helicopter support to select probable areas of geological and mining interest north of the Antarctic Peninsula. Similar teams have worked on the Tabarin Peninsula and Vicecomodoro Marambio Island since the 1978-79 season.

Detailed stratigraphic studies of sediments, and magneto-telluric soundings were made on the east side of the Antarctic Peninsula between Cape Buen Tiempo and Jason Peninsula by a team which included scientists from the National Space Research Commission (CNIE). Scientists from the Centre for Geological Resources Research, the Institute of Geochronology and Isotopic Geology (INGEIS) and the Faculty of Exact and Natural Sciences, University of Buenos Aires, worked from Fosiles Bay on Vicecomodoro Marambio Island to make a geological correlation between the Cape Marsh and Fosiles Bay strata.

A magnetic survey by helicopter of a section of the sedimentary basin of the north-west Weddell Sea was made by a team from the IAA and the Naval Hydrographic Service (SHN). The scientists worked in an area east of Vicecomodoro Marambio Island. In the Mt Flora area near the head of Hope Bay an IAA team worked from Esperanza Station on stratigraphic profiles to establish the paleo-environmental correlation among the Mt Flora-Botanica Bay strata.

### ICE STUDIES

Scientists from IAA, CNIE, the Argentine Institute of Snow and Glaciology (IANIGLA) and the National University of La Plata (UNLP) made a field survey of deposits and geoforms of glacial origin on James Ross and Vega Islands. They worked with helicopter support from field camps on the islands.

An IAA team continued studies of the dynamics of a sector of the Larsen Ice Shelf, and also worked on Vega and

Cerro Nevado Islands. The scientists had Twin Otter aircraft and helicopter support, and made snow and deformation measurements of the Larsen Ice Shelf. They also made dynamics and mass balance measurements in glaciers on Vega Island.

Five IAA biological groups worked by ship from Almirante Brown, at Esperanza Station, aboard the Almirante Irizar, in the South Shetlands, and on the Valdez Peninsula. The projects covered fish, krill, penguins, benthic fauna, and elephant seals.

One team made an ecophysiological study of the *Patinigera* species (Antarctic limpet) in the ocean and in the laboratory at Almirante Brown. An aerial photographic census of penguin colonies near Esperanza was made by a second team which also carried out ecophysiological studies of Adelie and Gentoo penguins.

### KRILL RESEARCH

A team which worked from the Almirante Irizar studies the horizontal and vertical distribution of krill and fish larvae in the Scotia, Weddell, and Bellingshausen Seas, and in Gerlache Strait. An ecological study of benthic fauna at Potter Cove on King George Island in the South Shetlands was made by a team which worked from the Jubany refuge, and also surveyed the nearby fauna and flora. In Valdez Peninsula area the fifth team studied the population dynamics and differentiation of elephant seals.

Upper atmosphere studies were carried out on the Filchner Ice Shelf, and at Belgrano II, Almirante Brown, and Marambio. These are all continuing programmes carried on throughout the year.

An analysis of the dynamics of the plasmopause through the study of the generation and propagation of radioelectric whistlers is an international co-operative programme on the Filchner Ice Shelf and at Belgrano II by IAA and the Universities of Poitiers and Slough. Continuing programmes at Belgrano II, on the Filchner Ice Shelf, and at Almirante Brown include studies of the geomagnetic field in the auroral zone by the National Meteorological Service,

and continuous recording of the cosmic noise at 27 and 30 MHz. Auroral activity is recorded at Belgrano II during the dark period this winter.

Argentina's National Space Research Commission has international co-operative programmes with the United States National Aeronautics and Space Administration (NASA) and the West German Space Agency. Last season's programme with NASA included the launching of balloons and meteorological sounding rockets from Marambio. The rockets carry sensors for the measurement of ozone, winds, and temperatures in the stratosphere, and in the lower mesosphere from ground level up to 70km.

As part of the programme with the West German Space Agency a signal receiving station for communication with the Marisat satellite was installed at Belgrano II in the 1979-80 season. Experiments there were continued last season to analyse the effects on propagation in communications within the L band.

Installation of the remaining receiving station at Marambio was planned for 1982. This station is for communications in the C band with the SYMPHONIE satellite. Data collection platforms were also to be installed at several Antarctic sites in the first few months of 1982 after the satisfactory results obtained in a check of platforms installed in Argentina.

## CHILEAN PROGRAMME

# Ascent of Anvers Island peak

Forty-eight scientists, including a team from West Germany's University of Hannover, took part in last season's Chilean research programme sponsored by the Chilean Antarctic Institute (INACH). Among the projects was an ascent of Mount Francais (2822m), the highest peak in the Osterrieth Range on Anvers Island. Other projects included studies of penguins and seals, the ecology of Antarctic fishes, glaciology, and geodesy.

Seimological and ionosphere recordings and tide measurements were continued at the permanent bases, General Bernardo O'Higgins on the Antarctic Peninsula, and Teniente Rodolfo Marsh on King George Island in the South Shetlands. Scientific field parties also worked on Deception, Anvers, and Doumer Islands, and carried out marine mammal and ornithological studies in the South Shetlands.

In November studies of marine mammals were conducted in the South Shetlands by a team of five scientists led by Professor Daniel Torres, of the Biological Department, University of Chile, Santiago. The biologists conducted a census and mapped the coastal distribution of different species of seals

in the area. Field camps were established for systematic studies of the fur seal and elephant seal population. In January and February newly-born pups were tagged, especially fur seals.

Dr Roberto Schlatter, of the Institute of Zoology, University of The South, Valdivia, did ornithological research in the South Shetlands. His objective was to locate and map penguin colonies. The purpose was to estimate populations and breeding periods to make calculations of the biomass.

On Deception Island in Foster Bay and on Doumer Island in South Bay Dr Victor Ariel Gallardo, of the Biology Department, University of Concepcion, and Professor Marco Antonio Retamal, studied benthic communities. They ob-

tained seabed specimens to determine the abundance of the various species of organisms existing in the sediments at different depths. In addition the scientists determined the parameters of non-life supporting elements to establish the character of the environment in which settled organisms live (temperature, depth, oxygen, and type of sediment).

