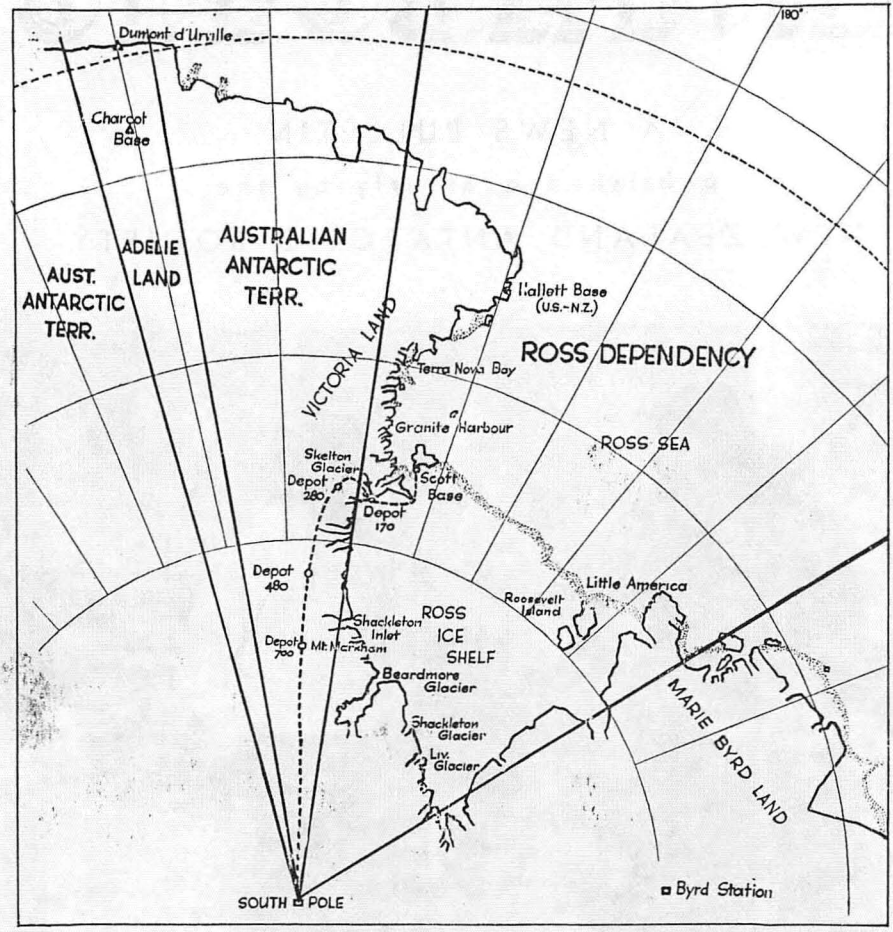
# ANTARCTIC

A NEWS BULLETIN
published quarterly by the
NEW ZEALAND ANTARCTIC SOCIETY


## ANTARCTIC MEETING

**Sir Edmund Hillary and Dr. V. E. Fuchs join forces at Depot 700, established by the New Zealand party 700 miles south of Scott Base.**
(World Copyright: Trans-Antarctic Expedition.)

VOL. I No. 9. MARCH 1958




## THE ROSS DEPENDENCY

By Order in Council dated July 30, 1923, the territories of the Ross Dependency—that sector of the Antarctic Continent between 160° E. longitude and 150° W. longitude, together with the islands lying between these degrees of longitude and south of latitude 60° S.—were brought within the jurisdiction of the New Zealand Government.

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The dotted line indicates the route being followed by the New Zealand expedition's southern party, with the approximate positions of the depots established and proposed.

UNIVERSAL PRINTERS LTD., 22-26 BLAIR STREET, WELLINGTON

"ANTARCTIC"

(Successor to "Antarctic News Bulletin")

VOL. I No. 9. MARCH 1958

Editor:
L. B. Quartermain, M.A., 1 Ariki Road, Wellington, E.2, New Zealand.
Business Communications, Subscriptions, etc., to:
Secretary, New Zealand Antarctic Society, P.O. Box 2110, Wellington, N.Z.

# NEW ZEALAND EXPLORERS EXAMINE THE ROSS DEPENDENCY

**In addition to the great southern journey in support of the Trans-Antarctic Expedition, parties of New Zealand explorers have carried out geological, survey and biological work in many parts of the Ross Dependency. The New Zealanders have covered a total area of 80,000 square miles, extending from Cape Adare in the North to the South Pole, the whole length of the land area of the Dependency.**

### STUDENTS' TREK

Two fourth year geology students of the Victoria University of Wellington, B. C. McKelvey and P. N. Webb, who left Wellington on December 14 on "Endeavour" probed 400 square miles of uncharted territory with New Zealand and American field parties.

With a New Zealand trail party, they explored the unknown fastnesses of the dry valleys which exist in an ice-free area of the Victoria Land coast. With an American party, carried by helicopter from Williams Air Operating Facility, they covered further valleys in another part of this area.

### SURVEY OF LAKE AREA

Three biologists, Balham, Barwick and Packard, and a geologist, Webb, left Scott Base by American helicopter on January 5 for a ten-day trip to Victoria Land.

The dry valley system they investigated lay between the Wright and Mackay Glaciers. One particular lake, measuring half a mile by several hundred yards, was the first object of the survey.

With them the party had a fibreglass boat capable of carrying two men. From this craft soundings of the lake were taken, plankton collected, and bottom samples taken. Instead of sledging, the men carried packs in this snow-free region.

### NORTHERN PARTY

The four-man Northern Party consisting of Brooke, Douglas, Gunn and Warren was engaged in mapping and surveying the length of five glaciers—Mawson, Fry, Mackay, Debenham and Taylor—and along part of the Ferrar Glacier. By early December they were working along the western side of the Prince Albert Mountains. Brooke and Douglas took time off from sledging to indulge in climbing the highest peak in the Prince Albert Mountains. The peak, which is unnamed, is about 10,000 feet high.

### SEAM OF BLACK COAL

Gunn and Warren, the geologists, have made the important discovery of an extensive coalfield in the Ross Dependency. Black coal is exposed for two miles, and this outcrop has been thoroughly investigated. They first sighted it in an air reconnaissance with Cranfield, on Decemmer 1. Three days later they sledged in to it. The coal is sub-bituminous. It contains fossil leaves and tree stems of two feet in diameter.

The Mawson Glacier outcrops are in a bare snow-free hillside. Above the coal seam the hills rise another 1,800 feet. The coal is embedded in the hill which is compact sandstone. The general description of the land is scree-covered, steep hillside with low glaciated bluffs.

In late December Gunn and Warren were camped on the east side of the Lashly Mountains, where they planned to spend four days. Brooke and Douglas were making a 30-mile side trip to the Plateau Depot to pick up supplies and to cache rock specimens collected by the party.

In the last week of December this party established five new survey stations, and collected many more specimens of plant fossils.

### ASCENT OF MT. HUGGINS

Late in January Warren and Douglas were flown out from the head of the Skelton Glacier, while Brooke and Gunn travelled on down the glacier to the Ross Ice Shelf. These two on January 26 succeeded in an attempt to climb the 12,870 ft. Mt. Huggins, one of the most distinctive peaks in the Royal Society Range.

It was the last week of surveying and geology for the two climbers before they returned to Scott Base. The first part of their climb was to go in from their base camp at 5,000 feet up to the site they had chosen for establishing a "bivvy camp" at the head of a trench-like glacier on the north face of Mt. Huggins at 8,000 feet. To do this they had to go four miles, and they covered the distance in six hours. The glacier at this stage was heavily crevassed but a good route was found close under ice cliffs where old avalanche debris had filled in the chasms.

The climb gave them 2,000 ft. of broken ice face with powder snow about one foot deep and this they found extremely hard work. On the last section they followed the north rock ridge of the peak and had a steep pitch to finish with an overhanging cornice. At this point they were in lightly falling snow from local cloud.

They returned to their "bivvy camp" at 7 o'clock in the evening, where they remained for two hours before continuing to base camp, which they reached at 11 o'clock.

Brooke and Gunn had an unbroken spell of four months with their dog teams in the mountains west of McMurdo Sound.

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### S.C.A.R.

The Special Committee on Antarctic Research set up by I.C.S.U. (the International Council of Scientific Unions) ended a three-day meeting at The Hague on February 5.

The Committee decided in principle that scientific investigations in the Antarctic should be continued for at least five years after the end of the International Geophysical Year. The Committee also decided to recommend the establishment of three new meteorological stations, on Bouvet Island, Heard Island and Peter I Island, and to add geology, morphology (the study of land forms) and cartography to the special committee's programme.

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As the Americans withdrew their airfield installations from the ice runway, a voice asked over the radio: "Where is the control tower?" The reply was: "The McMurdo Tower is secured. It is being towed away."

## A BLUE HOLE OPENED

On December 15 a party of two dog teams under Ayres and Carlyon was working about 20 miles west of Mt. Longhurst in the Britannia Range. They were at 7,000 feet at the top of the Darwin Glacier neve.

No troubles were foreseen by Ayres and Carlyon when they stopped for their Sunday lunch of a slab of chocolate and a flask of hot cocoa. They had been travelling through crevassed country but only a half a mile of this now lay between them and the plateau proper.

After lunch the men set off again with their dog teams. Each was moving on skis beside his own sledge.

Carlyon noted later in his diary: "Harry, who was ahead of me, disappeared over the next brow. A few minutes later I breasted the brow to see Harry waving vigorously to me. There was neither sledge nor dogs in sight."

Ayres had been there for six minutes, unable to do anything. Apart from what he stood up in his whole rig was down the crevasse. He had been travelling along in the ordinary way, and then his team stopped. One of the dogs was yelping. He moved forward on his skis from the rear of the sledge and had only time to notice that a dog was down to his belly on the snow, when the ground to his immediate left began to collapse softly and rapidly.

### DOGS BREAK THROUGH

The first four dogs on the trace fell abruptly through a blue hole which formed in an instant on the snowy surface. The ground began to break back. The other five dogs went through. Jerked forward, the sledge ran a yard or two, then plummeted vertically. The snow under Ayres' left ski broke clear away. He threw himself to the right, and was safe. He was also quite alone.

Roy Carlyon's diary goes on: "I saw the long hole in the surface. The sledge, on investigation, was found to be jammed about 10 feet down the crevasse, hanging vertically. There was no sign of the dogs save for an occasional whimper far below."

### AYRES TO THE RESCUE

A steel wire dog span was anchored with both ends in the snow. Ayres went down the crevasse on a rope and attached the doubled end of the dog span to the sledge. The sledge and the dogs suspended below it were thus held from falling further.

"I let Harry down on a rope and laboriously hauled up two dogs on another rope, which he attached to their harnesses," wrote Carlyon. "Even then Harry, who was wedged with his feet against one wall of the crevasse and his back against the other, was not able to tell the fate of the remaining seven dogs."

Ayres was finally able to establish than one dog was dead and that two were right at the bottom of the crevasse detached from the trace. The dead dog had apparently been struck by the men's heavy can of kerosene which had been dislodged from the sledge and was now at the bottom.

When Ayres had sent up the six live dogs in the trace, Carlyon took his place down the crevasse. "I then put on my high altitude climbing boots and crampons and Harry lowered me on the rope down past the precariously lodged sledge, past the length of suspended dog trace, to the bottom of the crevasse, 70 ft. down."

At the end of a day and a half's work Ayres went 70 ft. down again into the blue depths of the crevasse to retrieve part of a fruit cake which had been made by his wife.

# New Zealand Geologists at Work in North Victoria Land

The eight-man New Zealand Geological Survey trail party (v. "Antarctic" 1/7) was transported from McMurdo Sound to Hallett Station in two flights of a U.S. Navy Dakota on December 16 and 17, and had 7½ weeks of full work in a "sub-tropical" Antarctica.

They enjoyed almost entirely calm sunny weather, which nearly compensated for the "delirious nature of man-hauling" in mountainous country. For their first two weeks in the field they were joined by Mr. G. Turnbull, an English paleomagnetist under contract to the United States I.G.Y. Committee, who collected oriented rock samples before returning to McMurdo Sound for further collecting.

Hallett Station is in a mountainous setting, and is built on a low coastal spit backed by 1,000 ft. cliffs leading up to a 5,000 ft. ridge. At present the only easy means of exit from the station is on the sea-ice. So several jobs had to be done simultaneously and in a hurry in the two weeks before the ice in Hallett and Moubray Bays went out to the Ross Sea. It had been observed from the air that a major valley glacier flowed into Tucker Inlet 20 to 30 miles south of the station. A 2,000 ft. pass (Football Pass) leading from Hallett Bay to the Tucker Glacier was reconnoitred, along with an overland route back to the station, and a depot of food and fuel was made by weasel near the foot of Football Pass.

Five men went on a six-day geological journey northwards to Moubray Bay to make a tenuous link with the work done 50 years earlier by the Borchgrevinck and Campbell parties at Cape Adare and Robertson Bay. The topographic team of four men established several survey stations on high points around Hallett Bay. The food depot was hauled to the top of Football Pass, and two lines of ablation and accumulation stakes were set out on Hallett Glacier. This work was completed in time, one day before the sea-ice broke up in Hallett Bay.

The next four weeks were spent on the Tucker Glacier, mainly establishing survey stations and mapping the geology; but also digging snow pits, collecting lichens, mosses and insects, and making regular weather observations. From their highest camp on the Tucker Glacier, 66 miles from Football Pass, four members of the party climbed two peaks that they have called Mt. Shadow and Mt. Twilight, getting superb views for a radius of 100 miles over the pyramidal peaks of the Admiralty Range and out to the Plateau.

This work has shown that Hallett Station can be used as a base for trail parties ranging widely over the northern part of Victoria Land, for the Tucker Glacier is a highway into the heart of the region.

The members of the expedition arrived back in New Zealand on February 24 on the U.S.S. "Glacier" and after a short break assembled in Wellington to compile their maps and write the official report, which it is hoped will be ready for publication by the Deportment of Scientific and Industrial Research later this year. The maps will cover a district extending for roughly 100 miles along the coast between the Lady Newnes Ice Shelf and Cape Adare and inland for 20 to 80 miles,

with ground control excellent in the middle but fading in accuracy towards the margins. A minor problem in compiling the map is that a dozen mountains in the district were named by Sir James Clark Ross during his voyage into the Ross Sea, but there are so many mountains that there is difficulty in identifying those that he named.

