81/43
φ3

BMR PUBLICATIONS COMPACTUS
(LENDING SECTION)

091770

BUREAU OF MINERAL RESOURCES
LIBRARY
12 FEB 1982
φ3
CANBERRA, A.C.T.

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD

1981/43

GEOLOGICAL INVESTIGATIONS IN ANTARCTICA 1973
- THE SOUTHERN PRINCE CHARLES MOUNTAINS

by

R.J. Tingey
R.N. England
J.W. Sheraton

The information contained in this report has been obtained by the Bureau of Mineral Resources, Geology and Geophysics as part of the policy of the Australian Government to assist in the exploration and development of mineral resources. It may not be published in any form or used in a company prospectus or statement without the permission in writing of the Director.

1981/43

GEOLOGICAL INVESTIGATIONS IN ANTARCTICA 1973 - THE SOUTHERN PRINCE CHARLES MOUNTAINS

by

R.J. Tingey
R.N. England
J.W. Sheraton

FOREWORD

This Record is assembled on a locality by locality basis and is designed more as a record of geological data from these localities than as a geological interpretation either of the localities or of the region as a whole. The Record is intended (with companion Records) to serve as a data base for interpretation of the geology of the area investigated and as a guide to future investigations. An interpretation of the geology of the Prince Charles Mountains as a whole is in press (Tingey, in press), as is a special 1:500 000 scale geological map of the southern Prince Charles Mountains. It is hoped that it will be possible to prepare accounts of the metamorphic geology and regional geology of the southern Prince Charles Mountains based upon data contained in this Record.

CONTENTS

FIGURES

SUMMARY

This Record describes the geological fieldwork and subsequent office and laboratory investigations of the Bureau of Mineral Resources (BMR) and Australian National University (ANU) geologists who joined the Australian National Antarctic Research Expedition (ANARE) field party in the southern Prince Charles Mountains during the 1972-73 austral summer field season. 1:250 000 scale geological maps of the southern Prince Charles Mountains have been compiled, largely as a result of the work described here and of interpretation of the vertical aerial photographs obtained during the season. The 1972-73 season was much the most productive of the six devoted to field surveys in the Prince Charles Mountains and in addition to the geological mapping, was notable for successful programs in gravity, geochronology, geochemistry, barometric height estimations, aerial photography, and airborne ice-thickness sounding.

The stratigraphy of the area is set out in Table 1, an interpretation necessarily reliant upon the rather unreliable bases of lithological similarity, degrees of deformation and metamorphism, radiometric ages, geochemical characteristics, and stratigraphic order; it is subject to revision. The southern Prince Charles Mountains consist of a wide range of basement metamorphic rocks ranging in age from late Archaean (2800 m.y.) to late Proterozoic (800 m.y.) and in metamorphic grade from lower greenschist facies to granulite facies. They are intruded by Proterozoic basic dykes and Cambrian granitic rocks, and a few scattered Phanerozoic basic dykes. Permian sediments have only been found as glacial erratics.

INTRODUCTION

Geological fieldwork was given high priority in the 1973 ANARE Prince Charles Mountains survey and was carried out by three BMR geologists - R.N. England, J.W. Sheraton, and R.J. Tingey - and P. Arriens, then Senior Research Fellow in the Research School of Earth Sciences, ANU. L.E. Macey, formerly Officer-in-Charge of Mawson ANARE station, was Officer-in-Charge of the field operations which were based at Mount Cresswell in the southern Prince Charles Mountains. Logistic support was provided by the Antarctic Division, Department of Science; transport in the field was by Hughes 500 helicopters chartered from Jayrow Helicopters, Melbourne, and flown by company pilots.

In the Prince Charles Mountains, the weather gradually deteriorates through Janary and particularly deteriorates when the sun begins to set. It is thus important to start fieldwork as early as possible: in 1973 fieldwork started on 2 January and finished on 6 February. The expedition ship Nella Dan sailed from Melbourne on 7 December 1972 and moored at the edge of the fast ice off Mawson on 25 December. Equipment and personnel were then flown into Mawson Station and on to the Prince Charles Mountains, where the Mount Cresswell base was operated by men left behind by the spring tractor train. Two tractor trains from Mawson, one in Autumn and one in Spring, had resupplied the base camp after the 1972 field season when supplies of aircraft fuel had been exhausted.

