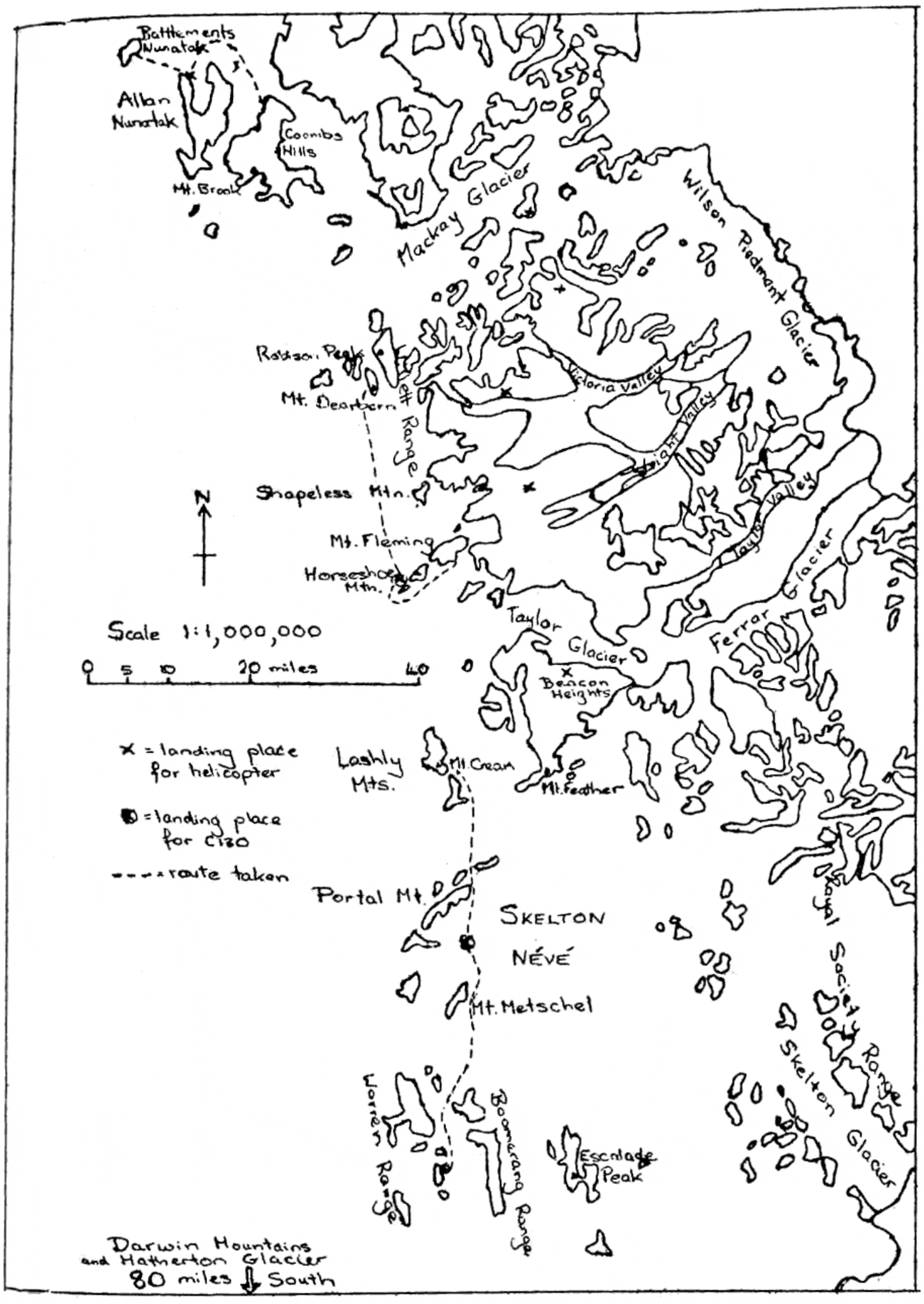
This report has been prepared for the benefit of the University Council of Victoria University, the University Research Grants Committee, the Ross Dependency Research Committee, and individuals who have assisted the Expedition in the execution of its research programme. It is not intended as a publication, and any scientific data contained herein may not be used or referred to in print without the express permission of the expedition leader and project leader concerned.


Battlements Nunatak
Allan Nunatak
Coombs Hills
Mt. Brook
Mackay Glacier
Wilson Piedmont Glacier
Victoria Valley
Wright Valley
Taylor Valley
Taylor Glacier
Ferrar Glacier
Radian Peak
Mt. Dearborn
Queen Alexandra Range
Shapeless Mtn.
Mt. Fleming
Horseshoe Mtn.
N
Scale 1:1,000,000
0 5 10 20 miles 40
Bencon Heights
Lashly Mts.
Mt. Crean
Mt. Feather
× = landing place for helicopter
● = landing place for C130
---- = route taken
Portal Mt.
SKELTON NÉVÉ
Mt. Metschel
Royal Society Range
Skelton Glacier
Warren Range
Boomerang Range
Escalade Peak
Darwin Mountains and Hatherton Glacier
80 miles ↓ South

CONTENT

PREPARATIONS FOR VUWAE 15.

Initial Planning.

In January 1970 Barrett and Kohn submitted a proposal to the VUW Antarctic Research Committee. A slightly modified plan was then submitted to the Ross Dependency Research Committee in March 1970 outlining the background, aims, organisation and field programme for VUWAE 15. The background and aims as submitted to the RDRC are shown below; for details of the proposed field programme see Appendix I.

VUWAE 15 Programme submitted to R.D.R.C.

This year's VUWAE expedition will concentrate on rocks of the Beacon and Ferrar Groups in several parts of southern Victoria Land. The stratigraphy of the Beacon Group in the Beacon Heights area has been described, and new formations defined, by McElroy (in press), and his work was extended in the 1968-69 season by McKelvey, Webb, Gorton and Kohn. It is intended that this year's expedition continue this work, extending the stratigraphy northward to the Mackay Glacier and southward to the Darwin Glacier. This will help establish a sound regional stratigraphic framework, a necessity for future petrologic and paleogeographic studies, and for regional geologic mapping.

The Beacon Group* is divided into two subgroups - the Devonian Taylor Subgroup, consisting largely of quartzose sandstone, and the Permian-Triassic Victoria Subgroup, consisting largely of feldspathic and lithic sandstone and containing coal measures. Tholeiitic basaltic rocks of the Ferrar Group, which intrude and overlie the Beacon, will also be examined.

Special emphasis will be placed on:-

(a) the basal units of the Taylor Subgroup, their relationship to each other and to the underlying basement complex;

(b) detailed collections of Devonian fish by a vertebrate paleontologist;

(c) the Late Paleozoic glacial beds (Metschel Tillite), their relationship to the underlying strata, their age, and the direction of paleo-ice movements;

(d) the collection of Beacon samples for detailed sedimentary petrography;

(e) a search for volcanogenic material in beds below the Mawson Formation;

(f) a layered dolerite sill at Mt. Warren and metamorphosed sediments in dolerite in the nearby Boomerang Range;

(g) The Kirkpatrick Basalt in the Allan Hills area, and its relationship with the underlying volcanogenic Mawson Formation.

* now Beacon Supergroup (Barrett, 1970).

The Darwin Glacier area was visited by VUWAE 6 (in 1962), and strata from both Taylor and Victoria Subgroups were found. Also a TAE party discovered basaltic rocks at nearby Westhaven Nunatak. The VUWAE 15 expedition intends to carry out reconnaissance work with a view to planning for future work in the area, because the area includes large areas of previously unexamined exposures, and forms an important stratigraphic link between Beacon rocks of southern Victoria Land and the Beardmore Glacier area to the south.

Geologic information which will later be used for map compilation at a scale of 1:250,000 (and 1:50,000 in some areas) will be collected. The sheet covering the Skelton Neve (Mt. Harmsworth) will be almost completely covered this season. Only parts of the Convoy Range, Taylor Glacier, Carlyon Glacier, Turnstile Ridge and Mt. Olympus sheets will be mapped, but it is hoped that coverage of these sheets will be completed in future seasons.