Dr. Harrington states that the main geological result was the discovery that the Robertson Bay group of metamorphosed greywackes and argillites, first described by Sir Raymond Priestley, occupies most of the region between Mt. Nansen and the northern coast of Victoria Land, and probably extends much further south also. This wide distribution was unexpected. Northerly trending belts of granodiorite intrude the sediments which are folded on west-north-west axes, striking towards comparable sediments of similar strike found by the Byrd expeditions in Marie Byrd Land, and towards metamorphics of similar strike found by French expeditions in Adelie Land. It seems a strong possibility that one major rock group, lying below the Beacon Sandstone, strikes from Marie Byrd Land across the Ross Sea and through Victoria Land to Adelie Land. If that is so, it follows that East and West Antarctica are **geologically** one continent.

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Dr. Troy Péwé, discussing the glacial history of the McMurdo area at the Wellington Symposium, pointed out the difficulty confronting the glacial geologist here because the glacier snouts being seaborne, deposits were beneath the sea. But erratics found at Cape Royds proved that the Victoria Land glaciers once extended right across McMurdo Sound, indicating a series of glaciations the dates of which are not yet even approximately known.

## H.M.N.Z.S. "ENDEAVOUR"

H.M.N.Z.S. "Endeavour" left Wellington on December 14 and called at Dunedin for two days to take on additional stores and equipment. The vessel reached McMurdo Sound on December 30 and tied up to the ice seven miles from Hut Point. Six days of continuous work emptied the ship of more than 250 tons of cargo and delivered it nine miles across the ice to Scott Base. The help of U.S. Navy ice-breakers in smashing a long slot in the bay ice was of great advantage, cutting five miles off the distance between ship and base.

Intensive improvement and cleaning-up work on the three historic hut built by Scott and Shackleton in McMurdo Sound has been carried out by crew members of "Endeavour", which left again for Wellington, New Zealand on March 5. On board were the Trans-Antarctic Expedition crossing party and Lewis, also the remaining members of the New Zealand section of the expedition, Hillary, Miller, Marsh, and airmen Claydon, Cranfield and Tarr, also Barwick of the summer party.

A great welcome, including a State Luncheon and a Civic Reception awaited them at Wellington on March 17.

## NEW ZEALAND AND THE ANTARCTIC

New Zealand will raise "at some time or other" the question of some form of international control of the Antarctic, says the Right Hon. Walter Nash, Prime Minister and Minister of External Affairs.

Mr. Nash has also stated that New Zealand has approved in principle of the continued operation of New Zealand bases in the Antarctic. "We will continue all our activities there," said Mr. Nash prior to his departure on his tour of Asia at the end of February, "particularly those concerned with the International Geophysical Year."

# COMMONWEALTH EXPEDITION CROSSES THE ANTARCTIC

**In our December issue we recorded the difficulties which confronted Dr. Fuchs and his Commonwealth Trans-Antarctic Expedition on his reconnaissance journey from Shackleton to South Ice. This quarter we report the triumphant conclusion of one of the great exploits of Antarctic exploration.**

November 14 was the day on which Fuchs had planned that the Main Party should finally leave Shackleton. All that could be done now was to await the arrival of the Otter which would take him back from South Ice to start the journey over again. Unfortunately the weather prevented flying and it was not until the 15th that he flew back in two and a half hours over the route which had taken 37 days to cover on the ground.

At Shackleton, everyone had been working steadily to prepare for the 14th, but becoming more and more anxious as the days went by and the 'three-week' journey extended to over five weeks.

When the party finally departed on November 24 it had three Sno-Cats, two Weasels and a Muskeg tractor. The four RAF members of the Expedition who so greatly contributed to the field operations were left to fly the Otter plane via South Ice and the South Pole to Scott Base on the far side of the continent.

### AT SOUTH ICE

With his mechanised transport encountering soft snow bridges on the difficult route between Shackleton Base and South Ice the progress of the party was slow at first. Persistent bad weather dogged the march. Twice, Sno-Cats slipped into crevasses. On the first occasion one of the vehicles hung precariously on the lip of a 60-foot crevasse for five hours. Sixty-five miles were covered in one day when conditions improved.

When Lewis flew out to South Ice on December 22 to meet the party on their arrival, he found them physically and mentally exhausted after their month-long strenuous journey. The three days at South Ice were spent in repairing vehicles and reloading sledges. The party left South Ice "going full-bore" for the Pole on the evening of December 25. Squadron Leader Lewis and his members of the RAF Flight at Shackleton had been flying in supplies from Shackleton Base prior to the party's departure. Two dog teams set off ahead of the main party and soon were 50 and later 75 miles out, reconnoitring a way for the vehicles to follow. Their task was to give radio warning of any crevassed areas to be avoided by the main column. As the advance party progressed they built a snow cairn every five miles which ensured that the main party followed their route even though the sledge track had become invisible.

### SCIENCE EN ROUTE

On the ground, seismic soundings showed that the ice thickness increases steadily southwards. But in the vicinity of latitude 88° 30' S. the rock base appears to rise to within 2,000 feet of the surface, whereas the general ice depth is about 6,000 feet. These soundings were made at approximately 30-mile intervals, but gravity stations were maintained at 10- to 15-mile intervals. The main problem was lack of sleep, for slow movement over great expanses of sastrugi (the widest was unbroken for 65 miles)

or in whiteout conditions means long hours of driving.

The train which left South Ice comprised four Sno-Cats, three Weasels and a Muskeg tractor.

Usually camp was pitched between 9 and 10 p.m. Then a 36 foot hole was bored in which the seismic shot was fired. This took two to three hours as the three-inch diameter ice cores had to be laid out for glaciological examination by Lister. The firing of the shot was delayed till morning so that Lister's thermometers could remain in the bore overnight. At that depth he found temperatures down to minus 52° F. While this work proceeded, La Grange set up his fluxplate equipment and Geoffrey Pratt and others laid out the 300-metre spread of 48 geophones. Vehicle repairs and the relashing of sledge loads, refuelling, radio schedules, and other tasks kept everyone busy until midnight, and the unfortunate subjects of Rogers' physiological programme had an even longer stint.

By the time pemmican had been eaten and they were settled for the night, there remained but six hours for sleep.

After leaving South Ice, crevasses were absent but there were belts of sastrugi at right angles to the route and periods of whiteout when the surface was invisible and steering was by magnetic compass alone. A combination of sastrugi and whiteout prevented all movement, and these occasions were used for vehicle maintenance and repair.

From South Ice the route led over a series of east/west ridges which remained a constant feature, though their regular nature gave way to a form of snow down-land where basins and swells could be seen undulating into the distance. In spite of the rise and fall they steadily gained height until they reached the true polar plateau at approximately 9,000 ft. The last of the undulations and rough fields of sastrugi disappeared only 50 miles from the Pole. Over this last stretch the surface was smooth but soft, making hard work for the transport, but this was more acceptable than the rough going of the previous 500 miles.

For the first part of the journey from South Ice the daily run was less than 20 miles. Early in the New Year the vehicles caught up with the dogs.

On January 4, Fuchs reported: "We are now 550 miles from Shackleton and 357 miles from the Pole in a position 84° 43' S., altitude 7,000 ft.

"The last 57 miles have been through a rugged field of high sastrugi.

"The vehicles go up and down 4 ft. ridges as they wend their way through a maze of weird forms carved by the wind from the snow.

"Every few yards, the heavy sledges crash over precipitous places, causing damage to runners, tow-bars and vehicles. The present average progress is 20 miles a day of 13 to 15 hours."

By the 8th the party was 7,600 feet up, at 86° 25' S. By mid-January the Muskeg and two Weasels had been dropped, as planned. The remaining five vehicles, four Sno-Cats and a Weasel, with the 18 dogs, were now 105 miles from the Pole. Good progress was made, and the Pole reached on January 20.

## THE SOUTH POLE

Dr. Fuchs describes the arrival at the Pole:

"Two days before our arrival Admiral Dufek, Commander of the United States Antarctic activities, and Sir Edmund Hillary flew from McMurdo Sound to the Pole station. Together with the Administrative and Scientific Commanders, Dr. Houk and Major Mogenson, they came out to meet us at a point some three miles from the Pole. We have received a great welcome here and enjoyed the luxury of a shower, for washing since we left Shackleton on November 24 has

scarcely been possible. We expect to remain here 48 hours before leaving on the next leg of our journey, but now we have the advantage of a known route for Sir Edmund Hillary's traverse to the Pole will tell us where the crevasse areas are and what surfaces to expect. In addition we have the successive depots which he has established for our use.

"Admiral Dufek has kindly agreed to fly out our dog teams to Scott Base so that we shall be free to cover distances greater than 30 miles each day."

Hillary flew back to Scott Base, ready to join Fuchs as soon as he reached Depot 700, to act as guide over the difficult terrain between 700 and Scott Base.

Dr. Fuchs' party left the Pole on January 23 and made rapid progress, an average rate of 40 miles for the first few days. The party was travelling in a partial whiteout and with a 15- to 20-knot tail wind.

By the 27th they were 117 miles from the Pole. Dr. Fuchs said by radio that seismic soundings showed a rising rock surface. The soundings were confirmed by gravimetric readings at 15-mile intervals.

## GAS-POISONING STRIKES

On January 28 Geoffrey Pratt, the seismologist of the party collapsed from the effects of carbon monoxide poisoning. Pratt had been unwell for a few days, but rather than worry his companions he had not told them.

Dr. Rogers at once applied oxygen from his own meagre supply and Pratt regained consciousness. Later in the day he was carried into the seismic Sno-Cat on a stretcher to observe a seismic recording which he insisted on seeing through to completion.

Word of the emergency was received at Scott Base soon after 5 p.m. on January 28. Dr. Fuchs inquired whether Pratt could be flown out by American aircraft and Sir Edmund at once went over to Hut Point to see Rear-Admiral Dufek who promised all possible aid. Two Neptunes were airborne before 8 o'clock and were in Dr. Fuch's area shortly before midnight. They picked up the vehicles on the radar screen from 20 miles out. Approach was made through low cloud. The cloud ceiling was only 800 feet and visibility was as little as half a mile.

Dr. Griffith Pugh, a physiologist, who is at McMurdo Sound on behalf of the British Medical Research Council, flew in one of the aircraft. He conferred with Dr. Rogers by radio before the drop of oxygen was made. Dr. Pugh had been making a specialised study of carbon-monoxide poisoning for about a year before he came to McMurdo this summer. He judged that Pratt could be properly cared for by the administering of the oxygen brought from McMurdo and he did not recommend that the real hazard of landing be undertaken in the circumstances.

Each aircraft successfully dropped one oxygen cylinder sufficient for at least 48 hours. The aircraft made their drops shortly before 1 a.m. and returned to base without incident. On the ground, Dr. Fuchs' men at once recovered the cylinders and reported them to be in good order. Pratt made an excellent recovery.

By the beginning of February Dr. Fuchs and his men were really "tramping along." They had passed the 300-mile mark from the Pole, leaving only 200 to Depot 700. Their best run was 70 miles. The party was travelling in bright sunshine with the temperature in the minus twenties. Winds were up to 20 knots. Surfaces were generally soft but the best for the Sno-Cat since leaving Shackleton Base.

Fuchs' 12 men were now distributed three to each of the four Sno-Cats, the last Weasel having been abandoned.

On February 6 Dr. Fuchs was in trouble among the crevasses which

had been found by Hillary south of Depot 700. Two Sno-Cats had dropped into crevasses, and had been recovered, but the steering of one of these was broken. It had been left with an attendant Sno-Cat while repairs were carried out.

### DEPOT 700

Fuchs passed safely through the most southerly area of crevasses. These were about 56 miles south of the depot. His trouble was in the second area, which he struck rather to the west of Hillary's route. He now travelled south-east, in an attempt to find the series of snow cairns which Sir Edmund's party built to indicate the safe route through, and with his immediate group of two Sno-Cats, reached Depot 700 shortly before 9.30 p.m. on February 7. The other two vehicles were then about 10 miles behind but well clear of the crevassed area.

Within a few minutes of arriving at the depot Fuchs spoke on the voice-radio to Hillary at Scott Base. The weather was fine and clear on the plateau, but no flight was possible as the weather over the Ross Ice Shelf was poor.

After more trouble with the steering gear, the delayed Sno-Cats reached Depot 700 safely. Hillary now flew in from Scott Base (see cover picture) and the whole party left 700 on the morning of February 10.

Radio black-outs now hampered communications for several days, and when messages again came through the party were at Midway Depot, and pausing for routine maintenance. Another mishap to one of the Sno-Cats halted the expedition on the 16th after only 18 miles of progress.

Dr. Fuchs reported the snow tractor named Rock 'n' Roll suffered a broken steering gear, forcing the party to camp overnight for repairs.

Hillary helped the expedition cover 50 miles on Friday in spite of a blinding "whiteout" caused by intense light on the snow. He tied a rope around his waist and went ahead on foot, testing the surface for crevasses with an ice axe, while the Sno-Cats crept along behind him for 30 miles by using instruments.

February 19 was a day of laborious fumbling through a "whiteout." At all times, two men went ahead to give the vehicles a safe lead, taking the work in hourly stretches.

Though crevasses were not reported in the area, the party could not take the chance of pushing ahead in a place where visibility was nil. The flag markers were put out by the men on skis about every 100 yards.

### PLATEAU DEPOT

The Plateau Depot was reached safely, and aircraft flew out from Scott Base with mail—and freshly cooked steaks: both received with boisterous satisfaction. Blaiklock and Stephenson, who had been the dog drivers on the Shackleton-Pole journey, were now flown out to Scott Base, the dogs having been brought back from the Pole by U.S. aircraft.

The party were now pitching six tents when they camped. Dr. Fuchs and Sir Edmund shared one of these. When the vehicles were running normally and the weather had not broken the party's routine, the halt for the day was usually made about 11 p.m.

The camp began to stir again shortly after 8 a.m. and the vehicles were on the road by 11 a.m. The off-duty drivers commonly lay in their sleeping bags in the body of the rather chilly Sno-Cats—and played chess.

On the trail, the periodic meteorological and gravimetric readings were still carried out. These caused delay for the vehicle directly engaged, and might halt the whole train.

## DOWN THE SKELTON

The vehicles were now moving down the upper staircase of the Skelton Glacier, having covered about 45 miles since departure from Plateau Depot.

When the party camped at 9 o'clock on the 24th the weather had closed in to a near whiteout and the temperature was minus 40 degrees. The wind was strong and bitterly cold.