### FISH STUDIES

Two scientists from the University of Valparaiso worked from Base Marsh to study the terrestrial botony of Fildes Bay. Professor Jorge Redon's objective was to determine the spacial structure of vegetable species in relation to environmental changes. For his thesis on vegetable communities in Fildes Bay a graduate student, Carlos Musa, worked to establish the variety of communities, and to determine how the interior groups existed in relation to the middle groups under micro-environmental conditions.

In their investigations of the ecology of Antarctic fishes Professor Carlos Moreno and William Duarte, of the Institute of Ecology, University of The South, and two other biologists, worked in South Bay on Doumer Island, which lies between Anvers and Wiencke Islands. They completed controlled investigations of the factors which determine the density of young fish in the soft bottom of the seabed in South Bay and investigated factors in the benthic environment which affected the association of fish on the rocky bottom and substrata with macro-algae. In addition they determined the feeding habits and specific composition of the diet of young fish that populate sponges and algae as their dominant habitat.

An international co-operative programme of geodesy and glaciology between INACH and the University of Hannover was carried out at Punta Spring on the Antarctic Peninsula and on Anvers Island. A team of nine scientists was led by Professor Victor Villaneuva, of the Geodesy Department, University of Chile, and included Dr Cedomir Marangunic, of the Geology Department, and Dr Gunther Seeber, who headed the West German group.

Among the five objectives of the programme were determination of the geographic position of the Quintana pillar in Punta Spring by means of Doppler technique for satellite communication, measurements of the gravity variations in the sector of the geodetic column, and tide ensurements in Punta Spring for data vertical from the column. Research on Anvers Island included determination of ice mass measurements at specific glacial points, and measurement of gravimetric profiles on the island.

### PEAK CLIMBED

An expedition of 12 men led by Dr Marangunic, who is a consultant in glaciology to INACH, made an ascent of Mount Francais (64deg 38min S/63 deg 27min W) which forms the summit of Anvers Island and is the highest peak in the Osterrieth Range (64deg 40min S/63deg 15min W) which runs north-east to south-west along the south-east coast of the island.

Mt Francais was discovered by the French Antarctic Expedition (1903-05) and was named by Charcot after the expedition's ship. The Osterrieth Range was discovered by the Belgian Antarctic Expedition (1897-99) and de Gerlache named it after a patron of the expedition, Madame Ernest Osterrieth. One of the objectives of the Chilean expedition was to provide support for an expansion of geological and geodetic research activities on Anvers Island.

As part of the regional geology programme four scientists led by Professor Estanislao Godoy, of the Geology Department, University of Chile, worked on the north-west coast of the Antarctic Peninsula between Capes Tisne and Kater. They completed a controlled investigation of the formation of Mesozoic volcanic detritus and earth-borne sedimentary formations of Upper Paleozoic and Lower Mesozoic age initiated in the zone bounded by Paradise Bay and Hughes Bay.

Data collecting programmes at seismic and ionospheric stations were continued from Bases O'Higgins and Marsh. Mario Pardo, of the Geology Depart-

ment, University of Chile, and an assistant, repaired, calibrated, and maintained the instruments and equipment of the seismological station at Base O'Higgins. They also instructed staff in charge of the station during the year in the functions of the instruments and equipment, and the interpretation of data. Dr Alberto Foppiano, of the Central Institute of Physics, University of Concepcion, visited Base Marsh to reinstall a riometer and magnetometer to reactivate the ionospheric station's operations.

Two scientists from the Naval Hydrographic Institute maintained the tidal station equipment installed at Base Marsh. They also instructed base staff on how to carry out tidal observations. Tide movements were recorded at Base Marsh, and temporarily at Punta Spring where INACH has a refuge hut.

Automatic stations for the collection of atmospheric data by satellite were serviced and maintained by a team of four led by Mauricio Araya, of the Geodesy Department, Division of Space Affairs, University of Chile. Since 1978 satellite data collection platforms (DCPs) have been installed at Bases Marsh and O'Higgins, and on the coast of the Weddell Sea.

There are two DCPs on King George Island. About 5km from the one at Base March another was installed at a place known as Collins. The Weddell Sea Coast DCP is in Duse Bay 60km from Base O'Higgins on the east coast of the Trinity Peninsula. Last season the DCP at Collins was transferred to Punta Spring.

## Ice-breaking capacity of Shirase

Japan's new research and supply ship Shirase, which was launched in December last year, will begin her Antarctic service in the 1983-84 season when she will take the 25th Japanese Antarctic Research Expedition to Syowa Station. She will replace the Fuji which has been in service since the 1965-66 season.

Built at a total cost of 34.4 billion yen, the 11,647-tonne Shirase is 134m long, 28m wide, and has a draught of 9.2m. Her bow, plated with a 45mm layer of high-tension steel specially tempered for very low temperatures, will enable her to cut through ice 1.5m thick at a speed of three knots.

After ice trials the Shirase will be commissioned next year. She is now being equipped with ultra-modern scientific equipment to enable her to carry out research in Antarctic waters. To detect seabed resources she will use automatic ocean-charting equipment. Signals from the navigational satellite MARISAT will be received directly, and shipboard computers will decode weather data received from the TIROS-X satellite in its polar orbit.

To transport men and supplies from the ice edge to Syowa the Shirase will have two CH53E Sikorsky Super Stallion helicopters, each capable of carrying 50 people or 10 tonnes of cargo in a single flight. Two Sikorsky 61A helicopters will be used until the CH53E machines are available. One OH-6D class helicopter will be carried for ice reconnaissance, and on her maiden voyage the Shirase's cargo will include a crated fixed wing aircraft for assembly at Syowa.

With a cargo capacity of 1000 tonnes the Shirase will have a crew of 170 and accommodation for 60 scientists and support staff. She will have a range of 25,000 nautical miles at 15 knots. Her research facilities will include laboratories and equipment for scientific observations in upper atmosphere physics, earth sciences, oceanography, biology, and gravity measurements.