The geological fieldwork was mainly concerned with 1:250 000 scale regional geological mapping of the southern Prince Charles Mountains and every significant exposure in the area was visited. Arriens collected a large suite of samples for isotopic age determination and Sheraton collected samples for geochemical study. The geologists also made gravity meter readings and assisted topographic survey work by reading aneroid barometers at most landing sites. In addition, a large collection of lichens was obtained for the ANARE biologists.

Late in the field season, traverses were made to the northern Prince Charles Mountains to resolve problems encountered during compilation of geological maps of that area, and to obtain additional gravity data.

In this Record, results of the 1973 fieldwork in the Prince Charles Mountains are presented in order of 1:250 000 Sheet areas; preliminary edition geological maps of these areas were issued by 1976. During the 1973 season, ANARE surveyors flew systematic aerial photography missions over the southern Prince Charles Mountains area; photogeological data from the excellent photographs obtained have been used in the compilation of the preliminary geological maps. Plate 1 (at the end of this Record) shows the outcrops visited and samples collected during the field season and Plate 2 depicts the geology of the southern Prince Charles Mountains.

AERIAL PHOTOGRAPHS AND BASE MAPS

During the 1950s, ANARE aircraft based at Mawson flew reconnaissance aerial photography missions in the southern Prince Charles Mountains. In December 1960 the ANARE DC-3 based at Binders Nunatak (Plate 1) flew a few more such missions. This reconnaissance photography was taken with trimetrogon cameras and systematic block photography was not attempted. The earlier photography had a high contrast between rock features and the ice and snow and was of little use for photogeological interpretation; photographs taken from the DC-3 were better. The photographic coverage of the southern Prince Charles Mountains available in 1972 was inadequate for systematic geological mapping.

The need for systematic vertical photography of the Prince Charles Mountains was recognised as regional topographic and geological mapping of the Prince Charles Mountains progressed. In 1973, the southern Prince Charles Mountains were systematically photographed with an RC-9 camera installed in the ANARE Pilatus Porter aircraft. Most missions were flown at 6,100 m and both colour and black and white films were used. Despite some equipment malfunctions, severe cabin conditions (temperatures were about -40^{o}C), and the limited performance of the aircraft at high altitude, excellent vertical photographs of all rock features in the southern Prince Charles Mountains are now available. In future seasons, ANARE geologists hope to go into the field equipped with modern aerial photographs and photogeological maps; mapping will therefore be carried out in much the same way as in Australia.

LANDSAT (then known as ERTS)* imagery of the Prince Charles Mountains became available early in 1973 and provides a convenient synoptic overview of large areas at 1:1,000,000 scale. Large-scale features and lineaments can be detected on enlargements. Topographic detail is enhanced by low sun angles at the time of image acquisition (see Tingey, 1974).

Base maps used during field seasons in the Prince Charles Mountains up to 1973 were compiled from the reconnaissance photographs with minimal ground control. The available maps of the northern Prince Charles Mountains contained considerable errors in the contour information but are planimetrically quite accurate. Existing maps of the southern Prince Charles Mountains contained considerable planimetric errors and contours that have been shown to be figurative only. Because of these inadequacies in existing topographic maps the preliminary geological maps were compiled on planimetrically more accurate compilations derived from LANDSAT imagery.

METHODS OF WORK

ANARE regional studies in the Prince Charles Mountains-Lambert Glacier area were multidisciplinary. Each season, different disciplines were given priority for the use of logistic support, and in 1973 geologists had virtually exclusive use of the three Hughes 500 helicopters chartered for the field operations.

In view of the large areas to be mapped and the scarcity of previous geological work, the fieldwork was done on a 'day-trip' basis in contrast to the 'camping-out' style adopted in previous field seasons (see Tingey, 1972). BMR field parties in Australia commonly use helicopters on a day trip basis, and in the 1973 Antarctic field season this resulted in efficient and economic use of the helicopters and the following advantages over previous methods:-

1. geologists spent virtually no time on the domestic chores necessary when camping out;

---

*Earth Resources Technology Satellite. When the second satellite was launched in 1975 it was called LANDSAT-II and the ERTS satellite renamed LANDSAT 1. All imagery previously known as ERTS is now called LANDSAT.