However, when the 11 men broke camp in the morning the sun was shining. They set off still with a cold wind but the temperature rose to minus 30 during the day.

Now the vehicles were running on a series of descending waves, some of unaccustomed steepness, losing a further 2,000 ft. in eight miles until they emerged on to The Landing, with their altitude only 3,000 ft.

The Lower Staircase took the party down a further 2,000 feet and brought them at last to 1,000 feet of altitude at Clinker Bluff. Now the route was becoming more enclosed, with the rock features of the mountain chain narrowing towards the Glacier proper.

From Clinker Bluff the men had less than 45 miles to go for the Skelton Depot. The Skelton, a typical valley glacier, has 12 to 15 miles of crevasses, all clearly visible, and all at right angles to the line of march. They are narrow but must be crossed.

The depot, some four miles east of Teall Island, was reached on the morning of the 27th.

Lister, the glaciologist with the party, who travelled with Fuchs and Hillary in the leading Sno-Cat, said that Hillary's knowledge of the polar plateau and the Skelton Glacier saved Dr. Fuchs's vehicles up to a fortnight on the journey.

## SCOTT BASE

From the Plateau Depot it was a clear run across the ice-shelf to Scott Base, where the crossing party were welcomed by a jubilant group of over 100 New Zealanders and Americans on March 2, 99 days after setting out on their great journey.

An impromptu band played the National Anthem, Dixie, and "My Bonny lies over the Ocean." Some of the British party were overcome to the point of tears. Admiral Dufek, Cdr. Witherell, U.S.N., and "Bob" Miller welcomed the crossing party, and Dr. Fuchs and Sir Edmund Hillary replied.

After an "eggs and bacon" meal at Scott Base, and a long-anticipated bath, Fuchs was shaving off the beard which he had worn since arriving in Antarctica when the message arrived announcing his knighthood.

## TRANS-ANTARCTIC FLIGHT

The first attempt on December 30 to fly the Otter from South Ice to Scott Base broke down when icing and turbulence were met in thick cloud about halfway from South Ice to the Pole, and the plane had to return to South Ice. Fuel supply was now too low to make the second attempt safely, but an American Dakota aircraft from Ellsworth Station flew five drums in from Shackleton Base for them.

Squadron Leader John Lewis and his three companions—Flight Lieutenant Gordon Haslop of Te Aroha, Flight Sergeant Peter Weston and Sergeant Ellis Williams—spent an uncomfortable week at South Ice, wondering if they would have to return to Britain through the American Ellsworth Station.

But conditions improved and on the morning of January 6 the Otter took off again. Two hours after setting out, the plane flew over the ground party making its way to the Pole. For about three hours over the plateau in the area of the

## PLUNGE INTO FROZEN SEA

Mr. Albert P. Crary, the scientific leader at Little America, fell 60 feet from the ice barrier into Kainan Bay on February 28.

He scrambled on to a small ice floe and was carried out to sea.

With a civilian scientist, Mr. S. Den Hartog, Crary was making a hydro study at the edge of the ice barrier. Suddenly a 15-foot section of the barrier broke off and he was spilled into the ice-strewn water.

Den Hartog jumped clear, and after seeing his companion come to the surface and scramble on to the small ice-floe he made his way two miles and a half to the station to summon help.

One minute after being notified, a rescue party was under way. At the ice-edge a raft was lowered, and a party under Captain Maher descended on a line and paddled out to Crary, whose floe was now a mile out to sea. The rescue party reached him in 20 minutes, and hurried back to the ice-edge.

Here a helicopter lifted Crary to the top of the barrier by a line and sling. He was at once transported to the camp by a waiting Sno-cat, and six hours later was eager to get on with his work.

107 men will winter over at Little America. The scientific personnel number 22. This includes Weather Central participants from France, Argentina, U.S.S.R. and Australia. Mr. Albert Crary continues as Scientific Leader and Deputy Chief Scientist for the entire U.S. Antarctic scientific programme for a second year.

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At McMurdo Sound, on December 29 and 30, canopies of jungle grey silk carried ten men to the snow, in the Navy's first Antarctic jump. The jump was made to requalify members of McMurdo's search and rescue team who stand by to aid downed flyers.

## BYRD STATION

The largest tractor train in Antarctic history departed from Little America on January 20 en route to Byrd Station. The train was made up of seven 40-ton Caterpillar tractors towing 12 20-ton sleds and three wanigans, one sno-cat towing a 2½-ton sled, and one crevasse detector weasel.

Major Merle Dawson, U.S.A., Army polar expert, who blazed the original trail to Byrd station in November, 1956 accompanied the train to check the eight-mile stretch of crevasses which begins at the 183rd mile on the trail. They probed their way carefully, feeling for deadly traps hidden beneath innocent-appearing snow bridges. A new improved electronic crevasse detector snooped out five danger spots, four of which proved only minor cracks but one was a full-scale crevasse. After collapsing the snow bridge by blasting, the gaping gully was filled by a Sno-dozer Caterpillar tractor. The filled area was then tested and packed by running a 38-ton tractor over it with two men walking 50 feet behind and driving with tractor reins. Repair of the crevasse area took ten hours, then the train crossed one sled per hour. Major Dawson returned to Little America when the train was safely across.

Another task of the tractor train crew was to reflag the trail. Orange flags tied atop 12-ft. bamboo poles were planted every one thousand feet. Across the crevasse area flags were planted every one hundred feet on both sides of the trail. It took 4,200 flags to mark the 647 mile trail. After unloading nearly 200 tons of cargo train crews assisted in station construction and development for several weeks.

The 19 men of the tractor train left Byrd on February 21, arrived back at Little America on March 3 and will winter there. The outward trip took 11 days, 21 hours, and the return journey was done in the

# NEW ZEALANDERS' PART IN TRANS-ANTARCTIC EXPEDITION

**In accordance with carefully prepared plans, the New Zealand component of the Trans-Antarctic Expedition, under Sir Edmund Hillary, established Depot 480 at 79° 51'S., 148° E. Their task now was to lay a further depot and to reconnoitre a safe route for Dr. Fuchs' Sno-cats on the last portion of their journey across the Continent.**

Ellis and Mulgrew, recovered from injuries, now rejoined the tractor party, and with Hillary, Bates, Wright and correspondent McKenzie left Depot 480 on December 6. Miller and Marsh, who had reached Depot 480 with their dog teams on November 28, pushed on south five days ahead of the tractor party, scouting ahead. Ayres and Carlyon, also with dogs, broke away from the main party's route and headed east to carry out the first exploration and mapping of the area around the Darwin Glacier.

Travelling at night because a southerly sun made sun-compass observations easier, and in temperatures of 20° below zero, the tractors made successive runs of 53 miles and 40 miles in glorious weather with little wind. This brought them to 80° 55' S., 145° 20' E.. about 150 miles W.N.W. of Mt. Albert Markham. The plateau altitude here is approximately 8,000 ft., with large gentle undulations of several hundred feet.

Early on the morning of December 8 the right runner of one sledge broke through the ice crust. The sledge, loaded with food and tents, sank to half the height of its load at an angle of 45°. Hillary, probing with his ice axe, determined the run of the crevasse and the sledge was extricated after an hour's delay.

Two hundred yards further on another sledge went through. Some of the snow bridge disappeared, showing blue ice down to 60 feet or more. The sledge was hauled out and trail was made a mile or so to the west.

## MIDWAY DEPOT

The weasel was now at its last gasp and Hillary decided to establish an intermediate depot to relieve the loads. In a hummocky area at 81° 30'S., he set up Midway Depot with six drums of fuel. They were now 130 miles from Depot 480.

Bates and Ellis made one last effort to reclaim the weasel. The thrust bearing in the differential had disintegrated and they had no spares. Bates constructed a temporary bearing out of brass welding rod but despite ingenious ideas for keeping it cool, it proved unsatisfactory.

They abandoned the weasel and put all the loads behind the three tractors. The next 90 miles was a trying experience. Deep snow in the hollows forced them to relay; the hard surface of the ridges was all too frequently split by crevasses and they had many unpleasant moments.

By December 12 the party was within 58 miles of Depot 700. But the night's run was only slightly more than 17 miles. Then with about 10 miles to go, crevasses again were encountered and Hillary ordered camp.

Setting out again at 5 a.m. on December 15, two miles on the journey the leading tractor lurched wildly and sank back heavily into a crevasse it had just failed to

straddle. Its peaked tow bar pointed upward at 70 degrees. The tractor was jammed in the lips of the crevasse and joined by rope with the vehicle following.

A pasage was found for the other two tractors, and after much snow had been shovelled away they pulled their companion tractor out.

A few hours later the whole train trundled down the last slope to the black tents and dog lines of Depot 700, which had been established by Miller and Marsh. The party had covered the 220 miles from Depot 480 in nine days.

The R.N.Z.A.F. Flight had a strenuous time stocking depots 480 and 700. In both cases it was necessary for a small detachment to be stationed at a staging depot at the foot of the western mountain chain. In the case of Depot 480 it was at the foot of the Darwin Glacier, and for Depot 700, at the foot of the Shackleton Inlet.

The stocking of Depot 700 was completed on December 20, and the marking flags were set out on ten six-foot snow cairns half a mile apart spread out five miles on either side of the depot.

## FURTHER SOUTH

Hillary then moved on south and west to reconnoitre through the crevassed area in order to flag a route for Dr. Fuchs. With him were Bates, Ellis, Mulgrew and Wright. McKenzie returned to Scott Base to cover the news story from there.

On December 24, the party were at 83° 44′ S. and exactly on the 141st meridian heading due south. They reported innumerable crevasses, mostly bridged satisfactorily, but some so big that one machine was almost lost when a snowbridge gave way. They were averaging 24 miles a day. Christmas day was spent charging and checking their tractors.

With unexpected time on his hands, Hillary raised the question of extending the New Zealand party's journey south. The Ross Sea Committee raised no objection provided that any such extension could be undertaken within his existing resources of men, food, fuel and transport, and that Dr. Fuchs, and the London Committee were in agreement. The London Committee raised no objection provided the objective of the expedition was not in jeopardy. Hillary himself consulted Fuchs by radio.

## "WE WILL PUSH ON"

Sir Edmund himself summed up the position: "The idea of a tractor train to the depots had never been included in the original plans for our expedition—but even before we left New Zealand I had hopes of doing something with our limited transport and perhaps meeting Dr. Fuchs somewhere near the South Pole. And now we had our opportunity. We were only 500 miles from the Pole, our tractors were operating reasonably well, and I had managed to accumulate twenty drums of fuel—the bare minimum for the job. We could do a useful job establishing the route out through the crevasse areas and then if all went well we would push on."

The "Daily Telegraph" (London) quotes Sir Edmund Hillary as telling Dr. Fuchs from Depot 700 that he would "scrub the southward jaunt" to the Pole if he could help Dr. Fuchs in any way. 100 miles out on his trek further south he waited a full day in case Dr. Fuchs made any further request. Four days out from 700, as no request for additional aid had reached him, he pushed on another 100 miles, clearing the crevassed areas and marking a trail. As the going was then easy, he decided to make for the Pole.

So on the morning of December 26, Scott Base received the news from Sir Edmund: "We are heading

hell-bent for the Pole, God willing and crevasses permitting." He went on to report a tremendous improvement in the plateau conditions. The tractor party were crossing a large featureless snow plain at an altitude of 9,450 feet, and they were then 325 miles from the Pole. The last two marches had added 100 miles.

Next day colder weather and a higher altitude brought only satisfactory progress in soft snow of the consistency of sugar. The Fergusons were now operating at 9,800 feet, and the temperature was minus 12°F. with a fresh breeze adding to the unpleasant conditions.

Early on the morning of December 28, the point of no-return was reached, 250 miles out from Depot 700. They had left Depot 700 with 20 drums each of 44 gallons. From the Polar Plateau to Depot 700 the Fergusons had averaged 1·6 miles a gallon. From Depot 700 onwards the performance rose to two miles a gallon.

Despite a white-out and deep snow, 41 miles were run the previous night and the altitude was now over 10,000 feet. Difficulty was experienced in getting the tractors out of second gear.

By December 29, the party were less than 200 mile from the Pole, and the previous night's run was 44.2 miles. The altitude was 10,400 feet.

A persistent steady rise brought them to 11,000 feet the next evening. Temperatures had dropped and the vehicles were labouring. However, the light loads being drawn had allowed the tractors to move along steadily and 44.5 miles had been covered. The weather was still fine, but the cloud was increasing and the temperature had fallen to minus 23° F. "We are holding our own with the fuel," Sir Edmund stated.

He continues: "On December 30 we were less than 200 miles from the South Pole and we started running into areas of deep soft snow. Our progress slowed right down and our petrol consumption rose alarmingly. The following day it took us six hours to cross one area of six miles. At this rate we would have run out of fuel well before the Pole. We decided to depot everything we possibly could. Sledges, food, kerosene, tractor spares were dumped and we continued without reserves, but with our minimum requirements.

## TO THE SOUTH POLE

"On January 2 we were still over 70 miles from the Pole and we had exactly 180 gallons of fuel left for our three tractors. We decided to make a non-stop run for the Pole. For the next twenty hours we drove steadily on. Every six hours I checked our position from the sun with my bubble sextant—I knew we didn't have the fuel to spend time looking for the Pole so we had to be right the first time.

"At 8 p.m. on January 3 we had done 60 miles and were looking rather anxiously for any signs ahead. I was in the lead tractor and was about to stop for refuelling when I suddenly noticed a black dot to my left. I swerved towards it and then realised that it was a red marker flag. In tired relief I waved to the others to stop and then switched off my motor. This would do us! And tomorrow we would continue on and finish the last few miles!

"At mid-day on January 4 we drove through the last few miles of soft snow and up to the American South Pole station."

When the other four members of the Pole party returned by American Neptune planes to Scott Base, Mulgrew remained at the South Pole with his special radio set in order to provide a vital radio link between Dr. Fuchs' party and Scott Base.

# Epic Sledging Journey

**The Deputy Leader of the New Zealand Expedition, Bob Miller, and Dr. George Marsh reached Scott Base on February 23 with their 18 huskies after one of the longest sledge journeys ever made in the Antarctic.**

With them was Dr. James Adam, a London physiologist who joined them from an Otter the day before to carry out physiological studies.

They left Scott Base on October 21, pioneered the route which Hillary followed with his tractor train as far as Depot 700, and then began a survey journey which provided mapping data for 15,000 square miles and took them into areas never before penetrated by man.