# Italians may return to Ross Dependency

Italy, which has sent five expeditions to Antarctica and the sub-Antarctic, one privately sponsored, has now acceded to the Antarctic Treaty. An Antarctic mission sponsored by the Italian National Council for Research (C.N.R.), has been planned for the 1982-83 season, and will discuss future research activities.

Three Italian expeditions since 1968 have worked in the Ross Dependency with New Zealand scientific and logistic support. New Zealand has been associated with Italian scientists in the Antarctic since the International Geophysical Year (1957-58) when Lieutenant Franco Faggioni, of the Italian Navy, wintered at Scott Base in 1958, and will assist the Italians next summer.

In the 1967-68 season Italy's best-known alpinist, Carlo Mauri, visited Antarctica as a newspaper correspondent and took part in an ascent of Mt Erebus with several New Zealanders. He returned in the 1968-69 season with a small scientific and mountaineering expedition sponsored by the C.N.R.

Italy's first Antarctic project in the Ross Dependency was the result of the Ross Dependency Research Committee's decision that some support be given to small groups from countries not concerned in the Antarctic Treaty, provided that logistic support was available. Mr R. B. Thomson, superintendent, Antarctic Division, visited Rome in 1968 to discuss the project.

Six Italian scientists and mountaineers were then invited to work from Scott Base in the 1968-69 summer to gain knowledge and experience of New Zealand's scientific work. The scientists were Dr Carlo Stocchino, meteorologist and leader, Professor Aldo G. Segre and Dr Marcello Manzoni (geologists). Carlo Mauri led the mountaineering section, Alessio Ollier and Ignazio Piusi.

This expedition did geological research in the Wright Valley and the Boomerang Range, climbed in the Boomerang, Olympus, and Asgard

Ranges, and helped in the construction of Vanda Station.

Before the second expedition in the 1973-74 season Dr Stocchino and Dr Manzoni visited Antarctica in 1972 as guests of the Antarctic Division. They returned in the expedition which was led by Professor Segre, and included two mountaineers, Clemente Maffei and Ignazio Piusi.

With New Zealand support this expedition did geological, morphological, and palaeomagnetic research in the Taylor Valley, and on the Blue Glacier. It also did meteorological research in the area, and in the Miers Valley.

Italy's third expedition was organised with the co-operation of New Zealand scientific and government organisations and financed again by the C.N.R.. It was led by Dr Stocchino. This was his fourth visit to the McMurdo Sound area.

Captain Enrico Rossi, a staff officer in the Italian Navy, was the expedition's meteorologist. The other members were Ivo di Memmo, an electronics technician, and the noted mountaineer and alpine guide, Walter Bonatti, who acted as topographer.

This expedition's main purpose was to carry out research into the micro-climate of both non-frozen and frozen land. It worked in the Wright Valley and also collected rock samples, lichens, and fossils. In addition Walter Bonatti and Gary Ball, an Antarctic Division field assistant, climbed several high peaks in the Royal Society Range and the Johns Hopkins Range.

A private expedition of 15 scientists and mountaineers led by Professor

Renato Cepparo, a film producer, mountaineer, and skier, spent several weeks in the Antarctic Peninsula area during January and February, 1976. This shipborne expedition made geological studies of the shoreline and seabed of Admiralty Bay on King George Island in the South Shetlands, and did underwater exploration. The mountaineers climbed seven peaks, four on Wiencke Island, south-west of Anvers Island, and three on Livingston Island in the South Shetlands.

In 1959 the Italian Polar Geographical Institute organised an expedition to Bouvet Island, the isolated island in the sub-Antarctic 1402 nautical miles south

of Cape Town. Exploration of the island was carried out by Dr Silvio Zavatti and Giorgio Costanzo.

Other Italians have been to Antarctica as mountaineers or yachtsmen, among them Commander Giovanni Aimonecat. He made two voyages to the Antarctic Peninsula in 1969-71 and 1973-74 in the motor schooner San Giuseppe Due.

Italian scientists worked in a Belgian research programme during the 1960-61 season. Four from the University of Pisa took part in an ice drilling project at the Belgian station, Roi Baudouin. They were sponsored by the Italian National Committee for Nuclear Energy.

## Conservation trophy awarded to Antarctic artist

A New Zealand artist, Maurice Conly, who spent two summers painting in Antarctica has been awarded the New Zealand Antarctic Society's Conservation Trophy for 1981 — an Emperor penguin carved in walnut. There have been eight previous awards of the trophy since 1972. It is awarded to any person or organisation contributing significantly to any aspect of Antarctic conservation — preservation of flora and fauna in the Antarctic and sub-Antarctic, and the preservation of historic buildings.

Mr R. G. McElrea, president of the society, who announced the award, said that Mr Conly's paintings and drawings of the huts built by Scott and Shackleton on Ross Island had become widely known in New Zealand and overseas. They had directed closer attention to the huts' condition, and also had emphasised the need to preserve such relics of the Heroic Age of Antarctic exploration. His paintings and drawings of Antarctic wild life had helped to make people more aware of the need to maintain the place of penguins, seabirds, and seals in their still unpolluted environment.

Mr Conly, who lives near Wellington, was born in Dunedin, and did his art training there. Later he worked in Christchurch for a number of years. He went south first in the 1971-72 season as official artist for the Royal New Zealand Air Force, and his second visit in the 1973-74 season was to make a pictorial record for the Antarctic Division.

For two summers Mr Conly worked in the field under harsh Antarctic conditions, using oils, watercolours, acrylics, and charcoal to record life and work on the continent. In 1977 a collection of 52 of his paintings and drawings was reproduced in "Ice on My Palette", with text by Neville Peat.

Mr Conly also painted three large dioramas of wild life for the Antarctic Centre of the Canterbury Museum. He is the Antarctic Division's official artist, and still holds a similar post with the RNZAF.