Four parties, each consisting of a geologist and assistant, are planned for the programme. The areas of scientific responsibility for the parties are the Taylor Subgroup, the Devonian fish remains, the Victoria Subgroup, and the Ferrar Group. Two such parties, i.e. four men, will work in the Skelton Neve and the Darwin Mountains. In the Allan Hills and the Dry Valleys parties will work independently (see programme summary), as others have done in the past.

Further Planning

In mid-June a table of flight requirements, destination, number of persons involved and weights (weights were calculated from the DSIR field manual and included personnel weights) were submitted to Antarctic Division at their request (Appendix II). This plan was later passed on to Deep Freeze Headquarters by Antarctic Division. This first table was later supplemented by another giving precise dates for helicopter and Hercules support required, exact destination (in latitude and longitude), and approximate elevation of pick-up and put-in points. For Hercules landing sites, Kohn suggested two possible landing sites in the Skelton Neve, an area he had visited with the VUWAE 13 party. Barrett had the opportunity of discussing possible Hercules landing sites in the Darwin Mountains with Dr. J. Kennett, a member of VUWAE 6 (1962-63). The "most desirable" sites chosen by Kohn and Kennett proved suitable for Hercules landings.

During September 1970, Barrett prepared a reading list comprising important books and papers on Antarctic geology and also books and narratives of Antarctic expeditions from 1901 to 1970. A detailed set of notes on the measuring of sections was also prepared. The reading list and these notes were circulated to all members of the expedition. All members of the party also had the opportunity of measuring a "trial" section so that measuring techniques could be compared and standardised.

Maps were provided by Antarctic Division at our request. Limited air photo coverage of areas to be visited were supplied by Denis Rainey from the Lands & Survey collections. Additional photos were requested from the U.S. Geological Survey in Washington through Antarctic Division. These arrived too late to be used in the field.

EXPEDITION MEMBERS

The 1970/71 party (VUWAE 15) was made up as follows:-

Leader:	Peter Barrett	M.Sc. (Auckland), Ph.D. (Ohio State Univ.), Post-Doctoral Fellow Victoria University, Wellington.
Deputy Leader:	Barry Kohn	B.Sc. (Hons.), doctoral student.
Geologist:	Rodney Grapes	B.A. (Hons.), Junior Lecturer, doctoral student.
Geologist:	Rosemary Askin	B.Sc. (Hons.), doctoral student.
Geologist:	John McPherson	B.Sc. (Hons.), M.Sc. student.
Geologist:	David Reid	B.Sc. (Hons.), M.Sc. student.
Geologist/ Paleontologist:	Alex Ritchie	Ph.D. (Edinburgh), Curator of Fossils, Australian Museum, Sydney.
Geologist/ Paleontologist:	Gavin Young	B.Sc. (Hons.), Assistant Curator of Fossils, Bureau of Mineral Resources, Canberra.

The VUWAE 15 programme was planned during February 1970 by Barrett, Kohn and Grapes. Ritchie had expressed a keen interest in carrying out Antarctic field-work water receiving the fish fossils collected by VUWAE 13 in early 1969, and was invited to join the party by Professor Clark. Ritchie then selected Young who had previously worked on fossil fish in east Australia as his field assistant. Both Ritchie and Young were financed by their respective institutions. Applications for three geological field assistants were called for in April 1970 and drew about fifteen applicants. Miss Askin and Messrs. McPherson and Reid were selected for the positions in early June. Ritchie visited Wellington in mid-June 1970 to meet expedition members and discuss details of the programme.

Messrs. Kohn, Grapes, McPherson, Reid and Young, and Miss Askin attended the Antarctic Training Week at Tekapo in August 1970. This proved to be a most valuable experience and allowed us to meet the future Scott Base Leader and other participants in the 1970/71 NZARP programme.

FINANCE, EQUIPMENT AND GENERAL PROVISIONS

Finance

The expedition was supported financially by a grant from the University Grants Committee. This grant was used to purchase such items as food, clothing, stationery, etc., and to cover insurance of personnel and instruments. The University Council provided financial support for the three geological field assistants.

Field Gear

Many items necessary for Antarctic field work were already available in the VUWAE Antarctic store. This included sleeping bags, windproof clothing, Mead tents, commanda radios and kitchen utensils. New purchases such as kitchen boxes, kitchen utensils, spare primus parts, small first aid kits and sponge rubber mattresses etc., were made. Antarctic Division provided additional gear such as heavy down clothing, heavy gloves, rope, crevasse ladders, large radios, polar tents, manhauling harnesses, toboggans and sledges.

Food

In planning the expedition it was estimated that 30 D.S.I.R. 20-man day food boxes would be required for the season's work. It was later decided to order only 26 food boxes and to supply the equivalent of five food boxes in the form of fresh meat, tinned vegetables and tinned fruit. By the end of the season only 15 had been used. All stocks of loose VUWAE food were left in the VUWAE store at Scott Base. This food, about the equivalent of 4 food boxes, would only be useful as a supplement to new food boxes, and should not be counted as food in hand.

Instruments

Special equipment, cameras, tape measures, small Abney levels and compasses were borrowed from the Geography and Geology Departments.

NARRATIVE ACCOUNT OF EXPEDITION

PART A	Beacon Heights		November 7-12 P. Barrett B. Kohn
PART B	Skelton Neve		November 17 to December 12
		P. Barrett (leader)	R. Grapes
		B. Kohn (dep. leader)	D. Reid
		R. Askin	A. Ritchie
		J. McPherson	G. Young
PART C	Portal Mtn to Horseshoe Mtn		December 12 to January 17 P. Barrett (leader) R. Askin A. Ritchie G. Young
PART D	Allan Hills		December 17 to January 6 S. Curreen (DSIR-leader) R. Grapes J. McPherson D. Reid
PART E	Darwin Mountains		January 20 to February 2 P. Barrett (leader) R. Askin S. Curreen G. Young
PART F	Victoria Valley area		January 17 to February 4 B. Kohn J. McPherson

The detailed itinerary of each part of the expedition is given in Appendix III.

NARRATIVE ACCOUNT OF EXPEDITION

PART A

Barrett and Kohn were transported to Beacon Heights on the afternoon of November 7 by helicopter. Reconnaissance of the geology of the SW side of the Taylor Glacier in the vicinity of Windy Gully was carried out on the flight. The remainder of the day was spent setting up camp and carrying out a quick reconnaissance of the middle part of the geological section at West Beacon. The 1,100 m section was measured and described over the next three days and detailed rock collections were made. Notes and photos of the geology of the area were also made to provide information for map compilation on a scale of 1:250,000. On the evening of November 10 a blizzard blew up and confined us to our tent for the next 36 hours. A half-day of geology was carried out by Barrett on the morning of November 12 while Kohn started packing up camp. We were transported back to base after showing Brian Porter and the helicopter crew some of the local geology. In order to take off from West Beacon we had to relay our load (about 1,200 lbs) down to the Taylor Glacier in three shifts.

Division of Time

Spent on Geology	3½ days
Spent on air (helicopter) shifts	½ day
Days lost (bad weather)	1 day
	5 days

PART B

The party of eight with 9,000 lbs of equipment was put in to the Skelton Neve 4 miles north of Mt. Metschel (Lat. 78°13') (Long. 159°08') on November 17th. November 18th was spent organising equipment and supplies for the three week journey to Boomerang and Warren Ranges. Departure was delayed on the 19th by Barrett and McPherson being almost overcome by fumes from the primus. While McPherson had complained of a headache, Barrett experienced no warning symptoms apart from a stiffening and loss of control of muscles just before losing consciousness. Both victims recovered more or less completely in about 5 hours. The journey to Metschel took until 2300 hrs. on November 20th, because we took a circuitous route in an attempt to avoid the worst sastrugi. The sastrugi were hard and up to 3 ft. high, making travel slow and difficult. We suffered our first broken sled runner and had trouble starting No. 1 toboggan. Also the track came off No. 3.