### AS IN "THE HEROIC AGE"

Going up the Skelton Glacier they faced a 60 knot wind at a temperature of 20° below zero, and on the Polar Plateau they experienced temperatures as low as —42°F. Back at Scott Base their faces provided evidence of the hardships they had undergone. Patches of skin under their eyes were burnt almost black from constant exposure to sun and glare. Miller's nose still showed signs of the frostbite he suffered early in the journey. Their hair was matted. They had been unable to change their clothes on the trail. Each man had lost about a stone in weight, but both were in fine physical condition, fitter they claimed than when they began their great trek.

For 125 days they lived on hoosh in a small tent, once black but bleached grey by the midnight sun. About once a fortnight they raided their "luxury box" which contained such delicacies as sardines, anchovies and dates.

The area covered was bounded by the top of Shackleton Inlet, the Ross Ice Shelf, the Marshall Mountains fringing the Beardmore Glacier and the previously unmapped region to the west. They discovered two mountain ranges. The largest one extends for 90 miles south-west from Mt. Markham. The other range is roughly parallel with it, some 30 miles to the west. Their discoveries included a peak estimated to be over 11,000 feet high.

### MAGNIFICENT PANORAMA

They spent 100 days at altitudes over 8,000 feet. Here they studied the glacier drainage system of the area. "The most spectacular sight," said Miller, "I have ever seen. We could see 100 miles in every direction. Below us were the origins of three great glacier systems which no man had ever seen before."

To reach this point they had left their dogs staked out, and had climbed 14 miles to make a survey point. "Without the dogs", said Marsh," we felt insecure. It was hard leaving them and we were relieved to get back to them. On the trail you do actually find yourself carrying on chit-chat with the dogs."

Christmas Day was spent at 83° 49′ S., 157° 20′ E., some 40 miles S.S.W. of Mt. Markham. New Year's Day found them camped at the southern end of the lower range.

The cyclometers on their sledges when they reached the warmth and comfort of Scott Base registered 1,670 miles.

# Along the Antarctic Coast in "Thala Dan"

The Australian relief expedition which left Melbourne on January 3 in the new Danish vessel "Thala Dan" arrived at Mawson on February 10 after a remarkable voyage along the whole coastline of Australian Antarctic Territory, including calls at several of the IGY stations established by other countries.

"Thala Dan" arrived at Lewis Islet on January 11. All cargo was transported to the hilltop by 2000 hrs, Establishment work ashore was completed next day, and the ship departed for Oates Land, leaving three men to assemble and test the automatic weather-recording equipment.

On January 15 "Thala Dan" turned south along 150° E. to sound Virik Bank and approach Cape Freshfield. A giant berg 60 miles long was encountered. The ship sailed down the western edge through a maze of domed bergs in heavy fog. The delineation of the eastern edge of Virik Bank was completed. It proved to be flat at 280 fathoms. "Thala Dan" was blocked south of the giant berg by consolidated pack at 66° 42′ S., 148° 46′ E. Despite mist and poor visibility, Grove and Sandercock made a two-hour ice reconnaissance and determined the southern edge of the giant berg, flying at 200 feet.

## CAPE FRESHFIELD

Next day the weather was slightly clearer. Wilson and Law flew to photograph Cape Freshfield and the Ninnis Glacier area. Flying 100 miles to Freshfield in low cloud, they found the pointed cape gone and suggest that the giant berg is broken from there. Photography was difficult owing to low cloud pouring off the plateau, so they gave up at Horn Bluff and returned to the ship after 3½ hours. "Thala Dan" now retraced her path north and reached the north tip of the giant berg at 2015 hours, then again headed east, reaching open sea from heavy pack north-west of Virik Bank. The vessel then proceeded to Dumont d'Urville Base without meeting ice but in bad weather, reaching the French station on the 21st. Thirteen men dined ashore with the French while 15 French dined with the remainder on the ship. All returned at midnight and the ship sailed for Lewis Islet.

On January 23 Law advised: "We pushed through some very heavy floes to approach Davis Bay and anchored at Lewis Islet at 1055 hrs. The plane went up to photograph the extent of the Dibble iceberg tongue. We found the men well and their work accomplished, but at the last minute the master clock gave trouble and delayed us five hours. We finally departed at 1830 hrs. with the station transmitting satisfactorily. Some coastal survey and soundings west, then north towards the ocean but blocked in most directions by very heavy floes. We pushed through pack-ice from 0200 till 0900 on Friday, then came to open water and are proceeding to Wilkes Station. All transmissions of the automatic station have been satisfactorily received to date."

Eighty miles of pack-ice forced the party to abandon a proposed call at Wilkes Station. An aircraft with mail for Wilkes returned with Donovan for the rest of the voyage.

On February 2 "Thala Dan"

reached Mirny. The Australians went ashore and inspected the station, lunched with the Russians and departed after a most interesting visit.

## AT DAVIS

The "Thala Dan" dropped anchor at Davis Station on February 4 and change-over operations were completed two days later. During the change-over period the expedition's Beaver aircraft took aerial photographs of the Vestfold Hills region and the expedition launch sounded the nearby waters as far as Ellis Fjord.

On February 7 the expedition left Davis and set sail for the Larsemann Hills. Fortunately the weather was fine and the bay largely ice-free. After the ship had entered a fjord, landing parties set out in two dukws and the expedition's new launch "MacPherson Robertson." The parties travelled down the fjord in convoy and though blocked by fast-ice and high cliffs at many places, landings were made on two islands and scientific data collected. A long photo survey flight from the Larsemann Hills inland past Sandefjord Bay was also carried out.

The ship sailed late that night for the Bolingen Islands at the head of Prydz Bay but was unable to reach them because of a three-mile strip of fast-ice adhering to the islands. The ship therefore turned east to the westerly portion of the Larsemann Hills and anchored off the main peninsula. After a short reconnaissance scientific parties were landed on nearby islands to make geological, gravity and magnetic observations and Law proceeded to the mainland with the expedition geologist, climbing the highest hill and photographing the area.

The "Thala Dan" is the first ship to make a close approach to this region south of the Vestfold Hills and the six new landings made by the expedition are the first to be made from the sea.

The "Thala Dan" departed for Mawson on February 8, arriving there on February 10. The deck cargo of aviation fuel, motor spirit, explosives, Dukws and a Beaver aircraft were unloaded. Fourteen men were put ashore and six of the 1957 party were taken on board. The ship departed in the evening for Amundsen Bay to cary out coastal exploration along the Enderby Land coast. A "first" landing was made near Mt. Riiser-Larsen.

The expedition arrived back at Mawson on February 18, and reached Melbourne on March 19.

## NEAR DISASTER

On the first day of the Mawson relief "Thala Dan" dragged anchor on the polished rock bottom of Mawson Harbour soon after the first party had been put ashore and grounded on the rocks of West Arm just after midday.

A 30-knot wind briefly moderated and the captain was able to inch the ship off without damage. Mail and cargo was unloaded into duwks and launch-drawn pontoons.

In an ominously rising mid-afternoon wind the pontoon, loaded with 27 drums of aviation fuel and short railway sleepers, "skidded" and overturned.

Weather observer Alfred Bolza was caught under the capsized pontoon in a wicked swell.

New Zealander Ian Adams, this year's leader at Mawson and veteran of two Macquarie Island landings, stayed with the pontoon, clawed his way up the side as it slowly turned over, and stood up on the bottom.

He freed Bolza from the deadly tangle of lashing lines, drums and sleepers and dragged him to safety after a couple of minutes in sub-freezing water.

Adams although drenched stayed a couple of hours to help with the exhausting work of lassooing the drums and fuel and towing them to the ship.

# AUSTRALIANS' GREAT JOURNEY INTO THE INTERIOR

**The Australian six-man seismic traverse party from Mawson, which set out on November 9, returned to the base on February 16, after a notable journey.**

The train consisted of two caterpillar tractors and 10 cargo sledges, four of which carried fuel. A weasel scouted ahead of the main party and reconnoitred a safe route. The overall weight of the train, including vehicles, was more than 40 tons.

By November 25 Mather and his team (Goodspeed, Willing, Collins, Shaw and Mellor) were at an elevation of 6,500 feet.

### BY MID-DECEMBER

At mid-December the party was about 200 miles out from Mawson. The tractors were pulling well and the weasel had proved invaluable as a scout vehicle. The heavy fuel sleds were ploughing through sastrugi awash with snow up to their decking. However, the sleds rode heavily over the larger snow dunes and tended to crash down the far side. The average speed of the main train was three to four m.p.h. Time was consumed not so much in travelling as in the scientific work at each camp. Substantial delays had occurred due to weather, and minor delays due to crevassing. Only 57 per cent. of days had been safe for travel, 24 per cent. being "white-out" and 19 per cent. blizzard or very severe drift.

The party had crossed a submerged mountain range about 3,000 ft. high. Their elevation was 8,000 ft. and Goodspeed was measuring only 5,000 ft. of ice. Night temperatures were falling to about minus 20°. The Katabatic wind was very strong in the mornings so they breakfasted about midday, then worked through till perhaps 3 a.m.

By New Year's Day the party had reached a point on the Antarctic plateau 300 miles inland, and on January 23 it was reported that the party had reached 72° 46′ S. but that further progress was blocked by ranges running east-west. As no way through could be found, Mather decided to make a short east-west traverse and then return.

### AN EXCITING RETURN

The party returned to Mawson on February 16 after an absence on the Antarctic Plateau of one hundred days. All the men were well, though scraggy, leaner and tired. The final few days spent negotiating slopes where the plateau falls away towards the sea were nerve-wracking and packed with incident. On February 11 the caravan of one train rolled over when the port runner rode up on high sastrugi during a fast run in poor visibility. Mather and Goodspeed were inside but were not hurt.

Proceeding the following day in thick snow drift the weasel set a wrong course and entered crevassed country. Very lights were fired from the weasel to stop the trains but the signals were misunderstood and the trains bore on. Weasel driver Mellor raced his vehicle back and halted the trains in time.

### NEARING HOME

The first good weather for weeks came on the 13th, allowing the trains to race north 40 miles in the day. They were then 90 miles from Mawson. A similar run the following day brought them close to the ten-mile coastal strip where deep

snow cover gives way to hard blue ice. Here the route swung east through Horden Gap in the David Range then north again between the David and Mawson Ranges. The character of the Gap had changed since the party passed that way in November along what seemed a very safe route. Snow drifts had thawed during the summer, exposing patches of rotten ice bridging old crevasses.

Three miles east of the Gap one tractor "threw" sideways as 11 feet of ice broke from below it. Perhaps the momentum of the following five sleds helped it across the abyss, but the sleds themselves were badly thrown about as each in turn reared, then fell, then dragged up again as the tractor regained control. A few hundred yards further on a six-foot crevasse broke. Then a towbar snapped, necessitating a halt for repairs. "After 800 miles of plateau travel," says Mather, "almost every towbar, rear hook and sled had suffered and the trains are largely slung together with any old shackle or piece of steel we could remove from somewhere else." They camped that night with a gaping hole alongside the trains and hoped nobody would sleepwalk.

## THE HOME RUN

The final run into Mawson began on the morning of the 16th in moderate drift. To negotiate the increasingly steep down grades which allowed the sleds to overrun the tractors, all the sleds were coupled together with one tractor pulling and the other serving as a brake at the rear. Moving very slowly the train (a hundred yards long) gradually edged down into Mawson. On the final steepest ice slope a coupling yielded, allowing the sleds to cascade down. Surprisingly little damage resulted beyond the crushing of a few supply boxes. Thus ended the 1957 southern journey.

Mather sums up the principal achievements of the expedition: (1) A new southern route much safer than the old Prince Charles route has been located and proved; (2) a continuous seismic traverse was made for more than 400 miles; (3) the altitude of the ice plateau has been measured, indicating a rise to about 10,000 ft.; (4) magnetic variations and the earth's gravity were obtained at regular intervals; (5) meteorological data far inland are now available for the first time in this quarter of Antarctica. Sastrugi and snow dune directions and heights were measured; (6) due to impenetrable crevassed zones we failed to pass the mountain barrier 400 miles south of Mawson but the weasel team in three sorties accomplished a basic survey of this range which can now appear on Antarctic maps. Geological samples were collected from the ranges; (7) glaciological studies of the plateau snow cover were made along the route; (8) not the least valuable has been the experience gained in the use of heavy tractor transport on the plateau.

## PRINCE CHARLES SURVEY

Stinear, Fisher and Sandilands left on November 15 for the Prince Charles Ranges, about 250 miles from Mawson, to carry out survey work. They remained five days at Camp 1 on Beaver Lake. Then Johnston flew out and took them to Camp 2, about 60 miles further south. From there they intended to move to Camp 3, 120 miles further south, but an early deterioration in the harbour ice at Mawson curtailed their programme.

The aircraft with skis as undercarriage use the ice as a runway. The ice is 57 inches in depth and was still thick enough but around the edge of the harbour the melting ice had caused a small lake in front of the hangar which made it difficult to get the aircraft out. The Prince Charles party were returned to base on November 25.

## NEWS FROM DAVIS

On the islands in the Mule group, 234 bull elephant seals were counted on November 28 with ages ranging from two years to veterans long past their prime. No elephant seal cows were sighted and it is assumed that the numerous beaches on the islands are convenient bachelor retreats for this species. Two seals bearing Heard Island brands were observed. The Davis quartet refrained from raiding the penguin rookeries to secure the customary supply of fresh eggs and the birds sat tight protecting their clutch from the predatory skuas.

December temperatures in degrees F. were mean 32.3; maximum 43.7; minimum 23.4; mean wind was 8.4 knots. The weather was good except for a brief period of boisterous gale conditions during the latter part of the month which dispersed most of the sea-ice in the area and cleared the track for the visit of the "Thala Dan."

The final sledging journey for the year coincided with the monthly elephant seal count in the Mule group of islands where 358 adolescent bulls were observed wallowing in the usual accumulation of filth. Lied and Hawker completed the sledging run without serious mishap although the surface conditions were generally poor. Numerous pools and a succession of leads and cracks encouraged more caution than usual for the six hours' duration of the trip. This brought the sledging season to a successful conclusion with an estimated distance of 1,100 miles covered during the period April to December, 1957.

Hawker on the last sea-ice journey for the year made a safe return to base after a visit to Breidneskolien: gale conditions breached the customary track between Davis and the island a few hours after he had left there. Eighty per cent. of the Adelie nesting records were completed before the final breakout of sea-ice which unfortunately precludes all further observations of pintado, petrel and skua nesting activities on the islands. One of the most interesting biological finds of the year has been the discovery of a leopard seal carcass on the shoreline of one of the salt water lakes some three miles east of Davis.