As a stamp designer Mr Conly has produced New Zealand and Pacific Islands issues. His Antarctic experience was called on when he designed a new set of definitive stamps for the Ross Dependency which was issued by the New Zealand Post Office to coincide with the 25th anniversary of the establishment of Scott Base on January 20 this year.

# Counting penguins from the air

By

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Aerial photography is by far the easiest reliable way to count breeding pairs at many Ross Sea Adelie penguin colonies. Analysis of the photographic results is a technique of undoubted value for obtaining an accurate and permanent record of the numbers and distribution of penguins in many colonies on the same day. The technique will allow future population levels to be compared reliably.

These conclusions have been reached by Rowley Taylor and Peter Wilson after their aerial photographic census of Adelie penguin colonies in the Ross Sea area last December. In the following article written specially for "Antarctic" they describe their project and its results.

On December 6, 1981, we carried out an aerial photographic census of a number of Adelie penguin colonies in the Ross Sea area from a Royal Australian Air Force Hercules aircraft en route from McMurdo Station to Christchurch. As mentioned in "Antarctic", December, 1981, this work was part of New Zealand's contribution to the International Survey of Antarctic Seabirds (ISAS).

One aim of ISAS is to help monitor and understand the distribution and abundance of *Euphausia* krill. Krill is the staple food of many species of whales, seals, petrels and penguins, and any natural or man-induced changes in its abundance could affect the size of these predator populations. Whales and seals are not easy to count, but some sea birds are, and therefore make good indicators of the continued health and balance of the Antarctic Ocean ecosystem.

During the period October to February the breeding population of Adelie penguins in any area may be counted, since the birds are then concentrated at colonies of ice-free areas of coast. The best way to estimate and compare the size of Adelie penguin colonies is from the number of "breeding pairs" present, although it must be

remembered that the breeding population represents only part, possibly 30-50 per cent<sup>1, 2</sup> of the total number of penguins (including immature birds) associated with any colony.

The number of adult penguins ashore at a breeding colony fluctuates markedly depending on the stage of breeding (egg laying, incubation or chick rearing). Counts of penguins can only be used to compare the size of two or more colonies, or to compare any one colony in different years, if they are made at the same stage of the breeding season. Peak numbers of adults are present at a colony in November when both mates of a pair are together at the nest, and again in late December and early January, when large numbers of successful breeders and non-breeding birds are ashore<sup>3</sup>. After mid-January the number of adults ashore declines rapidly.

## BIRD MOVEMENT

During the two periods of peak occupation counts of adult penguins are difficult to make, and those from a single visit almost impossible to interpret in terms of "breeding pairs", because there is much movement of birds about the colony, and many of those present are non-breeders. By comparison, for about two weeks during the first half of



Some of the thousands of Adélie penguins which breed on Possession Island north of Cape Hallett. The photography was taken at a height of 300m from Royal Australian Air Force Hercules by Dr Peter Wilson, Ecology Division, D.S.I.R. Mr Rowley Taylor and Dr Wilson made an aerial photographic survey of penguin colonies in the Ross Dependency from Ross Island to Cape Adare on December 6 last year.

December (when all breeding birds have finished laying), numbers are stable and birds ashore at a colony approximately equal the number of breeding pairs. At this time nearly all birds present are incubating intensely while their mates (and most non-breeding birds) are feeding at sea<sup>1</sup>. The evenly-spaced nesting birds are then relatively easy to count from aerial photographs (see accompanying photograph).

For our survey the plane flew between 300 and 400 metres above sea level and oblique photographs were taken through cockpit and cargo hold windows. Both photographers were in radio contact with the flight crew. Equipment used in-

cluded a motor-drive 35mm camera with 85-250mm zoom lens, and a 6×7cm format camera with interchangeable 105mm and 300mm lenses. Shutter speeds were kept at 1/500 second or faster to help cope with the effects of ground speed, aircraft vibration, turbulence, and camera shake. Films used were 35mm Ilford XP1 400 and 220 Ilford FP4.

Unfortunately, we could not visit any of the colonies for ground counts as originally planned. Detailed counts of total numbers of penguins, mated pairs, occupied nests, and nests with eggs, should ideally be obtained from at least one colony within a day or so of the

aerial survey to interpret more accurately the relationship between the aerial counts and the number of "breeding pairs".

Although the use of aerial photography for surveying penguin populations in the Antarctic is not a new technique<sup>4</sup> we are surprised that with its many advantages it has not been used more in the past. It is by far the easiest reliable way to count breeding pairs at many Ross Sea Adelie penguin colonies. Most nesting areas in the region cannot be surveyed on the ground at the best time because they are beyond helicopter range of permanent bases, and ships are seldom in the area during December.

In the past, visits to these colonies later in the season have suffered both from poor timing and insufficient time ashore for biologists to make detailed ground counts. For example, no reliable estimate has previously been made of the Adelaide penguin population of Franklin Island, although it has been visited during January by biologists from surface vessels on many occasions since 1958. By comparison our 1981 aerial photographed all parts of this large scattered colony (5-180m a.s.l.) during the optimum census period. Where previous reports mention a large colony on the west side of the island containing "50-100,000 pairs"<sup>2</sup>, counts from the 1981 photographs gave a total of 47,300 breeding pairs, which we consider is accurate to within about five per cent.

Similarly, the Wood Bay colony had not been checked since Captain Scott noted in 1904 a "small Adelie penguin rookery". More recently we were unsure as to whether there were one or two colonies there and of the number of birds involved. Our survey revealed one small colony of just over 1300 breeding pairs.

A very small colony of Adelie penguins not previously recorded was seen from a distance on steep slopes on the south-east side of Franklin Island. Unfortunately, fuel did not allow further positioning of the aircraft to obtain detailed photographs.

Aerial photographs taken at other colonies during the 1981 survey has still to be completely analysed, but results so far are most encouraging. They indicate the undoubted value of this technique for obtaining an accurate and permanent record of the numbers and distribution of penguins in many colonies on the same day, which will allow future population levels to be compared reliably.