2. all geologists visited all parts of the southern Prince Charles Mountains and obtained an overall appreciation of the geology. Regional collection of samples for age determination and geochemical studies were also obtained by the appropriate specialists;
3. all geologists discussed their observations after returning to base each day and helped plan future fieldwork;
4. gravity meter readings and barometer reading traverses were 'looped' each day.

The use of the helicopters as 'taxis' for the geologists had other advantages from the safety and logistic point of view and helped reduce the work load on the radio operator at Mount Cresswell (Humphreys, 1972; Macey, 1973).

During the field season, all significant outcrops in the southern Prince Charles Mountains were mapped in the normal fashion and large collections of rock samples were obtained. Gravity meter readings were made at 66 stations throughout the Prince Charles Mountains and barometers were read at 220 landing sites.

The rock samples were submitted for thin sectioning soon after the return of the field party to Australia, but petrographic studies were delayed because of the slow return of sections from the contractor and the inferior quality of many of the sections. By 1975 Arriens had completed his geochronological studies of specimens from the Prince Charles Mountains and Sheraton has completed major and minor element chemical analyses of some 200 rock specimens from the area. England has also made some electron microprobe analyses of minerals from selected rocks in an attempt to solve problems revealed by the petrographic studies.

In 1974 and 1975, 1:250 000 geological maps of the southern Prince Charles Mountains were prepared in preliminary edition form. They were drawn on bases prepared from 1:250 000 scale enlargements of LANDSAT imagery of the area and incorporated photogeological data interpreted from the 1973 vertical aerial photography. It was possible to relate the aerial photographs to the enlarged ERTS imagery quite accurately as snow drifts seen on the photographs could be easily identified on the ERTS imagery. This applied to drifts as small as 100 m wide, and is due to the excellent contrast exhibited by the imagery.

EXPLORATION AND PREVIOUS GEOLOGICAL INVESTIGATIONS

The Prince Charles Mountains were first detected in 1947 from U.S. Navy aircraft participating in Operation 'High Jump'. Overland parties from Mawson ANARE base explored the Stinear Nunataks and northern Prince Charles Mountains between 1954 and 1957; geologists were members of most of these parties and results of their observations were reported by Crohn (1959).

ANARE aircraft manned by the RAAF Antarctic Flight were based at Mawson from 1956 to 1961, and flew aerial photography and reconnaissance missions over a wide area including the Prince Charles Mountains. Geologists flew on some of the reconnaissance missions and were landed at scattered localities. For example, Stinear was landed in 1957 on the ice at the east side of the mountain that now bears his name and became the first geologist to visit the southern Prince Charles Mountains. In the following year, McLeod (1959) visited Clemence Massif and Wilson Bluff and inspected other mountains in the area.

An overland route to the southern Prince Charles Mountains was proved in 1957-58 by a seismic party led by Goodspeed (Fowler, 1971). In 1960 Ruker (1963) used 'Weasel' tractors and sledges to explore the mountains on the northern margin of the Fisher Glacier, and flew to other parts of the southern Prince Charles Mountains. He also described rocks collected near the southern end of the Mawson Escarpment.

The overland exploration of the southern Prince Charles Mountains continued in 1961, when Trail (1963) used dog sledges to traverse across the Fisher Glacier to Mount Bayliss and Mount Menzies, but severely crevassed ice on the southern side of the Geysen Glacier prevented the party reaching Keyser Ridge.

ANARE geological exploration in the southern Prince Charles Mountains was described by Trail (1964a, b) and McLeod (1964a) and incorporated in the map compilations of Trail & McLeod (1969) and Craddock (1972).

Soviet Antarctic Expedition geologists first visited the southern Prince Charles Mountains by helicopter in 1965, and Soloviev (1972) reported the results of their investigations, noting particularly the occurrence of 'jaspilites'* at Mount Ruker. Iltchenko (1972) described acritarchs from some of the rocks collected by Soloviev's party.

Australian geological investigations in the southern Prince Charles Mountains were resumed in 1972 when ANARE summer operations were based at Mount Cresswell. Geological fieldwork then had low logistic priority but Tingey & England (1973) were able to make a satisfactory geological reconnaissance. A Soviet geological party led by Dr Grikurov of the Institute for Arctic and Antarctic Geology, Leningrad, mapped the Mount Rubin area during the 1972 field season and a party led by Dr B. Lopatin visited more localities in the southern Prince Charles Mountains in 1973. Lopatin's group included a U.S.A. exchange scientist Dr E.S. Grew (Grew, 1975).