Thaw action in the immediate vicinity of the station was fairly rapid during December although a considerable amount of drift snow remained in the landing beach area. A reserve water supply of 600 gallons was stored in empty fuel drums in readiness for the anticipated "drought" period.

The four Davis men travelled over 1,000 miles with a six-husky sledge to investigate a vast area of bare rock and never-freezing lakes, some of which are 300 feet below sea-level and very saline. Dingle found the temperature of one to be 36° below the freezing point of fresh water.

January temperatures in degrees F. were: mean 32.5; maximum 42.8; minimum 24.6; mean wind was 9.8 knots.

The elephant seals have returned to the mainland beaches following the dispersal of sea-ice but numbers are comparatively few at the moment.

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## BLIZZARD WRECKS A TREE

The U.S. Pole Station staff had to be content with a dummy Christmas tree. The real tree, carefully flown in, had been consumed, trunk, roots, soil and all, by Blizzard, the station's pet husky. Born in treeless Antarctica less than a year before, Blizzard had never seen a tree before.

# WITH THE FRENCH

The m.v. "Norsel" carrying the relief French Expedition of 27 members to Adelie Land called at Dunedin, New Zealand, on December 28. Led by Gaston Rouillon, with André Cornet as his deputy, the expedition is taking south only about 220 tons of equipment.

## NARROW ESCAPE

The French expedition had a narrow escape in the icy waters of Hasselborough Bay when they called on the Australians at Macquarie Island.

Giant kelp stems, as thick as a man's body, fouled the propeller of the launch from "Norsel." The boat which was loaded with delicate scientific instruments and mailbags, nearly overturned as it stalled at the critical moment of launching in heavy surf.

Though the weather was good for Macquarie, the surf and weed were so dangerous that the French party could not pick up all the fuel from the large petrol dump established there.

## CHARCOT STATION

The hut at Charcot, 69° 22.5′ S., 139° 01′ E., was erected in December 1956. It is at an altitude of 8,500 ft. The 1957 wintering party under Jacques Dubois arrived there on January 27. In spite of the great practical difficulties, mainly due to snow-drifts and to the presence of only one meteorologist, also attending to such technical tasks as the maintenance of equipment and motors, the proposed meteorological programme, except for the wind-soundings, was carried out.

Monthly mean temperatures ranged from —7° F. in December to —55° F. in July. The lowest temperature recorded was —80° F., in June. Blizzard days ranged from 19 to 30 days per month. Wind gusts of 50 to 100 knots were "almost a usual occurrence."

On November 30 American airmen tried to air-drop three tons of fuel and supplies by Globemaster from McMurdo at Charcot Station. White-out conditions and lack of radio control made a drop impossible.

Early in December food supplies reached the French polar group which had been isolated for more than 300 days at Charcot.

A convoy of six heavy caterpillar trucks left Dumont d'Urville in November to take relief supplies to three explorers and scientists, Dubois, Lorius and Schlich, who spent the winter underground in a shack of corrugated steel and aluminium.

The relief party later hoped to make a "raid" into the heart of Antarctica in a bid to determine the present location of the South Magnetic Pole, as part of France's contribution to the I.G.Y. researches.

Rene Garcia has relieved Dubois as leader of the Charcot Group.

## VISITORS

On January 21 the Australian expedition in "Thala Dan" reached Dumont d'Urville after a three-day battle with heavy winds and seas. Correspondent Osmar White (a New Zealander) describes the site as "one of the bleakest and most forbidding places I have ever seen—a tumble of snow-capped, reddish boulders rising 200 feet from a sullen sea wherein slopped a scum of ice fragments."

The Australians, the first foreigners ever to visit the station, stayed a few hours and were hospitably entertained.

"Norsel" arrived at Hobart on February 15 on her homeward voyage with returning expedition members. Bertrand Imbart, the 1957 leader, came on to New Zealand to attend the Antarctic Symposium in Wellington.

One of the winter party was operated on for appendicitis by Dr. G. Goy, and returned in perfect health.

# F.I.D.S.

**Ships:** Damage to the "Shackleton" reported in the last issue of "Antarctic" was fortunately not as severe as originally feared, and after a few days in dry dock at South Georgia she was able to proceed to Port Stanley and is now assisting in the routine relief of the bases. The ship was holed on November 30 near Coronation Island in the South Orkneys, in approximately 60° 35′ S., 45° 30′ W., while on her way towards Hope Bay.

The "Biscoe" arrived at Stanley on November 26 having called at St. Helena, Tristan da Cunha and South Georgia. On December 6 she sailed again for South Georgia and then on to the bases, landing a six-man survey party on Livingston Island on the way.

H.M.S. "Protector" has also visited several of the bases.

**At the Bases:** All routine observations have been maintained. Radiosonde flights from Base F (Argentine Islands) on World Met. Days in November reached the limit of 30 millibars and were followed by theodolite to the burst.

A long-wave recorder and tide-gauge at Base F, and a tide-gauge at Base W (Loubet Coast) are now in operation.

**Field Work:** The glaciologist at Base G (King George Island) is working up on the ice-cap as well as on the Stenhouse Glacier, measuring temperatures and movement. At South Georgia, glaciological work has progressed satisfactorily and one of the two glaciologists has now returned to the U.K.

Numerous sledge journeys have been undertaken by geologists and surveyors, the longest being from Base D (Hope Bay) to Base O (Danco Coast) which was undertaken by four men. They left Hope Bay on October 8, arrived at the Cape Reclus refuge hut on December 1 and were later picked up by the "Biscoe" and arrived back at Hope Bay on December 30.

**Additional summer work** is being undertaken by a five-man party which was landed by the "Shackleton" on Powell Island just before she was damaged by ice. A similar party has been landed by the "Biscoe" on Livingston Island, and depots have also been laid in the south-west of King George Island in preparation for summer work on Nelson Island.

Professor Cragg of Durham University has now returned home after visiting several of the bases, and has drawn up a programme of ecological and other biological work for the coming season.

# At Norway Station

On November 22, Helle, Grytoyr, Hochlin and Lunde started on an inland excursion with two diesel tractors, six sledges and two dog teams, planning to survey the mountain region from about 3° E. and farther eastwards. After a heavy drive in deep, loose snow they reached the mountains on January 15, in about 71° 50′ S. and 3° 30′ E., from where they have carried out triangulation work in the mountains, driving with the dog teams. Helle will carry on this work until the middle of April. He has also undertaken magnetic observations in the mountain region, and Lunde has been engaged in glaciological investigation.

This area is in the region of the Gruber Mountains, some 200 miles south-east of Norway Station.

"Tottan" left Tonsberg on November 11 and Southampton on the 16th, called at South Georgia and reached Norway Station as early as December 25. Here three members of the wintering party embarked for Norway: the doctor, Sæther, the steward, Larsen, and the mechanic, Hem-

# King Baudouin Base Established

**The first Belgian Antarctic Expedition since the famous "Belgica" expedition of 1897-99 under Adrien de Gerlache, left Antwerp on November 12 under the command of Commandant Gaston de Gerlache, son of the earlier explorer.**

After calling at Capetown the two vessels "Polarhav" and "Polarsirkel" encountered ice on December 20 in lat. 62 S. At first, open pack allowed good progress, but later heavy close-packed ice was encountered. "Polarhav" made the going with "Polarsirkel" following 500 yards behind. By December 22 the ships had reached 67° 15′ S., 22° 30′ E., 190 miles from the projected disembarkation point.

On the 23rd the expedition's helicopter took off on a reconnaissance flight. Christmas Day was spent in "fairy-like" pack in sight of ice-cliffs 130 ft. high, and that night a suitable embayment in the ice-front was discovered and disembarkation at once began.

A site for the winter base was selected 10 miles in from the ice-front. Gerlache, Demaere and Picciotto went ahead on skis, van Gompel and Carels following with a light tractor. A trail was marked all the way from the bay to the base, which was named King Baudouin Base. It lies inland from Breid Bay in Princess Ragnhild Land, 70° 30′ S., 23° E.

The -expedition numbers seventeen, including an American observer.

King Baudouin Base was inaugurated on January 11, two days later than was planned. For three days a violent blizzard with winds of 75 m.p.h. snowed-up the base buildings and prevented all outside work.

No further radio messages were expected from King Baudouin Base until mid-February, when it was expected that the radio installations would be completed.

### SHIPS TRAPPED

Early in February it was reported that the two Belgian vessels on their way home had been trapped in the pack ice and had radioed a second appeal for assistance. The U.S. icebreaker "Burton Island" drove westward to their help as soon as she was able to leave the ice-bound Japanese "Soya Maru." "Polarhav" and "Polarsirkel" were locked in the pack for 30 days, but on February 12 a message from one of the ships stated that they had broken free and expected to be in open water shortly thereafter.

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mestad, and were replaced by Vinten-Johansen, Pettersen, and Bjerke, respectively.

Vinten-Johansen had wintered at Husvik Harbour in South Georgia and joined the expedition when "Tottan" called there.

"Tottan" left Norway Station on December 29, visited Halley Bay, left South Georgia on the return voyage on January 16, and arrived at Las Palmas on February 10. Here the expedition members went ashore and the ship proceeded to Halifax to capture seals off New foundland.

**"MACQUARIE ISLAND: a Bibliography,"** by John S. Cumpston: Sydney, Store Copying Co., 32 pages, map. Price 15/- (Australian).

Dr. Cumpston's valuable compilation, No. 6 of "Studies in Australian Bibliography," includes many references to the sub-Antarctic islands of New Zealand, especially Campbell Island and the Auckland Islands.

# ARGENTINE BASES

We have received from the Argentine Antarctic Institute this summary of scientific work carried out at the Argentine stations.

**Glaciology:** Three parties of four members each are working in the bases "General Belgrano" (phi77° 58′ S; λ38° 50 W.), "General San Martin" (phi68° 08′ S.; λ67° 06′ W.) and "Esperanza" (phi63° 19′ S.; λ56° 50′ W.). Besides sensing the glaciers within their reach, their morphology, hydrology, dynamic properties and physical and crystallographical properties at various depths are studied.

**Aurora:** An all-sky automatic recording camera has been installed in the vicinity of "General Belgrano." Timed from an accurate time-piece controlled by a precision tuning fork, this camera works continuously, taking photographs every minute. This is a trial, as the very severe weather conditions make this installation a difficult venture. Also a number of handy clinometers ("Gottingen" pattern) have been distributed amongst the members of the different parties working in the Antarctic for taking heights of the visually observed auroras. "General Belgrano" is located within the belt of greatest frequency of polar auroras.

**Geology and Petrography:** Four parties are surveying different areas and collecting samples that will be studied in our laboratories in Buenos Aires. Paleomagnetism and levelling profiles perpendicular to the shore line in different places are being made.

**Geomagnetism:** Three old stations have been reoccupied and in three new places the new measurements have been taken.

**Biology:** Both animal and vegetal biology are contemplated. No information of the progress of the work during this season is at hand. Noticeable progress has been made in the collection and banding of birds.

**Acclimatization:** A number of scientists of the Institute with little or no polar experience are participating in the life of different bases for periods of two to three months, in order to get acquainted with the problems to be considered when planning scientific operations in those territories.

**Chemistry:** Samples of water (sea-water, rain-water, brooks, etc.) and soils have been collected in different places for study in laboratories.

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The Argentine Antarctic tourist ship "Les Eclaireurs" was due at Deception Island in the Falkland Islands Dependencies on February 3 or 4 on her second tourist cruise.

When passengers on the first cruise landed they were given a welcome by H.M.S. "Protector." The British Government have reserved the right to raise the legal aspect of the matter at a later date.

On March 1 it was reported that the ice-breaker "General San Martin" had been sent to search for the bodies of three men drowned when a helicopter crashed. The helicopter has been given up as lost.

## CHILEAN BASES BURNT

Chile's General O'Higgins Base was destroyed by fire on November 27. Base personnel escaped.

O'Higgins Base is situated at Cape Legoupil, Trinity Peninsula, 63° 20′ S., 57° 53′ W.

On March 10 a similar disaster overtook the new I.G.Y. Risopatron Base. The six scientists took refuge in the re-built O'Higgins Base, near by.

# SOVIET EXPEDITION ESTABLISHES NEW INLAND BASES

**The third Soviet Antarctic Expedition in the "Ob" arrived at Mirny a few weeks earlier than last year to relieve the wintering personnel and take over the stations "Mirny", "Vostok" and "Pionerskaya." A new station "Sovietskaya" has been set up in the interior of the continent.**

"Komsomolskaya" operates between "Vostok" and "Pionerskaya." It will be run mainly as a second-class auxiliary station. E. I. Tolstikov is the leader of the continental expedition.

After off-loading, "Ob" broke through the heavy coastal sea-ice, making a passway for the cargo ship "Kooperatsia," which arrived later. About 6,000 tons of cargo were brought by these two ships. Ten crawler-tractors of specially improved type, thirteen new-type weasels, three aircraft and some dozens of light metal sledges of large cargo capacity were ferried-in. These 100 h.p. crawler-tractors of bright-orange colour with white penguins painted on their sides were constructed specially for the use of the Expedition. They are equipped with compressors for pumping air at high altitudes of 10-13 thousand feet. The cabs are provided with special heating. Broad caterpillars facilitate passage over deep Antarctic snow.

Three "leader" tractors are provided with 3 foot wide caterpillars specially for trail-blazing in front of weasel-sledge trains. A party of new tractors made a trial traverse at 34 miles distance from Mirny where a new fuel cache was established for further traverse parties going inland.

### SLEDGE TRAIN SETS OUT

Preparations of the weasel-sledge train for an expedition to the South Geomagnetic Pole were soon in full swing. Nine sledges were loaded with fuel, lubricants and other material. The load was specially fastened to endure the hardships of the voyage. In September a test journey of three tractors with sledges was made southward and a refuel base was established 93 miles from Mirny.

The party numbered 27 men under Treshnikov. It included two navigator-surveyors, two radio-operators, one doctor, two meteorologists, one magnetologist, one air-mechanic and 17 maintenance personnel. The train consisted of 6 crawler-tractors the cabins of which were turned into radio-stations, navigator's cabin, power station, electrically heated kitchen, and two living cabins. Eight sledges carried lubricants, 84 tons of fuel, a heavy roller for smoothing the ground for air-strips, two living huts, one ionosphere station for the Vostok station, prefabricated details for two magnetic huts, and an all-sky camera tripod for Vostok.