We spent three days at Mt. Metschel, measuring and sampling the Devonian fishbeds and the Permian glacial beds. Good fish were obtained mainly from the south end of the nunatak. Grapes and Reid worked on the dolerite sill capping Mt. Metschel.

The journey to Allemand Peak was again unexpectedly long (11 hours) because of extremely hard large sastrugi for 2 miles and because toboggan No. 1 stopped and could not be started. The weather at Allemand Peak was either very windy (Young was blown off the outcrop but with no ill effects) or whiteout and snow. However we measured and sampled three stratigraphic sections and Ritchie and Young obtained excellent fish. On November 27th Grapes and Reid were taken to Mt. Warren for several days work and Ritchie recovered the fish jaw observed on the 1968/69 VUWAE trip. After Grapes and Reid were brought back from Mt. Warren on December 1st, the rest of the party moved down the Deception Glacier to work in a previously unexplored area north of Mt. Wise. The weather deteriorated shortly after our arrival and the 1,000 ft. section was measured as it was being covered by a heavy snow fall.

December 4th was very windy and we decided to carry out only reconnaissance geology. Kohn and Ritchie were investigating a slope about 2 miles north of Mt. Wise when Kohn lost his footing, presumably because of an unusually strong gust of wind that Ritchie noted at the time, and fell about 200 ft. receiving facial cuts, concussion and severe bruising. When Barrett and Young returned it was decided that Barrett and McPherson should sledge back to the big radio at Allemand Peak and call on the 1815 schedule. Kohn had fallen about 0930 hrs. and it was now about 1300 hrs. The victim's condition and location were successfully passed to Scott Base and helicopter evacuation was achieved at 2115 hrs. December 5th was windy and we spent the day recovering from the two previous 24 hour "days". Ritchie and Barrett returned to the scene of the accident to collect Kohn's equipment and to photograph the face. The others continued collecting fish and plants.

We left on the journey to Base camp at 0300 on December 7th under whiteout conditions following our three-day-old tracks. After 3 miles toboggan No. 5 stripped the rear bearing so Barrett, Askin and McPherson continued on No. 2 to Allemand Peak. Grapes and Reid returned, and by tightening the drive chain, got No. 5 mobile, arriving at Allemand Peak by 2300 on December 7th.

We left Allemand Peak after sleeping and repacking the load and attempting repairs to a broken skid rail on No. 3. Within the hour at 1400, December 8th, the main track on No. 3 had come off and jammed solid and the drive sprockets on No. 5 had sheared off due to the bearing failure. Barrett, McPherson and Askin continued on No. 2 to No. 1 seven miles on, which had been abandoned two weeks previously. It started first time. A report on the two immobile toboggans was passed to Scott Base and a decision was made to ferry them by helicopter to Base camp. After reaching Base camp Ritchie and Grapes returned with one toboggan and sleds (No. 2 had developed an electrical fault the previous day). Eventually we got both machines running and arrived at Base camp on December 10th between 1715 and 2000, about the same time as the helicopter. The following day was mostly whiteout and snow, which cleared just in time for the scheduled resupply at 1000, December 12th.

Division of time

Spent on Geology	11 days
Spent on ground (toboggan) shifts	6 days
Spent on air (Hercules) shifts	2 days
Days lost (bad weather, toboggan repairs)	6 days
	26 days

PART C

On December 13th Barrett discussed with Professor Clark, who had just arrived at Scott Base, modifications to the programme required by Kohn's return to New Z ealand. At the 1215 schedule it was agreed that the three men at Scott Base, with Shamus Curreen as party leader, would work in the Allan Hills until January 10th, when Grapes and Reid would go to Taylor Valley for two weeks, and McPherson and Kohn, if the latter returned, would carry out Kohn's programme in Victoria Valley. The remainder of the day was spent completing repairs to the toboggans, mainly adding extra bolts to the skid rails of No. 3.

On December 14th Ritchie and Young collected more fish from Mt. Metschel, and Barrett and Askin set out to do geological reconnaissance at the head of the neve. Six miles from camp the bolts on the skid rail tore out, and it was only with some patience that the machine was brought back to camp. At the same time the engine which had just been brought in from Scott Base began running erratically. It had no sediment bowl and the carburettor was fouled. Attempts at camp to fit a filter bowl were unsuccessful as the three spares had no connectors for the fuel line. The situation was reported to Scott Base at the next sched (1215). A ground blizzard confined the party to tents from December 15th to 17th. During this time we learned that much work was being expended in an attempt to make the "Super-Voyager" field-worthy, but it proved to be unsatisfactory and was not sent.

On the 18th the blizzard subsided and the party made a day trip to Portal Mountain 8 miles north to begin geological work there. Next day the blizzard picked up again, but as time was running short we spent six hours digging out our supplies, packed camp and moved to Portal on the one good toboggan. Because of weather, load and sastrugi, wetook $4\frac{1}{2}$ hours to cover the eight miles. Next day the winds increased to a peak of about 70 knots. We learned on the 1815 sched that a replacement track unit for the toboggan would be flown in on the 21st, and that the flight might include an NZBC camera-man. December 21st was clear with little wind, and the helicopter arrived on time, though without the cameraman, who had disembarked with Jim Rankin to help assemble the toboggan at base camp. When Ritchie and Young later told him that we had arranged a guided tour of the outcrop where they had just found the first nearly complete fish from Devonian of Antarctica he was some-what distressed. While Ritchie and Young brought back the "new" toboggan Barrett and Askin began work on the upper part of the Portal section but the wind became too strong to stand up on the outcrop and they gave up. The weather on December 22nd and 24th-26th was good and both fish and plant collecting and section measuring to the top of the mountain were completed. The last day, spent on the upper part of the mountain required 19 hours on the outcrop and was the most strenuous, though not the longest, day of their season.

We prepared to move camp late on the 27th, but in taking the first sled up the steep slope at the beginning of the journey to the Lashly Mountains Barrett noticed that the seat and fuel tank section of the cab had cracked on three sides and was in danger of becoming detached from the cab front. The situation was described to Scott Base at the next emergency sched (0815, December 28th). Permission was requested and granted for us to proceed to Lashly Mountains 20 miles north, and we enquired into the possibility of being airlifted to the Horseshoe Mountain area 60 miles north of base camp. The remainder of the day was spent in repacking and lightening the sleds, and in making the best of two toboggans. We left for Lashly Mountains at 1830. A separate journey was required to take each sled up the slope by Portal Mountain, and the rest of the journey was slow because of soft snow and the heavy load. We eventually reached Mt. Crean, Lashly Mountains on the 29th at 0730. From then until January 3rd the weather held and the geological work was as productive as at Portal Mountain.

On December 4th after radioing Scott Base that our work had been completed, the party packed camp and left at noon for the 30 mile journey to base camp, arriving 12 hours later. However the steep slope by Portal had hardened and the runner of a man-hauling sled collapsed after turning over. It was temporarily abandoned. We could not raise Scott Base until the 1215 sched (January 5th) when we said that we would not be ready for pickup until at least 1700 when we expected Ritchie and Young to return with the broken sled and its load. Scott Base asked us to call back at 1730 when we learned of a flight delay due to plane trouble. At the 1215 sched next day (January 6 th) we were told to expect a plane at 1530, and it was there almost on the minute. After loading we flew 60 miles north to Horseshoe Mountain where we were offloaded, along with two new toboggans from Scott Base, in an ideal position only a few hundred yards from the outcrop. After take-off we noticed that the right main ski of the plane was drooping and as it was just before 1815 and the Scott Base radio watch, we notified Scott Base to pass the information on to VXE-6.