Results of Soviet geological work in the southern Prince Charles Mountains are reported by Grikurov and Soloviev (1974), Halpern and Grikurov (1975) as well as in papers presented at the 3rd International Symposium on Antarctic geology and Geophysics in Madison, Wisconsin (see Craddock, in press).

PHYSIOGRAPHY AND OUTCROP CONDITIONS

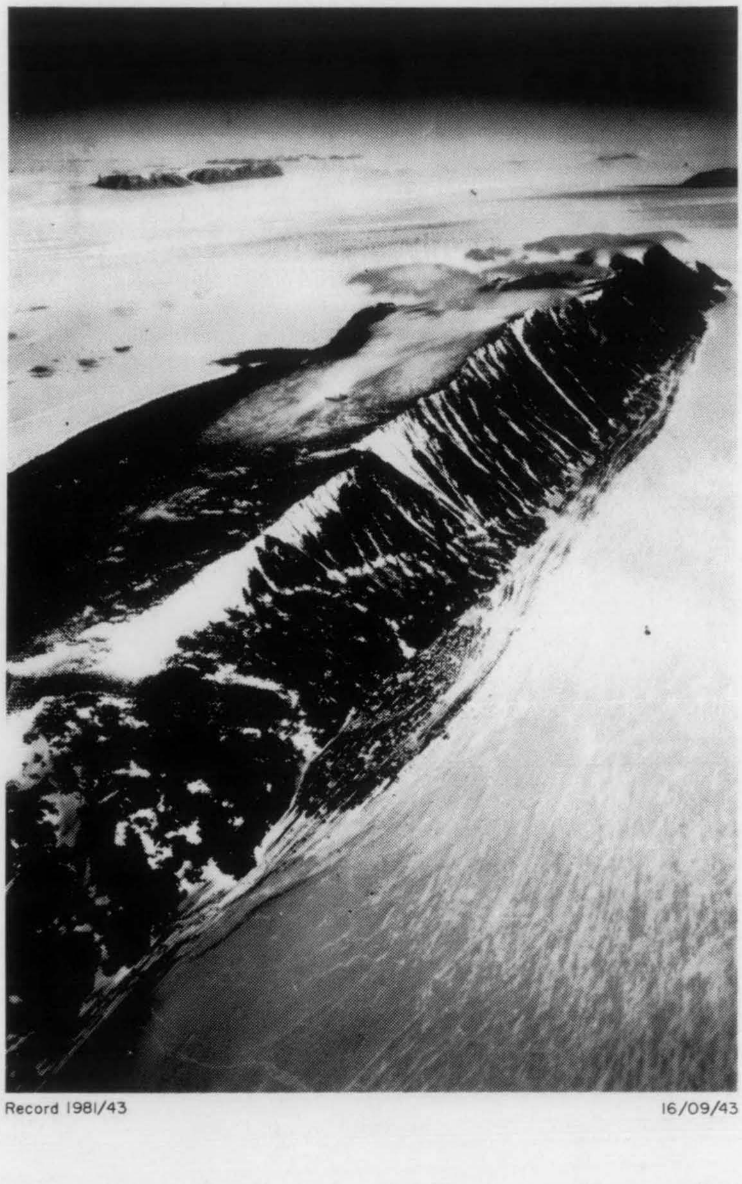
The glacial geology of the Prince Charles Mountains was described by Trail (1964a) who noted that flat-topped massifs are more common in the southern than in the northern Prince Charles Mountains. They are also more common near regional glaciers, such as the Lambert and Fisher Glaciers, and recent surveys have shown that their summits are concordant (see Plate 2). Crohn (1959) noted that many peaks in the northern Prince

*Magnetite rich boulders had previously been reported from moraines on the northern fringes of the Fisher Glacier by Ruker (1963).

Charles Mountains have concordant summits and there is little doubt that these, as well as the ones in the southern Prince Charles Mountains, are remnants of an old erosion surface. Trail (1963) thought the concordant summits in the southern Prince Charles Mountains might be of pre-glacial origin, but the preservation on their summits of glacial striae, blankets of moraine, pockets of till, and roches moutonnées show that all have been glaciated when ice levels were much higher than at present; at the time Mount Menzies was probably an isolated nunatak. [The present low level of the main glaciers relative to nearby flat topped mountain summits is probably due as much to uplift of the mountains as it is to a decrease in the Antarctic ice cover. Wellman & Tingey (1981) postulate that mountains in the Lambert Glacier basin have been uplifted about 1 km as a result of vigorous erosion along the main glacier streams.]