Up to the Pionerskaya Station a specially equipped tractor C80 was blazing trail for the expedition. It helped to cross a steep ascent from the coast to the plateau through a heavily crevassed area with deep soft snow. Before Pionerskaya the train had to cross a strip 62 miles wide with big and robust snow sastrugi. On October 16 the train reached **PIONERSKAYA** after passing 235 miles. Two air-strips were rolled out and repairing was done to all tractors and sledges.

On October 23 the weasel-sledge train moved onwards. The weather and snow regimen deteriorated, frequently sastrugi six feet high and drifts of snow had to be forced through. The tractors went very slowly and for two days the train was delayed by a blizzard. On October 29 the train reached the **VOSTOK I** station which is situated 390 miles from Mirny.

## AT VOSTOK I

Vostok I had been commissioned on 30th March and for over eight months the personnel of the station where the leader was ice-expert V. Averyanov had been conducting in extremely adverse conditions meteorological observations, regular radio-sounding of the atmosphere and later—from August—observations on the regimen of snow surface and of air at different altitudes. Now from an aircraft one can only see a big pyramid of fuel barrels and the deep trail of the tractor-sledge train heading for the South Geomagnetic Pole. On October 31 the train continued its course southward and arrived at **KOMSOMOLSKAYA** which is 530 miles from Mirny. Here the tractor-sledge train was re-supplied with additional fuel flown-in by aircraft.

For 69 days heavy tractors were rolling over the limitless snow plains. In spite of low weather, occasional heavy blizzards and low pressure at the 10,000-11,500 ft. plateau the expedition reached the goal.

## VOSTOK ESTABLISHED

On December 1 the train left again and on December 16 reached the site where the new station, **VOSTOK,** was to be set up. The station is in close proximity to the South Geomagnetic Pole.

Immediately on arrival the location measurements were made. The co-ordinates were 78° 27′ S. and 106° 52′ E. The station is 880 miles away from Mirny and is situated on an uplifted plateau 11,500 feet above sea-level.

Fourteen hours passed in active construction work and handling of heavy stores and equipment. At last the Soviet flag was raised over the new station and the first meteorological reports were broadcast.

The air-group had meanwhile given splendid support. Flights were made with cargo to all stations; field parties were flown in and out for making observations in aeroclimatology, glaciology, hydrology, and for conducting ice reconnaissance. During eight days in the second half of October L12 planes flew in 38 tons of fuel and other cargo to the Vostok and Pionerskaya stations to make provisions for the weasel-sledge train.

Five aircraft from Mirny landed at the Geomagnetic Pole on December 22, carrying supplies to the 15-man scientific party at Vostok. The return trip was made successfully.

## SOVIETSKAYA

Another train under Mr. A. Milolayev which had reached Pionerskaya on January 3 and Komsomolskaya on January 20, arrived on February 10 at the site selected for the new station "Sovietskaya." The train had passed 887 miles from the Mirny Base, thus completing the route planned for the summer period. One section of the train diverted to Vostok.

More than 120 tons of supplies have been brought to the Sovietskaya Station.

The train moved at a low temperature of —40° F. - —49° F. over very soft snow in which the tractors made a trail two feet deep. The bottom of the sledges frequently skipped over the snow surfaces. At two places the crawler-tractors actually sank into snow to the depth of five feet.

The party carried out meteorological, actinometrical and glacial observations along the traverse.

# Japanese Ship Trapped

**Heavy pack-ice has frustrated the attempt to land a new winter party at the Japanese "Showa" Base on Ongul Island, off the Prince Harald Coast.**

The expedition ship "Soya," which left Tokyo on October 21, struck pack in the vicinity of 41° 20′ E., 66° 50′ S. and was trapped at 39° 20′ E., 67° 45′ S. on January 5. Deprived of freedom of movement, "Soya" drifted towards the south-west, reaching the vicinity of 31° 50′ E., 68° 30′ S., to the north-west of Cook or Riiser-Larsen Peninsula on January 31.

The Antarctic Office in Tokyo asked the U.S. authorities for their assistance because a U.S. icebreaker was located nearest the "Soya," and the "Burton Island" was dispatched to the "Soya's" rescue. The ice-floes around the "Soya" having become rather loose, however, she continued her efforts to escape and succeeded in getting out of the ice by her own power on February 6 at 31° E., 68° S., before the arrival of the icebreaker. Hurrying her way towards the east, "Soya" met "Burton Island" at 39° 20′ E., 67° 30′ S. on the evening of January 7, and sailed south towards Showa Base under the lead of the "Burton Island," until they reached open sea at 36° 45′ E., 68° 35′ S. on the morning of February 9. In spite of their efforts, they could not approach any nearer to Showa Base than 80 miles.

It was decided to rescue first the 11-man wintering party, led by Dr. Nishibori, who had been engaged in observations at the base since February, 1957, and all the members of the wintering party were brought on board by the Beaver plane of the "Soya" by the evening of February 11.

After the vessels had eventually reached within 13 miles of the base, expedition members worked round the clock in an effort to re-man Showa, but by February 24 it had become evident that it would be impossible to land even a small party of the planned 20-man expedition, so the attempt was given up. Fifteen dogs, which were left with a month's food when the winter-party was flown out, had to be abandoned.

"Soya" and "Burton Island" parted company after 17 days of combined effort.

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On February 12 regular meteorological observations were started at the station. On February 16 the station was formally declared open.

The station is established in position 78° 24′ S. and 87° 35′ E. and elevated nearly 12,000 feet above sea-level.

The programme of observations covers meteorology, actinometry, aerology and glaciology.

The personnel consists of five men led by Babarykin (an aerologist); among the personnel are a meteorologist, a radio-operator, two machinists and a doctor.

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After completion of its duties "Ob" proceeded on its oceanographic mission under Prof. V. G. Kort, making depth profiles. At various points hydrographic coast parties were landed. Scientific rockets were launched from aboard the "Ob" for upper air investigations. The "Ob" came on to Wellington, New Zealand, where Prof. Kort and other scientists took an active part in the Antarctic Symposium held between February 18 and 22.

# OPERATION DEEP FREEZE III DRAWS TO A CLOSE

**The first ships for this season's operations arrived at Little America on December 1 and at McMurdo Sound on December 17. Three ice-breakers, "Glacier," "Atka" and "Burton Island," the tanker "Nespelen" and the cargo ships "John R. Towle," "Arneb" and "Greenville Victory" comprised the fleet which shuttled between New Zealand and the Antarctic this summer.**

During the period October 1957-end of January 1958 the U.S. air detachment delivered 348 tons of cargo. 333 hours were flown in support of traverse and trail parties alone.

The plans called for an air-lift of returning personnel in early March, but as the ice runway at McMurdo was threatening to go to sea, U.S.S. "Glacier" began picking up passengers on February 17. The ship carried 70 summer support personnel on the first trip to Lyttelton and then raced back to McMurdo to pick up the remaining 100.

A sudden deterioration in the ice on February 15 caught one Globemaster preparing to make a cargo air-drop at the Pole; instead the aircraft hastily on-loaded passengers and returned to Christchurch. Even the "roadway" between air-strip and base disappeared as the water-channel edged further in. The aircraft based at McMurdo were hurriedly flown to Scott Base where aircraft of three nations, Britain, the United States and New Zealand, were now parked. There were two Dakotas, two Otters, a Beaver and an Auster, with an occasional helicopter for good measure.

The full use of "Glacier's" massive power will not again be possible until she has undergone repairs in the United States. After three years pitting her strength against Antarctic ice, "Glacier" suffered a damaged bow when she struck a relatively small chunk of ice in light pack on February 1, en route from New Zealand to McMurdo Sound. This ten-foot ice did what a hundred million tons of super-hard pack-ice had failed to do, punched a hole eight feet long and two inches wide in "Glacier's" reinforced bow just below the water line.

## DEEP FREEZE IV

The United States will retain four stations in Antarctica—the South Pole station, Byrd, Hallett and the naval air facility at McMurdo Sound —beyond the International Geophysical Year which ends next December.

The station at Little America will be disestablished, but the runway will be maintained as an alternative landing strip. A half-way emergency landing runway and weather reporting station will be set up on a direct line from McMurdo Sound to Byrd Station.

Scientific and other equipment from the stations to be closed down after the end of this year will be utilised elsewhere as feasible. In each case, food and survival equipment sufficient for emergency purposes will be left behind.

This year's expedition, will be called "Operation Deep Freeze Four" and will use the same New Zealand ports and airports as during the other expeditions.

## AIR-STRIP AT MARBLE POINT

Admiral Dufek and Sir Edmund Hillary were members of a party which on January 31 made the first landing on an ice-free airstrip in the Antarctic.

The 1,200 ft. strip has been built by 27 men sent to Marble Point, a rock promontory about four miles north of Cape Bernacchi, 50 miles from the McMurdo camp, last October. They built the air-strip in five days, using bulldozers and clearing the remaining chunks of granite and marble by hand. Father Linehan is reported to have said: "Given the money, I believe a big air-strip is feasible." But the cost of constructing the 10,000 ft. runway envisaged as an international airport capable of taking jet airliners is estimated at more than £125 million.

A new 5,000 ft. runway under construction at Cape Bernacchi (77° 30′ S., 163° 45′ E.) will permit wheeled aircraft to land and take off there all the year. It will probably be the air base for aircraft flying between the Antarctic and Christchurch, New Zealand, replacing McMurdo Sound, which would be used only by ski-equipped aircraft.

All the equipment and supplies for the new airstrip will have to be landed "across the beach" which is a difficult operation as the beach is often clogged with broken bay ice which can only be shifted by the wind.

### REACTION TO COLD

A party of six research scientists under Dr. Nello Pace, left San Francisco by air on December 3 to conduct experiments in the Antarctic on man's acclimatisation to extreme cold. The party which includes Dr. L. G. G. Pugh and Major James Adam of the United Kingdom, and Dr. Gerhard Hilderbrand of Germany, flew to McMurdo Sound via New Zealand, and carried out physiological tests on men engaged in particularly exhausting over-snow journeys. The scientists studied the activities of the adrenal gland in intense cold, and general metabolism of heat balance in the body, and measured skin temperature and the rate of oxygen consumption. For this last purpose they wore "imps" (integrating motor pneumotechographs), devices which electronically measure air breathed over a 24-hour period. They wore suits made of knotted wire and covered with plastic "of a shocking pink shade" which were connected to devices that measured temperature changes over the entire body.

## LITTLE AMERICA

The first ships for this season's operation arrived in the Little America area on December 1, but off-loading was delayed because 10-foot-thick ice still extended nearly three miles from the ice edge. The "Glacier" was unable to give full ice-breaking assistance owing to the breaking off of a propeller blade while forging through the pack-ice en route from New Zealand.

For over a week off-loading could only be carried out by the five helicopters available, but on December 10 "Greenville Victory" began unloading supplies and equipment on to the ice after a 10-day effort by the icebreakers "Atka" and "Glacier" to clear a way to the offloading site.

The Seabees completed the off-loading of 2,000 tons of supplies and equipment in the record time of five days. The original estimated time for unloading operations was 10 days.

At one point on the road to the station, the loaded tractors had to pass over a snow bridge spanning a 50-foot crevasse. This dangerously crevassed area necessitates frequent blasting and refilling.

## HELICOPTER CRASH

While "Atka" and "Glacier" were smashing their way through the ice on the first day of unloading, a helicopter transferring staff connected with the ice-breaking job took off from the "Atka" and then crashed on the deck and burnt. Two men, Ensign Walling and Cdr. W. F. Flynn were slightly burned, but Lt-Cdr. P. W. Reigner, who was to relieve Lt-Cdr. J. E. Zoller as chaplain at Little America, was seriously injured, and on December 11 was evacuated to McMurdo.

Fourteen days after the accident the injured padre conducted a service from his stretcher in the McMurdo chapel. He was later flown to New Zealand.

## ICE DEFORMATION STUDY

Interviewed at his camp in the heart of a 50-square mile crevasse field, about 35 miles from Little America, where since November 20 he and three assistants had been probing and measuring a half-dozen crevasses, one of them less than 50 feet from their camp site, Dr. James Zumberge said that a crevasse seven inches wide expanded nearly seven hundredths of an inch in eight days. At this rate, a 100-foot crevasse would widen by nearly one foot—or one per cent.—a week. In two years the abyss would double in width.

## ICE SHELF TRAVERSE

On October 24 seven men, Mr. Albert P. Crary (Station Scientific Leader), Boyd, Cromie, Bennett, Renback, Schoeck and Larsen left Little America in three Sno-cats towing three 2½ ton sleds on a remarkable 1,450 mile journey over the Ross Ice Shelf. The first leg of the route lay roughly parallel with the Ice Front as far as to the east of Minna Bluff at 170° E. This point was reached on December 5. The second leg was south towards the foot of the Beardmore Glacier at 84° 51'S., 166° W. Here the floating ice thickened from the 300 m. near the ice-front to 420 m. near the glacier. Turning east, the trail now led along the mountains to the Liv Glacier: survey work was done on this stretch. Turning north, the party struck a badly crevassed area running S.E.-N.W. at 83° 5' S., 170° W. The area is approximately 20 miles wide and 60 miles long.

An ice-reconnaissance plane came out and the party back-tracked 20 or 25 miles and then turned east to Amundsen's route, 163° W., before turning north again to 82° 5' S.: then north-west to 168°W. and north to the Barrier edge before again moving eastwards to Little America, arriving there on February 13 after 113 days in the field.

It was found that the whole ice-shelf is influenced by the tide, strongly near the ice-front.

The weather encountered was surprisingly good. "I was expecting as much as 25 per cent. delay due to bad weather", said Mr. Crary, "but actually we only lost three days."

Every ten days, when conditions were suitable, and the area was crevasse-free, a Dakota would fly out and bring food, fuel and mail to the party. Sometimes the pilots landed in weather so bad that they had to taxi up to the camp by radar.

On three days only after the first few days was movement impossible. The three Sno-cats never moved forward all together. Travel speed at first was five m.p.h. but later this was increased to seven and a half m.p.h. The cats could go 350 miles without refuelling and so reliable was the air support that not once was the party held up for lack of fuel. Dr. Trevor H. Hatherton of New Zealand travelled with the party for several days on the second leg of the traverse. 43 seismic soundings were made, plus 150 gravimeter and magnetometer recordings.