It is hoped that the current survey will be completed during the next two seasons. Thereafter repeat surveys should be done at regular intervals or whenever this biological information is needed for management decisions.

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## SUB ANTARCTIC

# Foreign fishing activity in Economic Zone

Most of the foreign fishing activity in sub-Antarctic waters of New Zealand's Exclusive Economic Zone from mid-May last year to mid-January this year was off the Auckland Islands. Forty-six trawlers were reported in the area up to mid-January — 13 Soviet vessels, nine Japanese, one South Korean, and 23 joint venture trawlers.

In mid-May four Soviet vessels were fishing near the Auckland Islands, and also one Japanese trawler and one South Korean. Ten trawlers were working for joint venture projects. Near the Snares Islands in Area F of the EEZ there were four joint venture vessels and one Japanese trawler.

Five Soviet trawlers and two Japanese

were reported off the Auckland Islands in mid-June. There were also five joint venture boats in the area. In Area F south of the Snares and north of 50deg S there were two Japanese trawlers and two joint venture vessels. Two more joint venture vessels were reported in Area F just south of 45deg S.

Only three Soviet trawlers were reported working north-east of Campbell Island in mid-October. They were in an area between 170deg and 171deg E in Area F.

By mid-November Soviet and Japanese trawlers were fishing in four different areas of the sub-Antarctic. Five Soviet vessels were working near Campbell Island and two off the Bounty Islands. One Japanese trawler was off the Auckland Islands, and one off the Snares.

Four Soviet trawlers were working in Area E in mid-January, two off the Auckland Islands, one off Campbell Island, and one at 50deg S/171deg E. There were two Japanese trawlers in the

Auckland Islands area and three in Area F. Two of the latter were north-east of the Snares, and a tuna longliner was working at 47deg S/162deg E.

Of the eight joint venture trawlers three were off Campbell Island, and one at 50deg S/174deg E. In Area F four were working north-east of the Snares.

Soviet, Japanese, and South Korean trawlers which finished in the EEZ between April 1, 1979 and March 31, 1980, caught 87,775 tonnes of finfish and 23,435 tonnes of squid. Ninety-eight per cent of the Soviet catch of 28,361 tonnes southern blue whiting came from sub-Antarctic waters, and 96 per cent of the Japanese squid catch of 11,837 tonnes was taken in the Auckland Islands area.

Of the 51 foreign trawlers licensed to fish in the EEZ 31 were Soviet vessels and 13 Japanese. South Korea had seven trawlers in the zone. They took 8214 tonnes of finfish and 776 tonnes of squid, mostly from an area north of 45deg S.

## Transglobe team on last stage

Another stage of British Transglobe's planned circumnavigation of the world by sea, ice, and land, using the Greenwich meridian as a basic route, was completed on April 11 when Sir Ranulph Fiennes (leader) and Charles Burton reached the North Pole. The team was the first in history to reach both the North and South Poles over the ice.

Fiennes and Burton began the final stage of their journey on drifting ice across the Arctic Ocean to Spitsbergen in the middle of April. By the end of last month they still had 240km of melting ice to cover and keep their rendezvous with the support ship Benjamin Bowring. To cope with ice changes caused by summer temperatures they were using two 5m aluminium boats fitted with skis, and modelled on North American Indian canoes.

After a voyage through the North-West Passage last year Fiennes and Burton reached Alert at the northern tip of Ellesmere Island on September 26. They and Lady Fiennes wintered there, and the two men began their journey to the North Pole on February 13. They took 13 days to cover the 160km from Alert to Ward Hunt Island near Cape Columbia. From there they had 833km of ice to cross to reach the Pole.

Accompanied by a film team Fiennes and Burton travelled west along the north coast of Ellesmere Island in limited daylight and temperatures down to minus 45deg Celsius. Using snowmobiles they reached Markham Fiord in five days.

When the two men turned north over the sea ice progress became painfully slow through pressure ice piled in 9m

ridges. Several days later they had to return to the coast for vehicle repairs. After trials with smaller snowmobiles they set out on foot manhauling 90kg of equipment and supplies, having arranged for the vehicles to be flown to them once they were through the pressure ice.

### FIRE AT BASE

Progress continued to be exhausting and slow, and on March 4 there was a serious mishap at the Alert base. Fire destroyed one hut, four snowmobiles, the generator, scientific equipment, and expedition records.

Three small snowmobiles were flown to the party on March 7 and replaced a week later by larger vehicles recovered from Markham Fiord. The film party returned to Alert on March 7.

Because Burton strained his back the crossing party rested for a day. Progress was very fast on March 15 but soon after the start one snowmobile driven by Fiennes ran into a lead and sank, dragging the loaded sledge with it.

Fiennes and Burton spent a miserable night on the ice in a temperature of minus 25deg with only one sleeping bag, no tent, and no food or hot drinks. The next day the Twin Otter landed within 365m of the pair with another vehicle, sledge, and equipment.

On March 19 the two men were in trouble again, stranded on an ice floe in open water and lashed by a gale, the temperature having risen to minus 6deg. But when the wind dropped the temperature fell to minus 34deg and the two men were able to continue their journey. By March 25 they had reached 85deg 41min N/71deg 10'W.

Conditions began to improve later in the month. Although they encountered more pressure ridges, leads, and whiteouts, and were always cold and wet, Fiennes and Burton continued to make good progress.

Fiennes and Burton reached the Pole at 3.15 p.m. G.M.T. on April 11 they hoisted the Union Jack, had afternoon tea, and toasted their success with two bottles of champagne. The expedition was the seventh to reach the Pole over

the ice since 1909, and Fiennes and Burton joined 27 other men who have made similar journeys. They took 46 days to complete the 833km crossing.

While the two men remained at the Pole for 24 hours to verify their position they had visitors. First was the Twin Otter flown by Karl Zberg with one of the support team, David Mason aboard. Then a chartered aircraft arrived with a "Daily Mirror" reporter and photographer.