The flat-topped massifs of the southern Prince Charles Mountains are bounded by near-vertical cliffs, commonly more than 700 m, and, in some cases, more than 1000 m high (Fig. 1). The steepness of the cliffs and the preservation on the mountain summits of glacial striae in soft rocks, and small pockets of till with their clay fraction intact, show that the summits have only recently become free of permanent ice and snow cover.

The glaciers of the Lambert Glacier-Amery Ice Shelf drainage system are large and important physical features, some of them over 40 km wide and 200 km long, and in places up to 2 km thick. The efficiency of this system is responsible for the present day exposure of the Prince Charles Mountains (Trail, 1964a). Glacial striae measured during the 1973 season show that ice-flow directions when the levels were higher were much the same as the modern ones. The Lambert Glacier System is almost certainly located on a major geological structure (see Wellman & Tingey, 1976), possibly a graben as postulated by Crawford (1974) or complex of major faults as postulated by some Soviet workers (Begiazorov, 1969). Geophysicists from the Soviet Antarctic Expedition conducted a deep-earth seismic-sounding survey across the Amery Ice Shelf and widespread gravity and aeromagnetic surveys in the Prince Charles Mountains in 1973. Results are described by Fedorov, in press; Fedorov and others, in press; and Ravich & Fedorov, in press.



Record 1981/43 16/09/43

Fig. 1. Flat topped massifs bounded by near-vertical cliffs are characteristic of the southern Prince Charles Mountains. The central feature of this picture is Mount Stinear and the cliffs on the near side are 800 m high.
(After Airphoto ANT71 Run 202, 9125 R).
Negative: GB 993.

Most of the best rock exposures in the southern Prince Charles Mountains are in cliff faces and many are thus inaccessible. Flatter surfaces are mostly covered with felsenmeeren of almost-in-situ (locally-derived) rock debris in which bedrock distribution patterns are still preserved and can be mapped by photogeological methods. Structural data however can only be obtained from the cliff sections and the few small outcrops that protrude through the felsenmeer.

ASSOCIATED INVESTIGATIONS

ANARE summer field parties in the Prince Charles Mountains were multidisciplinary, and included, in addition to geologists, glaciologists from Antarctic Division, geophysicists from BMR, and surveyors from the Division of National Mapping. At base camp, the Medical Officer conducted experiments and made detailed observations and ANARE photographers filmed some operations.

Glaciological fieldwork in the Prince Charles Mountains area is part of the Australian contribution to the International Antarctic Glaciological Project (IAGP), and an assessment of the ice economy of the Lambert Glacier-Amery Ice Shelf ice drainage system was published by Allison, 1979. Other field operations are described by Morgan and Budd, 1975.

BMR geophysicists made magnetic measurements in the southern Prince Charles Mountains in the 1971, 1972, and 1974 field seasons. The information obtained will have a direct logistic application for aircraft, and for surface transport; it will also be valuable for accurate assessment of local variations in the earth's magnetic field in Antarctica.

La Coste and Romberg gravity meters provided by BMR were read on an opportunity basis in the Prince Charles Mountains during summer field seasons between 1969 and 1974. Other measurements were made on the 1957 seismic traverse from Mawson to the Goodspeed Nunataks (Fowler, 1971). The reduced gravity data permitted delineation of major crustal features (Wellman & Tingey, 1976), and had relevance to the glaciological work of

Allison (1979). Some of the data obtained before 1973 were of poor quality because either elevation measurements were inaccurate, or the meters went 'off-heat' during traverses, or consistent base station measurements were not made. However, in 1973 the meter was operated throughout the field season by one person and much better data were obtained. As the gravity meter readings were made in conjunction with barometer readings for the surveyors, accurate station-elevations were assured.

Biological observations were also made on an opportunity basis by field party members. For example collection of lichens from the Prince Charles Mountains is important for plotting their distribution in the Antarctic interior, and has been done by the geologists and surveyors. Discovery of lichens as far inland as the southern Prince Charles Mountains is an important advance on previous knowledge (cf. Filson, 1966). During the 1973 field season, birds were also seen in the southern Prince Charles Mountains and snow petrels were found nesting in the central part of the Mawson Escarpment.