Pole, there was cloud, but this was never a threat. The cloud formed stratus, with the top of the layer about 1,500 feet over the 10,000 ft. terrain. With a maximum ceiling of 12,000 ft., the Otter had about 500 ft. to spare.

From about half way over the plateau from the Pole, the skies were beautifully clear. From the Beardmore Glacier on, the mountains to port remained bright during the whole journey. Lewis stayed up at 5,000 ft. over the Ross Ice Shelf, where the favourable winds were helping the aircraft and petrol consumption was low.

Ten hours 57 mins. after setting out, the Otter reached its destination, 1,250 miles away, the first single-engined aircraft to cross the Antarctic Continent. Lewis brought his plane down on the airstrip under the shadow of Observation Hill at 10.49 p.m., with the low western sun blazing down the airstrip behind him. A jovial pair of United States Navy Otters went up from the American base to meet him, and when they stepped out at Scott Base, to meet them were not only their New Zealand counterparts but a most interested group of Americans from Hut Point.

### MOUNTAIN AREAS

The only new mountain areas discovered by the expedition were found within 250 miles of the Weddell Sea. Thus it was possible to carry out survey work in two mountain ranges—the Theron Mountains and the Shackleton Range—and one group of the Nunataks, the Whichaway Nunataks.

Geology was carried out at the same time. Fuchs had to leave this side of the scientific studies almost entirely to John Stephenson.

"Fortunately there was sufficient fossil material to give some indication of the age of the rocks," said Sir Vivian at Scott Base.

## Halley Bay Relief

The "Tottan," carrying relief personnel, stores and mail for Royal Society Base, Halley Bay (75° 31′ S., 26° 36′ W.), arrived there on December 31. On Christmas Day the "Tottan" had called at Norway Base to disembark relief personnel and unload stores for the Norwegians.

New personnel for Halley Bay are:

**Flight Lieutenant B. K. Brooker,** R.A.F. (26), medical officer.

**Bernard G. Ellis** (27), and **John A. Smith** (30), meteorologists.

**Sergeant Edward J. Gane,** R.A.F. (27), senior wireless operator.

Colonel Robin Smart, R.A.M.C., who has been leader at Royal Society Base for the past season, has handed over his command to Mr. J. MacDowall, the leader of the meteorological group at the base since the main party of the expedition arrived in January, 1957.

"Tottan" departed from Halley Bay on January 7.

The programme of I.G.Y. measurements at Halley Bay includes the twice-daily launching of meteorological balloons for upper air soundings as well as normal surface weather recording. Continuous watch for displays of aurora australis (or "southern lights") is maintained during the hours of darkness. Radio equipment is used to study the state of the ionosphere, the layer of the upper atmosphere which reflects radio waves and thus helps worldwide radio transmission. Other scientists at the base study radar reflections from meteor trails and the aurora with equipment which is complementary to that used in Britain. Instruments for recording the earth's magnetic field and a seismograph for detection of earthquake shocks are in continuous operation. Ice conditions in the region of the base are also studied.

record time of nine days 21 hours. The load brought back included the SIPRE ice-coring drill.

### TRAVERSE PARTY

The traverse party of six men from Byrd was led by V. H. Anderson and included Dr. C. R. Bentley, who is wintering over and will be in charge of next summer's traverse.

The three Sno-cats pulled three 2½-ton sleds and a mess wanigan. Leaving Byrd on November 19, the party travelled N.E. 250 miles to an un-named mountain at 76° 25′ S., 112° 38′ W.: from there on December 13 E.S.E. 350 miles to the Sentinel Mountains (see below), thence S.W. for 135 miles to 79° 37′ S., 91° 11′ W., on 90 miles to 80° 27′ S., 98° 05′ W., and finally 220 miles back to Byrd in mid-February, a total distance of over 1,000 miles forming a rough square in the heart of Marie Byrd land.

### THE SENTINEL MOUNTAINS

Topographically, the most interesting discovery was a major mountain system which the party called the Sentinels as it is roughly in the position where Ellsworth in his 1935 flight saw mountains which he named the Sentinel Range. These mountains, however, appear to be much more extensive and of greater altitude than anything shown on Ellsworth's photographs. The range is some 80 miles in length and extends from 77° S. to 78 30′ S. The party spent six days about seven miles west of the centre of the range and ascended a nunatuk.

### LONE EXPLORER

On New Year's Day, on the second leg of the traverse, while heading east of south at about 77° 3′ S., 98° 55′ W., the party was surprised to find the track of a solitary penguin at right angles to their line of march heading for the South Pole 860 miles away. The tracks were examined for over a mile and the course varied less than 2°. This regularity of the track and the presence of droppings indicated that the bird was in good condition, certainly not starving, although his nearest known food supply was 150 miles behind him. He had been travelling on his belly for all but six feet of the part of the track examined.

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## DEEP DRILLING PROJECT

Deep coring of the Byrd Land Ice Plateau began on December 16, and the project was fully operational on December 29 with the initiation of ice cores. Cores 3 ins. in diameter have been obtained by hard drilling to depths of 60 ft. The depth of the drill hole on January 26 was 1,013 feet. Unbroken cores 4 ins. in diameter, up to a length of 20 ft., have been obtained, allowing the study of detailed stratigraphy to depths of 320 ft. It is estimated that accumulation at the depth of 490 ft. was deposited in the early or mid 17th century. It is intended to continue drilling to depths of at least 984 ft. and to repeat the operation next season on the Ross Ice Shelf.

Mr. Hoffman, a driller with the New Zealand geophysical survey, who met the New Zealander Tony Gow, a member of the team, while at Byrd station, has brought back a 5-inch section of a 3¼-inch diameter core packed in snow in a plastic bag. This he will place in a refrigerator aboard H.M.N.Z.S. "Endeavour" for delivery in Wellington and analysis at the Gracefield laboratories of the Department of Scientific and Industrial Research.

The wintering over party comprises 12 I.G.Y. scientists under Mr. Stephen Barnes and 10 support personnel.

## SOUTH POLE

**(Amundsen-Scott Station)**

The new wintering-over party of 19 includes 10 I.G.Y. personnel, one more than last year owing to the presence of Paul C. Dalrymple, who will conduct a micro-meteorology programme. He conducted a similar programme at Little America last year with Dr. H. C. Hoinkes. The new Scientific Leader is Mr. Palle Mogensen and the Military Leader Lieut. V. Houk.

Approximately 350 tons of cargo was air-lifted to the Pole Station from Christchurch via McMurdo Sound after having been shipped from the United States. The largest single item dropped at the Pole was a D-2 tractor weighing approximately 7 tons, dropped on November 24. The tractor was in operation 20 minutes after being dropped.

### POPULATION RISES

The Pole has been quite populous at times during the summer. For one short period in mid-December there were three aircraft (two P2V's and an R4D-8) on the usually deserted strip, and 53 people living at the station.

In December U.S. seismologist Father Daniel Linehan fired three shots of T.N.T. in a 600 ft. line near the ring of oil drums which marks the exact location of the South Pole. The soundings showed that the Pole may be perched on rock 1,000 feet above sea level, buried beneath 8,000 feet of ice.

Personnel of the South Pole Station were among the first to celebrate the coming of the New Year. On New Year's Day, a typical American picnic was held at a —20° temperature. The camp cook provided hot dogs, with relishes, which were roasted over an open fire. The fire also was used to warm the ice cream so that it could be eaten.

On December 30, a record high for a bottom of the world radiosonde weather balloon was reached, when one rose to 105,223 feet, 20 miles, at the Pole. This is the altitude record for Antarctica. The previous mark was held by the Byrd I.G.Y. station.

### NEAR DISASTER

A twin-engined R4D Skytrain, making the last flight to the South Pole before the onset of the winter to pick up two members of Sir Edmund Hillary's expedition and two dog teams left behind by Dr. Vivian Fuchs, had to make a forced landing on Hollick Kenyon Plateau, 334 miles from the Pole, on January 21.

The Skytrain developed an oil leak in the port engine while cruising at 8,000 ft. in a cloudless sky en route to the pole from Byrd Station. As the rugged Horlick mountains were looming just ahead the loss of oil made a "precautionary" landing necessary.

The plane skidded for 3,000 feet on the smooth snow while landing, and the port landing gear collapsed. No one was hurt. A rescue plane from Little America was sent out with necessary replacement parts and an installation crew. The crew of the R4D meanwhile set up their survival equipment and made camp on the 4,000-foot plateau.

The repair crew worked in zero temperatures and a 15 knot wind for 18 hours without a stop to remove the damaged gear and to install and check replacements.

The last ski-equipped aircraft of Deep Freeze III arrived and departed from the station on January 27.

The 18 men of the station complement now will be alone for the next nine or ten months. This is the first time since the landing at the Pole on October 31, 1957, that the base has had no visitors.

## WILKES

The icebreakers "Atka" and "Burton Island" and the cargo ship "Arneb" arrived on January 25 at Wilkes, the northernmost U.S. station. The ships began resupplying operations and personnel rotation. Twenty-eight personnel, including 17 Navy men and 11 civilian scientists and technicians, will spend the winter at the two-year-old base.

Lieutenant Robert S. Sparks, is the new station military leader. Dr. Willis L. Tressler succeeds Carl R. Eklund, as scientific leader.

The "Burton Island" sailed on January 26 for a one-day visit to the Russian I.G.Y. station at Mirny, 450 miles west of Wilkes. On board the icebreaker were task group commander Captain Gerald L. Ketchum, U.S.N., and members of his staff. The icebreaker "Atka" originally was scheduled to visit Mirny, but she lost two blades on her port propeller while transiting the ice belt near Wilkes. While the operational capacities of the "Atka" are only moderately hampered, it was decided to send the "Burton Island" in her place.

The ice-pit dug at Wilkes is 115 feet deep, the deepest ever dug in North or South Polar regions for ice-study purposes.

Station personnel have made numerous scientific explorations of the area around the station. In July a survey of unmapped islands near the station was made along the coast to the Balaena Islets (66° S., 110° 48' E.), 24 miles northeast of the station. In September the routine operation of all disciplines aided in the completion of mapping and field work on islands and the coastline northeast to Cape Folger. In December a Weasel trip was made for 73 miles northeast along the coast for mapping, glaciological and biological studies. A small penguin rookery was discovered at the Balaena Islets. At the auxiliary ice-cap station established 50 miles east southeast of the station at an altitude of 4,000 feet, glaciological, meteorological, and auroral observations have been carried out.

The glaciological deep pit was excavated to a depth of 112 ft. in November. A hand drilled hole at the bottom has extended the depth to 196 ft. Density measurements of firn at the Ice Cap Station from the drill hole at the bottom of the pit gave high values up to 0.90. The flow rate at the centre of the Vanderford Glacier has been confirmed to be approximately six feet per day.

The ice cliffs from Clark Peninsula to approximately 65° 50' S., 113° E. were studied during a weasel trip on sea ice on the 5th and 6th of December. Elevated beaches were studied on several islands of the Windmill group.

In November 120 skuas had been banded and 27 recaptures made of birds banded last year. A survey of 11 Adelie penguin rookeries on the Windmill Islands has been made and detailed studies continued in the Clark Peninsula rookery. Collections were made for the U.S. National Museum. A census of penguins was made near the station.

Temperature telemeter studies were completed with 9 days' continuous recordings of incubating penguin and skua eggs.

Twenty-five Weddell seals were branded in November.

A nesting survey of the Windmill Islands was continued in December. During this period 73 skuas were banded and 34 recaptures made of birds banded last year.

The satellite station is expected to be in use by the middle of March for scientific studies.

## ELLSWORTH

On October 28, the five-man traverse party, led by Dr. Edward C. Thiel, departed from Ellsworth Station. A crevasse free passage was discovered from the eastern end of the rift with an elevation of 500 to 3,000 ft. above sea level. A mountain range was discovered in Edith Ronne Land which spreads approximately 100 miles or so in an east-west direction and extends south to less than 400 miles of the Pole. It is estimated that some of the peaks are about 11,000 ft. It was the intention of the traverse party to divert approximately 125 miles from the originally planned course to permit collection of rock specimens and geological studies of these mountains.

Approximately 100 miles south of Ellsworth Station, in mid-November, the party came upon a heavily crevassed area undetected by aircraft. On November 30, the traverse was approximately 150 miles south of Gould Bay at an elevation of 1,670 ft. in the highlands.

On December 7, the traverse party reported that at 81° 30′ S., 50°W., the elevation was 3,140 ft. and seismic soundings indicate land underneath the snow and ice cover to be 294 ft. above sea level; it has not yet been determined whether this is an island or part of the mainland directly south of Gould Bay.

On December 22, the party reached the mountains first sighted on the March 16, 1957, reconnaissance flight. The party camped at 1,760 ft. elevation about 7 miles north of a mountain range which was estimated to have an average height of 6,560 ft. Black horizontal bands were observed high up on the mountains. The range extends 30 miles in an east-west direction, between 51° and 55° W. and 82° 30′ S. The mountains form a 5,000 ft. high escarpment on their southern side.

Reconnaissance and resupply flights have also sighted mountains 125 miles away to the south-west. They are located between 60° to 70°W. and 83° to 84°S.

A new island was observed to the south and west of Gould Bay extending from its cape for 200 miles to 80°S. The island's eastern escarpment at 43°W. has three embayments, the largest about 50 miles in depth. Extending in an east-west direction for about 180 miles, the highest elevation of the snow covered island was observed to be 3,140 ft. above sea level at 80° S., 48° W. During the party's crossing of the island, seismic soundings showed land underneath the snow and ice to be several hundreds of feet above sea level.

Other islands whose contours were not fully delineated, were seen still further westward and appear to tie in with land in the Catherine Sweeny and Lowell Thomas Mountain groups. These observations appear to limit the size of the Filchner Ice Shelf from Molke Nunataks to Gould Bay where it terminates.

The traverse party covered approximately 450 miles in a southerly direction, then proceeded in a northerly direction toward Mt. Hassage. The traverse position on January 2, was 78° 40′ S., 69° 00′ W., or within 80 miles of Mt. Hassage.

The relief party which arrived on board the U.S.S. Wyandot was airlifted to the position of the traverse vehicles and will complete the last leg of the traverse triangle. The original party was flown back to Ellsworth.