Next day after a brief reconnaissance we sledged 12 miles to the east end of Mt. Fleming where Ritchie and Young were to camp near the fish beds, and spend the next seven days. A whiteout set in as we approached the site, but Barrett and Askin were able to return to base by following their tracks. Next day the whiteout lifted for about eight hours and Barrett and Askin began work on the nearby Horseshoe Mountain section which is about 500 m thick. However, in the afternoon it began to snow heavily and in only an hour the outcrop was largely covered by an inch of snow. It was apparent that it would soon be hazardous and they returned to camp. The snowing and whiteout continued for three days, and on the last day Barrett and Askin attempted to measure a section near camp, but it was impossible to see enough rock to describe. On the following day (January 11th) the weather improved and they travelled over excellent surfaces 30 miles north to Mt. Dearborn in only $2\frac{1}{2}$ hours. The rest of the day was spent mapping, and the following day, which was fine - and if anything too hot - was spent measuring a 400-m-thick

section. In the evening a whiteout developed. After waiting until midday for it to clear it was decidedto try and navigate back to camp. This was considered safe because of the simple topography and the lack of observed crevasses on the outward journey. As we travelled the horizon definition improved and after 3 hours we saw Horseshoe Mountain 3 miles ahead. Ritchie and Young had returned from their camp the previous day without discovering anything as the platforms there were still covered with snow. We radioed on the 1815 sched (January 13th) that we were ready for pickup as scheduled, that is, soon after 1600, January 14th. We were asked to call up at 1815 next day if the plane did not arrive. Askin and Barrett still had six hours work to complete on the excellent section on Horseshoe Mountain, so despite the 20-30 kt winds that came up overnight they set off early next morning, and returned cold but satisfied at 1430. Camp was packed up but no plane had appeared by 1815, when we learnt of the first delay (due to plane trouble). From then until 0845, January 17th, delays due to plane trouble and/or bad weather allowed Barrett and Askin a brief visit to Mistake Peak 10 miles northeast (part of the programme cut by the weather), and an examination of a nearby outcrop that yielded the best Triassic plants of the season.

Division of Time

Spent on Geology	15½ days
Spent on ground (toboggan) shifts	5 days
Spent on air (Hercules) shifts	2 days
Days lost (bad weather, toboggan repairs waiting for planes)	12½ days
	37 days

PART D

On December 17th a four-man party consisting of Curreen, DSIR field leader and party leader, Grapes, scientific leader, McPherson and Reid were flown by helicopter to Allan Hills. A camp was established on the north-west arm and the following day was spent on local geology. For the next three days the party was tent-bound by high winds. From December 21st to 23rd the geology on the north-east arm and at the head of the bay of Allan Hills was examined. Next day a welcome Hercules dropped Christmas mail for the party. Christmas day was celebrated in a tent specially enlarged to allow standing room by digging a pit in the floor.

On December 27th the party man-hauled to Battlements Nunatak, a distance of approximately 14 miles from the base camp. The weather was clear and calm, and surface conditions were remarkably smooth and hard, enabling a speed of approximately $2\frac{1}{2}$ miles an hour to be maintained. To reduce weight on the sledge the party had decided to take only the Mead tents as an emergency precaution and to build ice caves in which to live whilst at Battlements Nunatak. Unfortunately the snow at Battlement was very hard and the digging of ice caves was a long and arduous process taking about 10 hours. Despite the dripping walls and confined space they were nevertheless quite livable for the two night period. One full day completed the geology of Battlements Nunatak, and on the 29th December the party man-hauled back to the Allan Hills camp.

Whiteout conditions delayed the party until the 1st January 1971, when they man-hauled approximately 22 miles to Coombs Hills. Extensive wind scouring of the ice and snow around the north-east limb of Allan Hills forced the party to make a detour of approximately 12 miles, much of this through a heavily crevassed area. The last 4 miles of the journey was up a gentle slope, and this coupled with a 5 inch fresh snow cover on the surface made going very difficult. The total time for the haul was 10 hours. Camp was set up in a bay in the north-west corner of Coombs Hills.

The following days were spent carrying out geological mapping and sampling of the northern, central and southern areas of Coombs Hills and it was found that sections measured in this area correlated well with those at Allan Hills.

On the morning of the 6th January the party returned to Scott Base in two U.S. Navy helicopters.

Division of Time

Spent on Geology	6 days
Spent on ground (man-hauling) shifts	4 days
Spent on air (helicopter) shifts	2 days
Days lost (bad weather)	8 days
	20 days

PART E

The Darwin Mountains party which comprised Barrett (leader), Askin and Young of VUWAE 15, and Curreen, field guide and assistant, from DSIR, was put in at Island Arena by C-130 at 1000 on January 20th. The hour's reconnaissance flight before landing showed that there were larger areas of blue ice than expected between Island Arena and Westhaven Nunatak, 50 miles south and one of the major goals of the party. Because we had only one Polaris toboggan and had found previously that Sno-trics did not perform well on blue ice, it was decided that our efforts should be concentrated around Island Arena and the north-east side of the Hatherton Glacier.

The first three days were spent on geology around Island Arena. On one of these Barrett and Curreen brcke new ground by tobogganing down glacier towards Junction Spur. They were stopped by a crevasse field almost hidden by vast areas of rotten ice. However they found rocks in the easternmost Darwin Mountains that are different from and probably older than any other Beacon strata previously known in the area. They also investigated a possible passage through to the lower Hatherton Glacier but turned back in the face of deteriorating weather. Askin and Young were late returning to camp after measuring sections around Mount Ellis because a track slipped off their Sno-tric toboggan and the clutch was slipping badly. We decided to leave that machine at the put-in point as it had already burnt out a clutch in 30 miles travelling previously and we had only one spare.

On January 24th we left for the Hatherton Glacier camp with the Polaris and the Sachs Sno-tric toboggans. The 30 miles took 12 hours to cover for we had to negotiate two crevassed areas and a long steep slope on the west side of Haskell Ridge. Though the Polaris was slower we spent more time waiting on the Sno-tric. The carburettor iced up in the drifting snow, and on some surfaces it was difficult to get the Sno-tric and sled started.

The following day we found a route - the only one in this area - down on to the unexplored Hatherton Glacier, and spent a further two days working on the geology. On January 28th Curreen and Young were taking the first load up the slope on the way to our next camp when the rear axle of the Polaris toboggan sheared. Next day the entire camp was moved with the Sno-tric to the south end of Haskell Ridge from where a good part of the local geology could be worked. The immobilised Polaris was pulled apart and towed about 2 miles on a sled to the nearest possible Hercules landing site.

On January 30th the Sno-tric was checked and the tracks found to be loose. The bolts for tightening the inside of each track required a socket or box spanner and none of the right size could be found in the tool kit. The track had already slipped off once and the rubber was cracked slightly in a couple of places. We did not feel inclined to risk our only means of reaching a pick-up point by doing geology and decided to abandon the rest of the geology programme. The situation was outlined to Scott Base next day and a request was made for

our pick-up from the site of the immobile Polaris to be followed by a touch-down at Island Arena to recover the other Sno-tric and the rock samples collected in the first three days. We returned to the proposed pick-up area on February 1st, and were taken from the field about 2200, February 2nd. According to our information from Scott Base, VXE-6 had agreed to make the two field landings requested, but the pilot had instructions to land only once and we were taken straight back to Williams Field.

Division of Time

Spent on Geology	6½ days
Spent on ground (toboggan) shifts	3 days
Spent on air (Hercules) shifts	2 days
Days lost (bad weather, toboggan repairs)	2½ days
	14 days

PART F

On the morning of January 17th Kohn and McPherson were flown to Mt. Suess in the MacKay Glacier area. Originally Kohn and McPherson had planned to manhaul some 8 miles from near the mouth of the Frazier Glacier to Mt. Suess. Because of Kohn's accident earlier on in the season not as much time was available for Part F of VUWAE 15 and it was decided to study the Beacon-Basement contacts in this area using helicopter support on the put-in flight to Mt. Suess. After studying outcrops at Sperm Bluff and outcrops south of Pegtop Mountain in the Clare Range it was decided to land at Pegtop Mountain for about an hour to examine Beacon Supergroup sediments; the helicopter not being able to land very near the Sperm Bluff outcrop due to much surface snow and crevassing while the outcrops to the south of Pegtop Mountain were quite steep and largely covered with snow, we camped on the edge of a little lake at Mt. Suess and measured a section there the next day in calm but cloudy conditions. There was much water at Mt. Suess in the form of small lakes and swiftly flowing streams.