### BREAKING ICE

Good mileages were accomplished for several days after the two men left the Pole. But rising temperatures, stronger winds, and breaking ice forced them to spend several days drifting with the current. The sea frozen again and the party was able to move under its own power.

On April 30 the Benjamin Bowring left Southampton to pick up the two men north of Spitsbergen. Normally the Arctic ice extends to within a short distance of the island. In this year's abnormal conditions open water extended 160km further north.

By the beginning of May Lady Fiennes and her radio equipment had been flown from Alert to the Danish weather station at Cape Nord in north-east Greenland. In the middle of the month she reported that Fiennes and Burton had reached 85deg N/50deg E.

Norwegian and French expeditions also set out for the North Pole early this year. Ragnar Horseth (leader), Trygve Berg, and a 38-year-old Eskimo, Ekaksak Amoralik, were at 86 deg N when the Transglobe team reached the Pole. They planned to travel across the ice to Spitsbergen but abandoned the plan.

Disputes among its eight members caused the French expedition to abandon its plan to place the first Tricolor at the Pole. The expedition, led by a journalist, Christian Gaiissian, left Scoresby Sound in north-west Greenland in April but returned to its base after only a few days.

# Land mammal fossils found in Antarctica

Fossil bones of a marsupial of the late Eocene epoch — about 40 million years ago — were found on Seymour Island in the Weddell Sea last season by a United States scientific team headed by Dr William J. Zinsmeister, of Ohio State University's Institute of Polar Studies. They are the first fossil bones of a land mammal to be found in Antarctica. Fossil bones found previously were those of amphibians, birds, and reptiles.

This discovery ranks as one of the most significant scientific discoveries in recent years, according to the National Science Foundation, which is responsible for the United States for the United States Antarctic research programme. Dr Zinsmeister says the confirmed presence of land mammals in Antarctica clearly shows that Antarctica and South America were attached during the Late Cretaceous and Early Tertiary periods, about 65 million years ago.

Seymour Island, which is south of Erebus and Terror Gulf and off the north-east tip of the Antarctic Peninsula, yielded the first Antarctic fossils in 1893. Captain C. A. Larsen, who explored Erebus and Terror Gulf during his whaling and sealing voyage in the Jason brought back fossilised wood. Nordenskjöld's Swedish expedition in 1901-03 found fossilised molluscs, penguin and fish bones, and plants on Seymour Island.

Last season's find of the first fossil bones of a land mammal was made at the base of a large rocky tableland. The fossils were the jawbones of a small, rodent-like animal which fed on berries. The marsupial, now extinct, has the scientific name *Polydolopus*. Three jawbones were found, representing at least two animals. The jawbones were about 2.5cm long and each contained two or three teeth.

A long-held hypothesis that mammals migrated between South America and Australia through Antarctica is supported by the presence of mammals on

Seymour Island. Scientists have believed that remarkable similarities between certain animals on the three continents can be explained only by a land connection millions of years ago.

## REPTILE SKELETONS

Dr Zinsmeister's team, which worked on Seymour Island between February 17 and March 9, made other significant fossil finds. The scientists discovered a lizard, the first reptile reported from the Tertiary period of Antarctica. Earlier reptile fossils found in 1969 were from the Triassic period, about 200 million years ago.

Another find included a number of skeletons of plesiosaurs, large marine reptiles that thrived about 70 million years ago. One skeleton was more than 12m long. Fossil teeth in the jaw fragments were 17.78cm to 20.32cm long.

Other finds included large numbers of fossil bones of giant penguins up to 1.8m tall; fossilised shark teeth; the first discovery of a mosasaur, a marine lizard that lived 70 million years ago; and teeth of what appear to be the first crocodiles from the Tertiary period of Antarctica. Also found were exceptionally well-preserved fossils of bony fishes from the Cretaceous period, the first such find in Antarctica; large quantities of fossilised wood and leaf impressions; and a large number of unidentified fossil bones.

Dr Zinsmeister says that these important paleontological discoveries and the geological programmes carried out by

the expedition should provide a fairly accurate picture of the animal and plant life of Antarctica and the surrounding seas between 75 and 50 million years ago before the onset of glacial conditions. Future study of the unidentified fossil bones may show the existence of other land mammals and birds in Antarctica during the early Tertiary period.

Other Ohio State University's expedition was the first major research effort on the eastern part of the Antarctic. Others in the expedition included a New Zealander, Dr Rosemary Askin, now a research associate at the Colorado School of Mines; Dr Sankar Chatterjee, an adjunct professor of geophysics at Texas Tech University; and Dr Michael P. Woodburne, chairman of the department of earth sciences, University of California, Riverside.

Support for the expedition which was organised to study the geological and paleontological history of the James Ross Island Basin, which includes Seymour Island, was provided by the United States Coast Guard icebreaker *Glacier*. Field support was provided by the icebreaker's helicopters.

Dr Zinsmeister first worked on Seymour Island in the 1975-76 season. He was a member of an Ohio State University team which studied the Cenozoic biostratigraphy of the island. The object was to determine the geology, stratigraphy, and paleontology of the exposed raised continental shelf sediments in the Antarctic Peninsula, Scotia Arc, and far southern South America. The ultimate use of the programme was towards an evaluation of the Antarctic Peninsula area for petroleum and natural gas.

## Antarctic Society plans for anniversary

Plans for the celebration of the 50th anniversary of the New Zealand Antarctic Society next year were discussed at the annual meeting of the society's council. The anniversary celebrations will start on November 2, 1983.

To mark the occasion the society will also publish an illustrated history of its first 50 years. The book will record the society's achievements and the contributions of its members.

A Wellington businessman, Mr Arthur Leigh Hunt, arranged a meeting in the city on November 2, 1933, and those present decided to form the New Zealand Antarctic Society. A Dunedin branch was formed in 1936, and the Christchurch (now Canterbury) branch was formed in 1955.

Because of the Second World War the society went into recess and was not revived until 1949. The Dunedin branch also went into recess in 1950. It was revived after the war, but went out of existence in the early 1960s.