### ARGENTINA TO ELLSWORTH

On November 24 six American airmen led by Major James Lassiter arrived at Ellsworth Station after a daring two thousand mile flight from Ushuaia, Argentina. The

visitors were fondly greeted by the 39 permanent dwellers who were eager to see new faces and receive the first mail from home. This was their first contact with civilisation since the ships' departure almost a year before. Flying above the stormy seas of Drake Passage from Cape Horn they made a brief stop over Robert Island, the Chilean Base on the South Shetland Islands. The two C47 planes were airborne again at noon and spanned the Bransfield Strait separating the South Shetlands from the northernmost tip of Palmer Peninsula (Graham Land), cut across and followed the snowcapped mountains south along the western shores of the Weddell Sea. Three hours later the planes passed Cape Keeler and at 6 p.m. reached Bowman Peninsula. Tricky Antarctic overcast forced them to land on Dolleman Island, two hundred miles north of Ellsworth. Ten sleeping bags, food for four months and engine heaters were in the heavily overloaded planes for emergencies. Next day Lassiter completed the long flight in one of the planes while the other remained for another day on Dolleman Island. Reaching Cape Adams at the southwestern corner of the Weddell Sea, he followed the two-hundred and fifty foot high ice cliff extending uninterruptedly for three-hundred and fifty miles to Gould Bay. Within range of the homing beacon Lassiter soon sighted the station.

In early February Major Lassiter's group was to return to South America over the same route they used to reach the Antarctic.

### SHIPS ARRIVE

The Navy cargo ship U.S.S. "Wyandot" and the Coast Guard icebreaker "Westwind" arrived at Ellsworth Station on the Filchner Ice Shelf on January 10, ahead of schedule. Both ships stopped briefly at Dakar and Capetown before heading through the Weddell Sea to Ellsworth. The 44-day trip was comparatively easy except for several severe storms encountered late in the journey. The sea was relatively free of ice except for two days when "Westwind" had to cut a path through a floating ice pack.

The wintering - over personnel number 39 (14 I.G.Y.). Eleven of the 25 support men are associated with the aviation activities. Dr. Matthew J. Brennan is the new Scientific Leader and Lieut. Paul Tidd, Officer in Charge of the naval group.

## HALLETT

**(Joint U.S.-N.Z. Base)**

The "Arneb" completed its off-loading operations at Hallett Station in 72 hours. This record off-loading time was aided by favourable winds and an ice-free bay. Last year the "Arneb" was severely damaged by the ice off Cape Hallett. This year she steamed through pack ice for only four hours and entry into the bay was easy.

Nine hundred tons of supplies and 15 relief wintering-over personnel were delivered to the one-year-old base. The new wintering-over party includes seven I.G.Y. men, three of whom are New Zealanders. Mr. Kenneth Salmon of New Zealand is Scientific Leader.

The "John R. Towle" departed Cape Hallet on January 16 with last year's wintering - over personnel aboard bound for New Zealand. The personnel will be flown from there to the U.S.

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Another Russian cairn was found During February on Mitchell Island by two Wilkes glaciologists. "The cairn contained a message", states a report "which we are still trying to translate".

# How Much is Icing and How Much Cake?

**The Antarctic Continent has often been described as a great iced cake. It has been assumed, ever since the days of Wilkes, d'Urville and Ross, that beneath the ice-shelf of the Antarctic lies a great land mass, roughly of the size and shape shown on our maps today, with possibly, some have thought, a channel joining the Weddell and Ross Seas.**

Today, we know that this is not the case. At the Antarctic Symposium held in Wellington, New Zealand, from February 18 to 22, one of the most interesting sessions to the layman was that entitled rather forbiddingly "The Topography of the Sub-Glacial Continent," which, to the layman, means "the shape of the land under the ice."

The first inkling that there might be surprises if we could ever probe beneath the over-lying ice-sheet was given by the results of the 400-mile seismic profile made in Queen Maud Land by G. de Q. Robin of the Norwegian-British-Swedish Expedition of 1950-52. This disclosed that 125 miles in from the "shore" the land was still below sea-level, and that there were areas also below sea-level as far as 280 miles "inland."

The great ice sheet of the Antarctic, over 6 million square miles in extent, cannot be studied in anything but a spotty fashion. However, teams of glaciologists, seismologists, and support personnel are travelling by tractors and special over-snow vehicles thousands of miles across the ice in a series of traverses to obtain the profile of ice thickness across the continent and to attempt to learn something of the underlying terrain, or formation of the ice-covered earth.

The deep ice is explored by setting off small explosions on the surface and by listening to echoes reflected by the bottom of the ice and by any deeper layers of the earth's crust. The time the echoes take to return allows calculation of the depth of the ice.

During these traverses, it has been discovered that at many places thought to be high land with a heavy ice cover, the ice is actually much thicker than the height above sea-level. Further explorations will reveal whether such areas are frozen fjords or inland seas and what part of this submergence may be due to the bending inward of the earth's crust as a result of the weight of the ice.

Scientists engaged on this seismic profile work check the results achieved by such reflection shots by refraction shots and also by the more easily made gravimetric readings.

We summarise the results of the profiles carried out by the expeditions which reported to the Wellington symposium, and add the provisional findings from similar work carried out by Dr. Fuchs' party on the Commonwealth Trans-Antarctic Expedition.

### BYRD TRAVERSE

See story on page 244. Seismic observations were made at 50 stations, and gravimeter, magnetometer and altimeter readings at 500. Travel days, normally of 30 miles between seismic stations, alternated with station days. At each seismic station reflection depth measurements were made, using an "L" spread of geophones to permit the strike and dip of the rock surface beneath the ice

to be determined. The usual charge was a pound at a depth of four metres. Prolonged surface noise following the shot often interfered with the reflected arrivals.

From the Ross Ice-Shelf-Rockefeller Plateau boundary to the end of leg 1 the ice thickness varied between 2,000 ft. and 9,000 ft. All but a few peaks of the rock floor are at present below sea-level, the major portion far enough below to be under water if the ice were removed and the land allowed to rise into isostatic balance.

On leg 2 there was a smooth bottom and great ice thickness (7,500 to over 11,500 ft.). Near the middle of the leg the rock floor reached a depth of 6,500 ft. below sea-level. Here the elevation of the surface is a little over 4,900 ft.

On leg 3 the rock floor is very rough and mostly above sea-level, in several places breaking the ice surface to form nunataks, suggesting that the Sentinel mountain structure may extend south-west at least as far as 80° 30′ S., 98° W.

## ICE-SHELF TRAVERSE

Crary's tests indicate an ice thickness of from 1,000 to 1,200 feet throughout much of the 450 miles between Little America and McMurdo Sound. His soundings show that the depth of the water under the shelf varies greatly, ranging from a few hundred feet to 3,000 feet on the western side of the shelf, near McMurdo Sound.

Two small islands were discovered under the ice west of Roosevelt Island.

## OTHER TRAVERSES

The **AUSTRALIAN** seismic party fired 200 charges during a 300-mile drive inland from Mawson. Twice, near the coast, between 68° and 69°S., the rock bed was below sea-level, but further inland the snow level rose to nearly 10,000 feet and the land beneath ,at 73° S., was 3,000 feet above sea-level and rising.

The **FRENCH** going south for 300 miles on the 140th meridian from Dumont d'Urville found the land below sea-level near the supposed coast, and again 120 miles and between 200 and 250 miles south. The altitude of the sub-glacial rock varies betwen —2,000 and +2,000 feet, and is on the average at sea-level.

**RUSSIANS** with tractor trains made a seismic profile for 170 miles and gravity measurements on to 220 miles south of Mirny, almost to Pionerskaya. Eighteen miles from Mirny the rock-bed was 1,640 ft. below sea-level, and again below sea-level 120 miles and 190 miles "inland"; also (without seismic confirmation) at Pionerskaya itself. But at Vostok the ice was 8,700 ft. thick and the altitude 11,000 ft., indicating land rising to 2,300 feet.

## TRANS-ANTARCTIC EXPEDITION

Dr. Geoffrey Pratt, who carried out the seismic soundings on Dr. Fuchs' crossing, reports that the whole of the land traversed by this party is above sea-level. Seismic and complementary gravimetric studies were made at frequent intervals during the whole of the 2,200-mile traverse. "There is nothing below sea-level anywhere," Pratt says.

There are no mountains beneath the ice in the interior to compare with those in the McMurdo area. The mountain chains which were identified beneath the ice-cap are "humps" in comparison. The general level of the underlying land on the McMurdo side of the Pole (see map) is much higher than on the Weddell Sea side. One mountain system below the interior ice-cap is only about 1,500 ft. submerged. Here the surface is at 8,500 ft., the land at 7,000 ft. This is the area about 50 miles south of Depot 700, where bad crevassing was encountered. Crevasses in the interior commonly signpost mountains not far below.

### AIR-BORNE TRAVERSE

An American team under Dr. Cook formed an experimental air-borne traverse party in Victoria Land, west of the Ross Sea. The team began work in December 1957 near Little America, snpplementing Mr. Crary's work. Later they assisted the ice-deformation project.

On January 2, the first air-borne sortie was made. Cook and Vickers were flown out in a Dakota to 150° E. in Victoria Land. The high altitude made it necessary to carry heaters in the planes to prevent engine trouble during the station-periods.

**Station A** was of three and a half hours' duration at 77° 09′ S., 155° E. Two shots were fired at an elevation of 8,300 feet, but no satisfactory reflections were obtained.

For **Station B** four men were flown out on January 5 to 77° 33′ S., 158° 30′ E. at an altitude of 7,750 feet and camped there overnight. Seven or eight shots were fired during the 23 hours' stay, in holes 5 m. and 10 m. deep. Again there were no accurately-measured reflections.

**Station C** was a six-day camp (January 16-22) by Cook, Vickers and two physiologists. They were flown out in a Neptune to 77° 22′ S., 139° 48′ E. at an altitude of 8,900 feet, indicating that the plateau rises to the west. Thirty seismic shots were fired, but again the rock-bed was hard to find. A rough estimate gave 9,000-13,000 feet of ice.

It is, of course, far too early to re-draw the map. But the general indication is that while there is a very considerable land mass stretching right from the Graham Land peninsula to the mountains of Victoria Land, much of the area south of the assumed coast-line in many parts of eastern Antarctica is below sea-level, and that a major portion of Western Antarctica, especially "Marie Byrd Land," would, if the ice were melted, be oceanic in character.

# BOOKSHELF

**"SHACKLETON,"** by Margery and James Fisher: London. James Barrie Books Ltd., 559 pages, ill., N.Z. price 35/-.

There has been a great spate of books in recent months dealing with the Antarctic, but in many instances they add nothing to our knowledge, being merely a re-hash of previous publications written to catch a ready market. In a very different category to these is the excellent biography of Sir Ernest Shackleton, written by Margery and James Fisher. It is one of the best biographies I have read for a long time, and the years of patient research which went into its preparation are evidenced throughout.

Two things fortunately assisted the biographers, the fact that Antarctic explorers are usually long-lived—and they usually kept diaries while in the South. In connection with the veterans of the expeditions the Fishers made full use of tape-recordings for interviews. The world was combed for information relating to Shackleton, and much new data was brought to light from New Zealand.

Splendidly illustrated, and particularly well documented, the book contains an almost complete list of Shackleton's men, a full chronology covering his life, several maps and a bibliography.

Shackleton emerges as a real man, with a many-sided personality, with his weaknesses, and they were many, portrayed with sympathy. I closed the book with the feeling that all his life, apart from a few brief triumphant moments, he looked upon himself as a failure. Yet, how many men of his generation are so well remembered today?

This is both a very readable book and a fine work of reference. It is a "must" for every Antarctic library. A.S.H.

**"ARCTIC AND ANTARCTIC: a Prospect of the Polar Regions,"** by Colin Bertram: Cambridge, W. Heffer and Sons Ltd., 123 pages, ill., N.Z. price 25/9.

Though this is described by the author, until recently Director of the Scott Polar Research Institute, as "in considerable degree a second edition" of his earlier "Arctic and Antarctic: the Technique of Polar Travel," it is much more than that. It is a still useful treatise on the basic requirements of clothing, food and transport in polar regions, but by an experienced polar traveller who has kept abreast of modern developments. It is a survey of methods of polar exploration in an age that his passed but also a critical examination of the methods of the modern age. Dr. Bertram writes wisely of the effect of the changes on leadership and organisation—though one may quarrel with his statement that "idealism is well-nigh dead, adventure moribund and certainly vestigial."

All those whose interest in the polar regions is more than superficial should read, and ponder, this valuable book. L.B.Q.

**"METEOROLOGY OF THE ANTARCTIC."** M. P. van Rooy (Editor): Pretoria, Weather Bureau, Department of Transport, 240 pages, ill. and map. Price 60/-. (Reviewed by I. S. Kerr.)

This book, if it had been published towards the end of 1956 as intended, would have been of very great value to meteorologists and others preparing for the I.G.Y. Because the preparatory work took much more time than was anticipated, this aim could not be realised. Nevertheless its importance is but little diminished.

The work is an attempt, and a very successful one, to gather together all that was known of the meteorology of the Antarctic up to the beginning of the I.G.Y. This has been done, not only by quoting and summarising the work of earlier authors, but by collecting all the available data and subjecting the whole body of material to fresh and detailed analysis. Perhaps, in some parts of the book, the nature of the data or their paucity does not justify the treatment they have received, but the authors are always careful to emphasise the need to accept the results of such analyses with considerable reserve.

The plan of the work is excellent. It begins logically with an account of the geographical and hydrological features of the Antarctic which, incidentally, was taken to be the whole of the hemisphere south of the fiftieth parallel. The second chapter on the sources of meteorological data for the Antarctic, and including a brief survey of Antarctic expeditions from the time of Cook, is a very valuable one.

Next comes a chapter on meteorological instrumentation and the problems and difficulties of making weather observations in polar regions. This is followed by discussions of the atmospheric sea-level pressure, precipitation and evaporation, the clouds, and wind and temperature regimes of different parts of the region. Finally there are chapters on the conditions in the upper atmosphere and on the problems of synoptic weather analysis.

It is impossible in a short review to criticise or discuss the many results produced or problems raised by the authors but it is of interest to note that there appears to be some confirmation of the existence of pressure surges as postulated by Sir G. C. Simpson. In fact a great deal of Simpson's classical work is confirmed. On the other hand the authors do not support Hobbs' Glacial Anticyclone theory.

A fine set of photographs, including one of the United States Base at the South Pole, and 330 references complete a most timely and well-produced volume.

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# "THE ANTARCTIC TODAY"

This volume is out of print, but a limited number of the following **separate sections** is available, the stapling slightly rusted:

**Ionosphere Research** (J. W. Beagley).
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These separates are available at a cost of four shillings each from the Secretary, N.Z. Antarctic Society.

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