On the morning of January 19th we were shifted to Wheeler Valley. From our camp there we covered all the lower Beacon rocks in this area. We collected algae and salt samples from this area, as we did from all localities we visited during this phase of the expedition. On the morning of January 23rd we were transferred by helicopter to Vashka Crag flying via McKelvey valley in order to carry out a reconnaissance of the Olympus Range and Balham Valley. Four sections were measured in the Vashka Crag area. We were unable to reach a section 3 miles north-west of the snout of the Upper Victoria Glacier because of large patches of ice with smooth, sloping surfaces which we considered dangerous to cross. However a section was measured about $1\frac{1}{2}$ miles west of Sponsors Peak. Our camp had to be shifted once at this locality because unusually warm weather caused our camp-site to be flooded. On the morning of January 30th, after two days waiting (due to a radio blackout) for our next helicopter shift, we were transferred to the Olympus Range setting up camp between Mts. Aeolus and Boreas. On the way to this site we stopped for two hours at Mt. Jason in the eastern part of the Olympus Range and measured the most complete section in this area. The next day we went over to Balham Valley and measured a good basal Beacon section. We arrived back at our camp after being out for 14 hours, having climbed 800 m from McKelvey Valley and having experienced quite high winds in Balham Valley. The next day we were pleased to have a mail delivery from Scott Base. Two West German TV cameramen photographed us running out to greet the helicopter in our long-johns to receive the mail-bag and rockboxes on board. The rest of our time in the Olympus Range was spent measuring sections at Mts. Boreas and Aeolus. During the last two days at this site our work was hampered by whiteout and falling snow and on February 2nd we had our first tent day due to bad weather since coming into the field. It was still snowing and 8/8 cloud on February 4th when we were amazed to see our pick-up helicopter piloted by Jim Brandau appear through

the mist. We returned to Scott Base after picking up another passenger at Vanda Station.

It is interesting to note that during our time in the field weather conditions were generally cloudy (between 4/8 and 8/8) and that winds were generally calm. It was only in the last three days in the field that we experienced any heavy snowfalls.

Division of Time

Spent on Geology	13½ days
Spent on helicopter shifts	2½ days
Days lost (bad weather, delayed helicopters)	3 days
	19 days

SUMMARY OF TIME SPENT IN ANTARCTICA

The members of VUWAE 15 spent some 603 man-days in Antarctica. The division of time on a percent basis is as follows:-

Transit to and from Antarctica	3
Spent at Scott Base	15
Spent on Geology	37
Spent on ground (toboggan and manhauling) shifts	16
Spent on air (Hercules and helicopter) shifts	6
Days lost (bad weather, toboggan repairs, delayed planes and helicopters)	23
	100

Of the 495 man-days spent in the field about 45 percent of our time was spent on geological work, 19 percent on ground shifts, 28 percent of time was days lost and 7 percent was spent on air shifts. Time spent on geology in dry valley areas amounted to 71 percent, compared with 43 percent on tobogganning trips and 30 percent on a manhauling trip.

SCIENTIFIC ACHIEVEMENTS

Detailed results and discussion of the scientific work carried out by the expedition will be published in scientific journals. A general summary of the expedition has appeared in the Victoria University of Wellington GAZETTE and a summary has also been submitted to ANTARCTIC (the journal of the N. Z. Antarctic Society).

The scientific work carried out by the expedition is outlined below:-

1, Detailed geological sections measured with jacob staff and abney level at

West Beacon
Mt. Metschel (2 sections)
NW Alligator Ridge (2 sections)
Allemand Peak
Southern Warren Range (3 sections)
Portal Mountain (3 sections)
Lashly Mountains (3 sections)
Tabular Mountain
Horseshoe Mountain
Mt. Dearborn
Mt. Suess
Wheeler Valley (3 sections)
Vashka Crag area (4 sections)
Mt. Jason
Mt. Boreas
SW end Balham Valley
Island Arena area (8 sections)
NE side Hatherton Glacier (4 sections)

Detailed collections of rock samples for petrographic and chemical analysis were made from all sections measured.

2. Discovery of the richest deposits of fish fossil remains ever found in Antarctica. The fish fossils, which are Devonian in age (approx. 350 million years old), consisted of complete specimens of ray-finned and spiny-finned fish, jaws, armour plates, skull plates, fin spines and teeth of armoured and lobe finned, air breathing fish. These remains occur in the red, green and grey Aztec Siltstone. Many new fish localities were found and the fish jaw observed by VUWAE 13 was recovered from northern Warren Range.

3. Discovery of primitive plants, roots and stems in the red, green and grey fish-bearing beds (Aztec Siltstone) and the recognition of associated soil horizons

4. Discovery of the first Permian glacial striations in Victoria Land. The discovery of an ancient glacial-filled valley with related thin basalts and similar lavas in adjacent Aztec Siltstone will hopefully allow us to date the Permian glaciation and the age of the fish-bearing beds by radioactive methods.

5. Plant collections which include the best preserved Glossopteris and Dicroidium leaves yet found in Victoria Land. The collection of an excellent suite of samples from carbonaceous beds for spore and pollen analysis was also made. Spores and pollens can give a far more precise age to the strata than can the leaves, despite their excellent preservation. Previous attempts to obtain pollens and spores have been largely frustrated because in most places dolerite sills have heated the rock to as much as 750° C and burnt the carbonaceous material. Although we cannot be certain as yet if the samples collected contain microfloras, the chances are good because there was so little dolerite at the localities sampled.

   Devonian lycopod stems were also collected from West Beacon.

6. Samples were collected from the rhythmic banded Mt. Warren dolerite sill, other dolerite sills and the volcaniclastic rocks of the Allan Hills area were also examined. Special attention was paid to the method of injection of all dolerites examined during the season.

7. Geological data over some 8,000 square miles of Victoria Land has been gathered and will be used for map compilation at a scale of 1:250,000 (and 1:50,000 in some areas). The sheet covering the Skelton Neve (Mt. Harmsworth) is now almost completely covered. Large parts of the Convoy Range and Taylor Glacier sheets have been completed, while the Carlyon Glacier-Turnstile Ridge sheets are only partially mapped, but it is hoped that coverage of these sheets will be completed in future seasons.

As a result of this summer's work much data has been added to our knowledge of Beacon Supergroup stratigraphy and the Ferrar Group in the Southern Victoria Land-Darwin Mountains area. Mapping started by earlier VUWAE expeditions has been extended, new data has been added, and a better understanding of the paleogeography of these areas is now emerging.

FIELD TRANSPORTATION

VUWAE 15 was supplied with four Polaris motor toboggans and six Nansen sleds from Scott Base. In the course of the season the party experienced six major toboggan breakdowns and a number of sled breakages resulting in considerable lost time in the field, and in extra helicopter and Hercules time. However, delays were minimised by the excellent cooperation and support from both VXE-6 and the Scott Base staff. A description and discussion of the damage is given in some detail in a report by Barrett to Antarctic Division (March 1, 1971), and a brief summary of the report is given below.

The toboggan breakdowns resulted from:-

a broken axle	(1)
a worn bearing and broken axle	(1)
a jammed clutch	(1)
failure of sheet metal in cab and track units	(3)

Other less serious faults were dirty spark plugs, loose drive chains, and worn throttle cables, all inherited from the previous season.

In the first week in the Skelton Neve two areas of rough hard sastrugi totalling five miles across were encountered near Mt. Metschel. Continual working of the throttle was necessary to maintain control of the sleds and before the areas had been crossed cables had broken several times on two toboggans, and eventually could not be repaired. A piece of rope was used instead, but it was difficult to steer, watch the sled, and control the throttle effectively in the difficult terrain. New cables were fitted by base mechanics, with the aid of a welding torch to change the fittings, during the resupply three weeks later.

The Metschel sastrugi may have contributed to the breakdowns but they were not a major cause. A replacement toboggan flown in from Scott Base on December 12th had by January 6th acquired many small fractures around the petrol tank and cab floor. It had travelled less than 100 miles over moderate to good surfaces, and had not experienced the rougher Metschel sastrugi.