National celebrations of the 50th anniversary will be held in Wellington. The two branches will also arrange local occasions.

A past president, Mr J.M. Caffin, was made a life member at the council meeting in recognition of his outstanding service in furthering the aims and objects of the society. Mr Caffin has been chairman of the Canterbury branch, and since 1973 has edited the society's quarterly news bulletin, "Antarctic," which was first published in its present form in 1956.

Officers elected were: President, Mr R. G. McElrea (Canterbury); vice-president, Squadron Leader W. Hopper (Wellington); secretary, Mr G. D. Sylvester (Wellington); treasurer, Mr H. W. Burson (Canterbury); editor, "Antarctic," Mr J. M. Caffin. Two patrons were appointed. They are Mr H. F. Griffiths, a past president and former editor of "Antarctic," and Mr G. W. Markham, who was superintendent, Antarctic Division, Department of Scientific and Industrial Research, from 1959 to 1965.

OBITUARIES

## Bob Dovers was master of Polar travel

Robert Dovers, who played a leading part in the establishment of Australia's first permanent station in Antarctica, died in Sydney on December 10 last year, aged 59. He was surveyor and officer-in-charge of the winter party which set up Mawson Station in Mac-Robertson Land 28 years ago, and spend three months in the field leading parties into unexplored areas.

Son followed father to Antarctica because Bob's father, George, was a surveyor with Mawson's Australasian expedition of 1911-14 to Adelie Land, and was a member of the Western Party led by Frank Wild which spent a year on the Shackleton Ice Shelf. Bob Dovers served a sub-Antarctic apprenticeship on Heard and Macquarie Islands, and in 1951-52 was the Australian observer with the third French expedition to Adelie Land.

When he was only 19 Bob Dovers broke his studies to serve with the Australian Imperial Forces in the Middle East and the Pacific. He was first a gunner, and then served in a commando squadron. Shortly after his demobilisation as an engineer officer he joined the Australian Antarctic Division, then part of the Department of External Affairs.

In 1947 Dovers was chosen as a member of the first Australian expedition to Heard Island. He was second-in-command of the winter team, and his field observations as a surveyor in 1948 led to the production of the first accurate map of Heard Island.

When he returned to Australia in 1949 Dovers remained with the Antarctic Division. Later he spent most of the 1949-50 summer on Macquarie Island conducting another survey programme.

Plans to establish a permanent Australian station in Antarctica were postponed because of the lack of a suitable ship. While a vessel was being

obtained arrangements were made with Expeditions Polaires Francaises for Dovers to accompany the third French expedition to Adelie Land to gain polar experience. He was responsible for looking after the expedition's huskies.

### BASE FIRE

Soon after the expedition arrived at its base, Port Martin, towards the end of January, 1952, a fire broke out in the early hours of the morning. Fanned by a 50-knot gale it destroyed all the base buildings except an emergency hut and several small huts used as instrument shelters.

This disaster made it impossible for the winter party of 12 men led by Rene Garcia to remain at Port Martin. A subsidiary base near Pointe Geologie about 80km from the main base had already been established primarily to study a nearby Emperor penguin rookery of 12,000 birds.

When the chartered Norwegian sealer Tottan returned to Pointe Geologie and Mario Marret, leader of the four men there, was told what had happened he decided to remain and try to carry out his mission. Three members of the Port Martin team — one was Dovers — volunteered to join Marret's group.

This was agreed to, and the Tottan set sail for home, leaving Marret and his six men to carry on alone. During the winter of 1952 Dovers acted as cartographer, navigator, and dog handler.

## WINTER JOURNEY

Because seven men faced the prospect of living in a small hut near Pointe Geologie with stores planned to maintain four men Marret decided that a trip to the burnt-out Port Martin base in search of more food and equipment was essential. To bring back the badly-needed food and vehicles which had escaped the fire four men made a perilous journey to Port Martin in the middle of winter.

Dovers and his companions were forced to travel over the sea ice because they were short of petrol for the trip in their one and only weasel. The journey was made in darkness and low temperatures, and the party was held up repeatedly by blizzards and bad visibility.

But after 34 days Marret and his men struggled back to their hut on the Ile des Petrels with two new weasels and five tonnes of stores. A bonus for the rest of the winter was the whole cellar of Port Martin.

With more stores and fresh equipment the team was able to make its main western journey, first south-west on the Polar Plateau, and then down to the coast which was to be surveyed and mapped. Dovers took part in this

traverse of 643 km from the base and back, which was made with two weasels and two teams of six dogs each.

There were blizzards on 35 of the 43 days the party was in the field. But in spite of difficulties it reached 136deg 9min W, less than 2.8 km from the board of Adelie Land and Australian Antarctic Territory.

As a result of his experience with the French expedition Dovers became a master of polar travel by dog team and tracked vehicle. When Mawson was established he used his skills in planning field operations to explore east and west of the new station. On one spring traverse to the west he and the French observer with the expedition, George Schwartz, explored for the first time the region inland from King Edward VIII Gulf, covering a total distance of 900km.

A traverse south-west of Mawson took another party led by Dovers to what are now known as the Prince Charles Mountains. Dovers, a New Zealand geologist, Bruce Stinear, and the medical officer, Bob Summers, saw for the first time the northern part of these mountains. Later Dovers proposed that the mountain chain be named after the Prince of Wales.

# From desert and jungle to Antarctica

A distinguished New Zealand soldier, Lieutenant-Colonel Ronald Arthur Tinker, who fought during the Second World War in the North African deserts, in the enemy-occupied mountains of Albania, and then in the Malayan jungle after the war, died in Christchurch on February 16, aged 68. In 1962 when he was Chief of Staff, Southern Military District, he was appointed leader at Scott Base for the 1962-63 season, and wintered there in 1963.

Colonel Tinker, who was born in Christchurch, was a sergeant in the 27th (Machine-gun) Battalion when he was seconded to the Long Range Desert Group. He became an experienced navigator in the uncharted desert areas of North Africa, was awarded the Military Medal in 1942, and the Military Cross in 1943 when he was a second-lieutenant.