A review of the available information suggests that the dominant factor in the toboggan breakdowns was age. The machines are all about six years old, and as long ago as the 1967-68 season a DSIR party suffered a sheared axle and failure of sheet metal in the track unit (Massam, R.D.R.D 439). The toboggan breakdowns experienced by VUWAE 15 were of precisely the same type but occurred with greater frequency. A field mechanic could not have helped the party with the spares and tools available.

The party also had a number of sled breakages. In six instances the runners broke cleanly, suggesting that the wood was brittle and dry. Also the runners were lashed to the longitudinals with string, which was varnished. This gave a rigid join, in contrast to the flexible join obtained with the usual rawhide lashing. The poor throttle control and bad sastrugi added to the difficulties. Three other fractures were splintery and may have been due to driver error.

Recommendation 1: Toboggans should be stripped after each field season, and all moving and structural parts checked for wear and flaws or cracks. Chains should be soaked in graphite, cables oiled, and spark plugs, points and condenser replaced.

Recommendation 2: Adequate spare parts must be provided. VUWAE 15 was given fewer spares for four toboggans than the DSIR manual specified for one. (For list see Barrett, Report to Antarctic Division, 1 March 1971). Spares of parts that experience great stress or wear such as axles or clutches must be new.

Recommendation 3: Each toboggan must have a complete tool kit as recommended by the manufacturer, or as indicated by field experience.

Recommendation 4: Toboggans used by remote field parties should have no more than three seasons' use.

Recommendation 5: A toboggan of each type should be either kept in New Zealand, or flown back at the end of the season to be used for training future mechanics and field personnel. Field personnel with toboggan experience should be used for instruction because only they know the strong and weak points of the machines.

ASSESSMENT OF SNO-TRIC MOTOR TOBOGGANS

Two near-new Snow-tric motor toboggans were provided by Antarctic Division to the VUWAE 15 party at Horseshoe Mountains as a substitute for the Polaris toboggans disabled in the Skelton Neve. The Sno-trics were used in the Darwin Mountains also, along with one Polaris toboggan. One Sno-tric was powered by the original Sachs 2-cycle 18 HP engine; the other had been modified for a Kohler 4-cycle 10 HP engine, which is standard on the Polaris toboggan. The Sachs Sno-tric received the most use, despite the inconvenience of petrol fuel. The Kohler Sno-tric felt underpowered for slopes and hauling heavy loads, and it had a marked propensity for burning out the clutch. However most of the comments that follow apply to the Kohler Sno-tric as well as the Sachs Sno-tric. A total of 340 miles was covered on the latter, 100 of them with a moderate to heavy load (500 to 1000 lbs) in tow. Because the Sno-tric was intended as a replacement for the Polaris the performances of the two machines were compared in a detailed report by Barrett to Antarctic Division (26 February 1971). The report's summary is given below:-

> The Sno-tric is not a suitable replacement for the Polaris. It is of much lighter construction, and cannot cope as well as the Polaris with the variety of snow and ice surfaces and slopes normally encountered in the Transantarctic Mountains. The hard steering, the less responsive motor and gear system, the poorer traction on hard surfaces, and the difficulty in getting a sled moving, make it unsuitable for towing heavy loads. The change to the Kohler engine improves the toboggan's starting capability slightly, but at the expense of the clutch. Even with modification the Sno-tric would be much less safe than a Polaris in a crevassed area.
>
> The Sno-tric seems best suited for day trips up to 15 miles from a base camp, and for towing a light sled (up to 600 lbs) on moderate to good surfaces. A toboggan with performance comparable with the Polaris must be found if the NZARP geological programme is not to be much more limited in scope in the future.

ACKNOWLEDGMENTS

The expedition is grateful for the financial assistance provided by the University Grants Committee for equipment and supplies, and to the University Council for grants to student geologists. We are indebted to Professor Clark, Department of Geology, for his continued assistance and interest.

We acknowledge with gratitude the generous air support provided by U.S. Navy VXE-6 Squadron, and would like to mention Lcdrs. Bruce Campbell and George Drag, and Cdr. John Dana, and their Hercules crews. The party is especially grateful to Lt. James Brandau and his helicopter crew who have become a legend in their own time.

We thank Brian Porter and his Scott Base staff for their cooperation and the extra effort willingly made to keep us mobile.

The assistance of Antarctic Division, DSIR, with logistic and clerical matters was much appreciated.

We are also grateful to Dennis Rainey for finding and providing air photos from the Lands and Survey collection.

Contributions from philatelists totalling $31 were gratefully received.

APPENDIX I

SUMMARY OF PROGRAMME

NOTE: The geological work of Barrett and Kohn will include at all localities bed by bed measurements, description and regular sampling of the Beacon formations. Paleocurrent measurements will be taken where possible. Ritchie will collect extensively in the Devonian Fish beds. Grapes will describe and collect from the basalts, dolerites and the adjacent metamorphosed sediments. Notes and sketches of local geology will be made for later use in map compilation. Each geologist will be accompanied by a field assistant.

	Nov. 1	Barrett and Kohn arrive at Scott Base.
PHASE I	Nov. 2-7	Preparation for field.
"	Nov. 8-15	Barrett and Kohn work in the Beacon Heights area.
"	Nov. 16	Ritchie and Grapes arrive at Scott Base.
PHASE IIa	Nov. 16-20	Final preparations and reconnaissance for Skelton Neve.
" a	Nov. 21	Barrett, Grapes, Kohn and Ritchie put in by C-130 on Skelton Neve.
" a	Nov. 21-Dec. 11	Entire party works in Skelton Neve.
" a	Dec. 11-Jan. 8	Barrett and Ritchie continue work by toboggan around the Skelton Neve and north to Mt. Bastion.
"	Dec. 12	C-130 transfers Grapes to Allan Hills, and Kohn to Scott Base.
" b	Dec. 12-Jan. 20	Grapes works in the Allan Hills area.
" c	Dec, 12-Jan. 8	Kohn works with helo support in Victoria Valley System mainly.
PHASE IIIa	Jan. 10	Barrett and Kohn put in to Darwin Mountains by C-130, Ritchie taken to Scott Base.
" a	Jan. 10-Feb. 6	Barrett and Kohn work with toboggan around Darwin Mountains.
"	Jan 12	Ritchie returns to Christchurch.
"	Jan. 22	Grapes returns to Christchurch.
"	Feb. 8	Barrett and Kohn return to Christchurch.

LOGISTIC SUPPORT

Hercules C-130	7 flights	16 hours
Note: Hours calculated assuming that all flights originate from and return to Williams Field.		
Helicopter	7 flights	19 hours
Toboggans, spares, tools	3 from Nov. 20 to Feb. 6	
	1 from Nov. 20 to Dec. 12	
Polar tents	4	
Petrol for toboggans	300 gallons	
Food (20 man/day boxes)	40	

Date	Itinerary			(Equipment)	(persons) 1 = 180 lbs	Weight	(equipment)	Aircraft
BEFORE								
Nov 1	AIR CARGO	Christchurch	McMurdo	800	-	800	40	
Nov 1	Transport 2 men to ice	Christchurch	McMurdo	300	360	660	15	
Nov 5	Put in 2 men	McMurdo	Beacon Heights	500	360	860	28	Helo
Nov 12	Pickup 2 men	Beacon Heights	McMurdo	540	360	900	28	Helo
Nov 13	Transport 4 men to ice	Christchurch	McMurdo	400	720	1120	20	
Nov 16	Transport 2 men to ice	Christchurch	McMurdo	200	260	560	10	
Nov 18	Recce to Skelton Neve	McMurdo	Skelton and return to McMurdo	-	720	720	-	C-130
Nov 20	Put in 8 men	McMurdo	Skelton	9640	1440	11,080	930	C-130
Dec 12	Pick up 4 men, put in 2 men at Allan Hills, 2 men to McMurdo	Skelton Neve	Allan Hills	3610	720	4,330	350	C-130
		Allan Hills	McMurdo	1440	360	1,800	150	
Dec 14	Put in 2 men: lay depot in Upper Victoria Valley	McMurdo	Mackay Glacier	620	360	980	40	Helo
Dec	Transfer 2 men	Mackay Gl	St. Johns Range	540	360	900	30	Helo
Dec	Transfer 2 men	St. Johns Range	Upper Victoria Valley	540	360	900	30	Helo
Jan	Transfer 2 men	Upper Victoria Vy	Ferrar Glacier	540	360	900	30	Helo
Jan 8	Pick up 2 men	Ferrar Glacier	McMurdo	540	360	900	30	Helo
Jan 10	Take 2 men from McMurdo:	McMurdo	Skelton Glacier	1420	360	1780	60	C-130
	pick up 4 men from Skelton Gl:	Skelton Gl	Darwin Mountains	5940	1080	7020	520	
About	put in 4 men to Darwin Mts.	Darwin Mts.	McMurdo	1140	360	1500	40	
Jan 16	Transport Ritchie, Young	McMurdo	Christchurch	1000	360	1360	30	
Jan 20	Pick up 2 men	Allan Hills	McMurdo	1800	360	2160	190	C-130
About Jan 25	Transport Grapes, Reid	McMurdo	Christchurch	200	360	560	10	
Feb 6	Pick up 4 men	Darwin Mts.	McMurdo	3200	720	3920	430	C-130
About Feb 8	Transport Askin, Barrett, Kohn, McPherson.	McMurdo	Christchurch	400	720	1120	20	

APPENDIX III

ITINERARY - PARTS A, B, C and E

		Weather	
		Cloud cover	Wind (kts
Nov 2	Barrett, Kohn fly to McMurdo Sd.		
Nov 3	Field preparations		
Nov 4	Examination of important Beacon localities in Dry Valleys with Ohio State University geologists and turbine helicopter support.		
Nov 5, Nov 6	Field preparations		
Nov 7	Barrett and Kohn put in at West Beacon by helo.	Clear	Calm
Nov 8	Geological work	Clear	Calm
Nov 9		Clear	Calm
Nov 10		Clear	Calm
Nov 11	Tent day due to blizzard. Askin, Grapes McPherson, Reid, Ritchie and Young arrive at Scott Base.	8/8 some snow	10-60
Nov 12	Barrett and Kohn return to Scott Base by helo.	Clear	Calm
Nov 13, Nov 14, Nov 15, Nov 16	Field preparations.		
Nov 17	Scott Base to Skelton Glacier by C-130	Clear	0-10
Nov 18	Organised base camp	Clear	10-20
Nov 19	Moved camp 5 miles to Mt. Metschel	Clear	10-20
Nov 20	Geological work at Mt. Metschel	Clear	10-80
Nov 21		Clear	10-50
Nov 22		Clear	10-50
Nov 23		Clear	10-50
Nov 24	Moved camp 12 miles to Allemand Peak	Clear	0-10
Nov 25	Tent day	7/8	Calm
Nov 26	Geological work	8/8 some snow	Calm
Nov 27	Grapes, Reid moved camp 6 miles to Mt. Warren, and Askin, Kohn, Ritchie and Young recovered the fish jaw discovered by VUWAE 13.	Clear	0-20
Nov 28	Geological work half the day	Clear	10-60
Nov 29	Geological work	7/8	10-20
Nov 30	Geological work half the day	8/8 some snow	Calm
Dec 1	Toboggan and sled repairs. Grapes and Reid return from Mt. Warren	8/8	Calm
Dec 2	Grapes, Reid work on dolerites around Allemand Peak. Rest move 10 miles to near Wise Peak	2/8	0-20

Dec 3	Geological work	8/8 snowing	Calm
Dec 4	Geological work. Kohn injured in fall and evacuated	Clear	20-60
Dec 5	Tent day	2/8	15-40
Dec 6	Geological work	8/8 some snow	Calm
Dec 7	Moved back to Allemand Peak. Repaired toboggans	8/8 some snow	Calm
Dec 8	Moved 4 miles towards base camp. Two major breakdowns. Toboggans abandoned	2/8	Calm
Dec 9	Grapes, Reid, Ritchie and Young reached base camp with first load. Repaired toboggans	2/8	0-10
Dec 10	All of party and equipment except for one sled load brought to base camp	Clear	Calm
Dec 11	Packing and working on toboggans for resupply flight, when not tent-bound by heavy snow	8/8 snowing	Calm
Dec 12	Resupply and evacuation of Grapes, McPherson and Reid to Scott Base. For their subsequent itinerary see p. 4,	2/8	10
Dec 13	Toboggan repairs completed. Camp put in order	2/8	Calm
Dec 14	Geological work. Major breakdown. Another machine requested	6/8	5-10
Dec 15	Tent day	4/8 heavy drift	20-30
Dec 16	Tent day	2/8 heavy drift	20-40
Dec 17	Dug out equipment	2/8 heavy drift	10-30
Dec 18	Geological work on Portal Mt. Laid fuel dump	Clear	Calm
Dec 19	Moved camp 10 miles to Portal Mt.	2/8 heavy drift	10-30
Dec 20	Tent day	2/8 heavy drift	10-40
Dec 21	Geological work. Helo brought new track unit	Clear	10-15
Dec 22	Geological work	2/8	5-10
Dec 23	Tent day	8/8 snowing	Calm
Dec 24	Geological work	4/8	5-10
Dec 25	Tent day	Clear	Calm
Dec 26	Geological work	1/8	Calm
Dec 27		Clear	Calm
Dec 28	Major breakdown. Moved camp 20 miles to Mt. Crean with one toboggan	Clear	Calm
Dec 29			
Dec 30	Geological work around Mt. Crean with one day at Tabular Mt.	4/8	10
Dec 31		8/8	10
Jan 1		4/8	5-10
Jan 2		4/8	20
Jan 3		Clear	0
Jan 4	Sledged 30 miles to base camp	Clear	0

Jan 5	Packing camp and awaiting pick-up	5/8		5-10
Jan 6	Party transferred to Horseshoe Mt. by C-130	6/8		10
Jan 7	Geological work. Ritchie, Young moved camp to southeast ridge of Mt. Fleming	4/8		Calm
Jan 8	Geological work by Askin, Barrett	8/8	some snow	Calm
Jan 9	Geological work half the day	8/8	snowing	Calm
Jan 10	Tent day	8/8	snowing	Calm
Jan 11	Askin, Barrett sledged 30 miles to Mt. Dearborn. Geological work half the day	3/8		5-10
Jan 12	Askin, Barrett do geological work. Ritchie Young return to Horseshoe camp because rocks completely snow-covered	Clear		Calm
Jan 13	Askin, Barrett return to Horseshoe camp	8/8		Calm
Jan 14	Awaiting pick-up by C-130. Geological work continued between radio schedules	2/8		20
Jan 15		Clear		5-10
Jan 16		8/8		5
Jan 17	Return to Scott Base by C-130	2/8		5-10
Jan 18	Repairs and field preparations as Scott Base			
Jan 19				
Jan 20	Askin, Barrett, Curreen (DSIR) and Young put in at Island Arena, Darwin Mts.	3/8		Calm
Jan 21	Geological work in Island Arena area	1/8		Calm
Jan 22		1/8		Calm
Jan 23		8/8	some snow	Calm
Jan 24	Moved camp 30 miles to Hatherton Gl.	4/8		0-20
Jan 25	Geological work	Clear - 8/8		Calm
Jan 26	Tent day	8/8		0-10
Jan 27	Geological work	6/8		Calm
Jan 28	Began moving camp. Broken axle	2/8		Calm
Jan 29	Moved camp with one toboggan to Misthound Cirque 10 miles north	2/8		Calm
Jan 30	Geological work	Clear		Calm
Jan 31	Tent day	Clear		Calm
Feb 1	Geological work. Moved camp to nearby Hatherton Glacier pick-up point, because remaining toboggan considered unreliable	Clear		Calm
Feb 2	Returned to Scott Base by C-130. Pilot not permitted to pick up equipment and supplies from Island Arena	3/8		Calm