As an officer Colonel Tinker led his own L.R.D.G. patrols and expeditions in the Western Desert behind the enemy lines. When the North African campaign ended he took part in clandestine small boat raids in the Dodecanese Islands and against the Germans on the Greek mainland. After the Germans captured the Dodecanese he escaped to Turkey and made his way back to Palestine.

In Italy he trained in mountain warfare and ski-ing, and carried out sorties against German land and sea communications in the Dalmatian Islands and on the Yugoslav mainland. He then led a force which parachuted into Albania to fight against the German occupied forces.

As a regular soldier after the war Colonel Tinker served as intelligence officer with the Fiji Military Forces. Then he was chosen to form the Fijian infantry battalion sent to Malaya at the height of the Communist terrorist activities. He commanded the battalion for its two years in Malaya and the jungle warfare, and was awarded the O.B.E.

While Chief of Staff, Southern Military District, Colonel Tinker was given leave before reaching the retiring age for his rank so he could take up his appointment as leader at Scott Base. His

contribution to the New Zealand research programme was recognised by the placing of his name on the map of Antarctica in the Ross Dependency.

Tinker Glacier (74deg 00min S/164deg 50min E) is a 40km-long glacier which drains the central part of the Southern Cross Mountains and flows south-east into Wood Bay on the coast of Victoria Land. It was named by the northern party of the New Zealand Geological Survey's 1962-63 expedition. The Tinker Glacier Tongue, which is the seaward extension of the glacier, was named at the suggestion of the United States Advisory Committee on Antarctic Names.

During his desert service Colonel Tinker became an expert in the field of astral navigation. He maintained a keen interest in mapping and exploration, and was a Fellow of the Royal Geographic Society for many years.

## Greenhouse gardening at Arctowski

One of three permanent stations on King George Island in the South Shetlands, Henryk Arctowski, was built in the summer of 1977 by a Polish expedition led by Dr Stanislaw Rakusa-Suszczewski. It is in Admiralty Bay on Thomas Peninsula at 62deg 09min 45sec W, and was named after one of two Polish scientists with the Belgica expedition of 1897-99.

Run by the Institute of Ecology of the Polish Academy of Sciences, Arctowski has permanent meteorological, magnetic, and seismic observatories. Intensive geological, glaciological, and hydrological research is also carried out. The main target of the research is to find out about the flow of energy and circulation of matter in the coastal area of the Antarctic ecosystem, and to explore the biological resources of its waters.

Arctowski's buildings cover more than 1800 square metres. There are living quarters for a winter team of 20 in single rooms, and in summer the station can accommodate 75.

There are laboratories built and equipped for biological, oceanographic, meteorological, magnetic, and seismic

research. Electricity is supplied by generators installed in a building with a steel structure, and two wooden buildings serve as garage and storeroom. Special workshops have been provided for the repair and overhaul of equipment which includes boats and two Mi-2 helicopters.

Like other Antarctic stations Arctowski has a greenhouse. Scientists from the Botanical Gardens of the Polish Academy of Sciences use it to grow experimental plants. The greenhouse also provides fresh vegetables for the winter party.

Nature conservation is a special concern of the staff at Arctowski. Water mains, sewers, and a sewage treatment plant have been built, and a fuel tank with a capacity of 1000 cubic metres has a double casing. This prevents leakage of fuel oil even if the main tank is completely destroyed.



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# ANTARCTIC BOOKSHELF

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## Polynyas in the Canadian Arctic

Edited by Ian Stirling and Holly Cleator Canadian Wildlife Service Occasional Paper No. 45 : 72pp.

It is perhaps easier to know what polynyas are than to be clear about their ecological significance and the effects which greater intensity of ship traffic and pollution may have on them. This paper, edited in part by Ian Stirling, who is known to many workers on Ross Island, presents five reviews ranging from the physical characteristics of polynyas through primary biological productivity to their significance for marine mammal populations.

A polynya, we are told, is an area of open sea water surrounded by ice. They must be non-linear in shape (to distinguish them from shore leads) but may be limited at one side by the coast. Some are known to recur at the same position every year and they can occupy very large areas. Intriguingly, they are known to submariners as "sky lights!" Their distribution and other characteristics can be mapped from satellite imagery.

Little is known about the biological and physical oceanography of polynyas, particularly about the lower levels of the food web on which mammals and sea birds depend. However, it seems that polynyas are developed by varying combinations of strong currents, winds and up welling. It is thought that the constant formation of new ice in winter should increase the salinity of surface waters in polynyas and transport heat upwards from deeper layers. The ice-edge ecosystem rather than the open water is most important for primary biological production because there is an energy exchange along the ice-edge between the sub-ice system, the open water and the benthos.

To date there has been little study of the ice-edge ecosystem in polynyas or elsewhere though algae and diatoms have been sampled many times.

Antarctic polynyas play a critical role in the survival of many marine mammals though the precise relationship can vary greatly between species, seasons and individual polynyas. Some hunting communities have long been located near recurring polynyas, but increases in the numbers of hunters together with the availability of modern weapons has led to wasteful and excessive pressure on some animal populations.

Fears are expressed that most Canadian Antarctic polynyas are threatened with extensive disturbance and possible pollution as a result of offshore petrochemical development and year-round shipping. These problems cannot as yet be fully evaluated owing to inadequate understanding of the ice-edge economy. It could be, for example, that increases in the extent of ice-edge resulting from ice-breaking by ships will lead to greater primary production while adversely affecting populations of marine mammals.

Much of the material reviewed has application to Antarctic as well as Antarctic waters, particularly in regard to ice-edge ecology because the Antarctic is amongst the most productive marine regions of the world while the Arctic is among the least. Seasonal variation of Antarctic ice-cover is also much greater than in the Canadian Arctic. If events in the Arctic can be taken as any guide it seems likely that studies of sea-ice distribution, polynya formation and ice-edge ecology will soon become important aspects of Antarctic marine science.

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# ANTARCTIC

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