ITINERARY - PART D

		Weather	
		Cloud cover	Wind (kts)
Dec 17	Grapes, Curreen, Reid, McPherson fly to Allan Nunatak by helo	1/8	0-5
Dec 18	Party did geology of N.W. arm of Allan Nunatak	1/8	5-10
Dec 19	Tent day	2/8	30-40
Dec 20	Tent day	1/8 snow	50
Dec 21	N.E. arm and head of bay at Allan Nunatak examined	Clear	20-30
Dec 22	Tent day	8/8 whiteout	Calm
Dec 23	Further geology of the N.W. arm of Allan Nunatak	Clear	8
Dec 24	Tested man-hauling sledge and pulling load	1/8	5-10
Dec 25	Christmas celebrations	2/8	0-10
Dec 26	Attempt to manhaul to Battlements Nunatak. Whiteout conditions forced party to return to Allan Nunatak	8/8 whiteout	0-5
Dec 27	Party manhauled 14 miles to Battlements Nunatak	Clear	Calm
Dec 28	Party did geology of Battlements Nunatak	Clear	5
Dec 29	Party manhauled back to Allan Nunatak	1/8	0-5
Dec 30	Tent day	8/8 whiteout	Calm
Dec 31	Tent day	4/8	Calm
Jan 1) Jan 2)	Party manhauled 22 miles to Coombs Hills	8/8	Calm
Jan 3	Tent day	8/8	20-30
Jan 4	Geology of north sector of Coombs Hills	3/8	0-5
Jan 5	Geology of central and southern part of Coombs Hills	3/8-8/8 snow	0-5
Jan 6	Party returned to Scott Base by helo	7/8	5-8

ITINERARY - PART F

		Weather		
		Cloud cover		Wind (kts
Jan 17	Kohn and McPherson fly by heb to Mt. Suess and carry out morning's geology at Pegtop Nunatak and Sperm Bluff using helo support. Reconnaissance geology Mt. Suess in afternoon	3/8		0-5
Jan 18	Party do geology Mt. Suess	8/8		0-2
Jan 19	Party fly by helo from Mt. Suess to Wheeler Valley. Geology Nth. Wheeler Valley	2/8		0-2
Jan 20	Geology of E. Wheeler Valley	8/8		3-8
Jan 21	Geology of W. Wheeler Valley	4/8		3-8
Jan 22	Geology of S. Wheeler Valley	8/8	snowing	3-8
Jan 23	Party fly by helo to Vashka Crag. Local geology	8/8		4-8
Jan 24	Geology between Vashka Crag and Sponsor's Peak	8/8		15-25
Jan 25	Geology Barwick Valley	3/8		3-6
Jan 26	Geology Sponsor's Peak area	6/8		6-15
Jan 27	Geology Vashka Crag	7/8		5-10
Jan 28	Tent day, waiting for helo. (Radio blackout)	6/8		3-5
Jan 29	Same as 28	8/8		0-4
Jan 30	Party fly to Olympus Range and carry out geology of Mt. Jason using helo support on the way	1/8		0-2
Jan 31	Geology of Balham Valley	Clear		5-15
Feb 1	Geology of Mt. Boreas	8/8		0-3
Feb 2	Tent day	8/8	snowing	Calm
Feb 3	Geology of S.W. side Mt. Aeolus	8/8	snowing	Calm
Feb 4	Party return to Scott Base by helo	8/8 (whiteout)	snowing	Calm

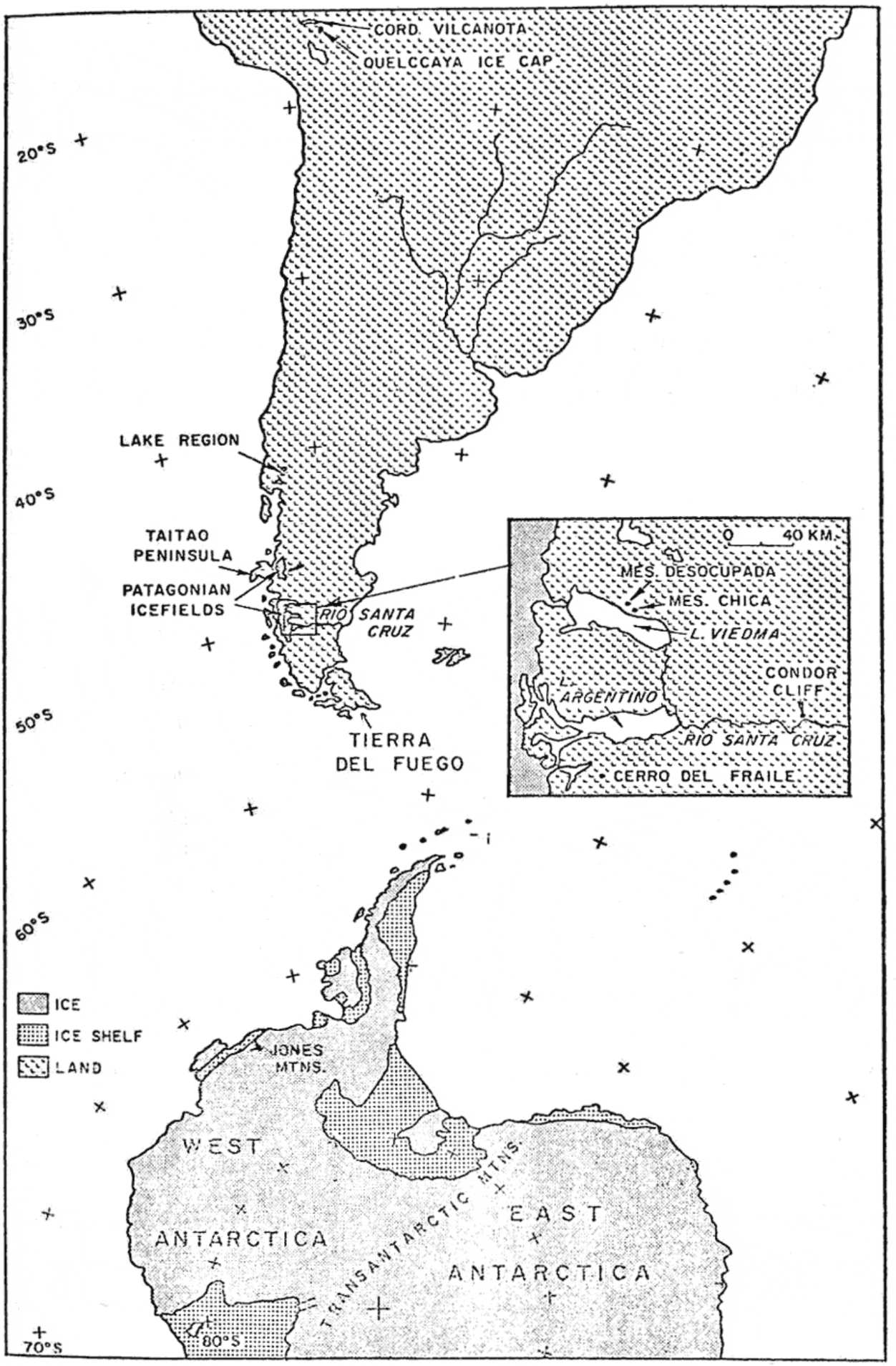

CORD. VILCANOTA
QUELCCAYA ICE CAP
20°S
30°S
LAKE REGION
40°S
TAITAO PENINSULA
PATAGONIAN ICEFIELDS
RIO SANTA CRUZ
50°S
TIERRA DEL FUEGO
0 40 KM.
MES. DESOCUPADA
MES. CHICA
L. VIEDMA
CONDOR CLIFF
L. ARGENTINO
RIO SANTA CRUZ
CERRO DEL FRAILE
60°S
ICE
ICE SHELF
LAND
JONES MTNS.
WEST ANTARCTICA
TRANSANTARCTIC MTNS.
EAST ANTARCTICA
80°S
70°S

Figure 3