STRATIGRAPHY, GEOLOGICAL HISTORY, and OUTSTANDING PROBLEMS

The stratigraphy and geological history of the southern Prince Charles Mountains is set out in Table 1. The southern Prince Charles Mountains consists of unfossiliferous and locally highly deformed Precambrian rocks, and only limited stratigraphic control is provided by geochronological data. Many correlations are made on the basis of similar lithology, the presence or absence of basic dykes, and metamorphic features, and are consequently suspect; Table 1 should only be considered as tentative. As only a limited amount of geological fieldwork has been done in the area - a total of about 1 man-year (including the work of Ruker and Trail in the 1960's who spent much of their field time travelling) - a number of problems remain to be solved. These include:-

a) the relationship between the banded ironstone formations and associated rocks at Mount Ruker and other rock units - particularly the Archaean quartzite-bearing unit exposed widely in the southern Prince Charles Mountains, notably at Mount Menzies;

TABLE 1 : SOUTHERN PRINCE CHARLES MOUNTAINS - STRATIGRAPHY AND GEOLOGICAL HISTORY

AGE	LITHOLOGY	DISTRIBUTION (Important localities are underlined)	RELATIONSHIPS & AGE DATA (See also Appendices II and III)	REMARKS
Recent	Lateral moraines consisting of heterogeneous, unconsolidated assorted boulders and rock fragments with fine grey green dust and clay. Thickness variable.	Throughout the southern Prince Charles Mountains on the margins of glaciers. Good examples at <u>Mount Ruker</u> and <u>Mawson Escarpment</u>.	Being transported by glaciers and mostly ice-cored.	Lateral moraines derived from scree slopes and cliff faces. Away from mountains, these moraines melt into the glaciers.
Quaternary - Recent	Patterned ground - distinctive polygonal pattern developed on loose in-situ and transported debris. Polygons up to 10 m across with coarser fragments at the margins and finer fragments near the middle. Thickness variable.	Throughout the southern Prince Charles Mountains, especially on flatter rock surfaces. Good examples on <u>Mount Rymill</u> and <u>Mount Stinear</u>.	Post-dates regional retreat of permanent ice cover. Age of patterned ground varies from place to place and determinations not possible.	Produced by a number of processes including frost-heaving, differential settlings, and wind erosion.
?Quaternary - Tertiary	Till - unsorted, unconsolidated, glacier-transported rock debris with much the same lithological characteristics as moraines. Thickness variable, but up to 30 m on Mount Ruker.	On many mountains in the southern Prince Charles Mountains with good examples at <u>Mount Ruker</u> and <u>Mount Menzies</u>.	Post-dated by patterned ground in most places. Age ranges from place to place and determination not possible.	Deposited on mountains when glacier levels were higher than at present or possibly during glacier surges. Examined in detail at Mount Stinear by Tingey & England (1973).
Permian	Red siltstone.	No outcrop known - found only as erratic debris on northwest flank of <u>Mount Rymill</u>.	From Glossopteris - see Ruker (1963); White (1962).	First discovered by Ruker (1963) and probably related to the Amery Group of Mond (1972). Probably occurs only at low topographic levels beneath glaciers at present. Restricted distribution of debris is puzzling.
Late Carboniferous	Muscovite pegmatite.	Mount McCauley	290 m.y. muscovite date	Late stage intrusive activity indicated.
Silurian	Ultrapotassic mafic dyke containing the rare amphibole magnophorite (K richterite).	Mount Bayliss	Intrudes Archaean gneiss; K-Ar magnophorite age 413 ± 10; K-Ar riebeckite age 430 ± 12 (See Appendix III).	Rock belongs to a rare potassium-rich alkali basalt group. See Sheraton & England, 1980.
Cambro-Ordovician	Muscovite pegmatites, biotite-muscovite pegmatites, biotite-muscovite granite, aplite, quartz veins. Beryl crystals found in some pegmatites. Tourmaline also a common accessory.	Binders Nunatak, Bosse Nunatak, Cumpston Massif, Goodspeed Nunataks, Keyser Ridge, Machin Nunatak, <u>Mawson Escarpment H,I,L,M</u>, Mount Borland, Mount Cresswell, <u>Mount Dummett</u>, Mount	Soviet data: Mount McCauley 490 m.y. (Halpern & Grikurov 1975). Australian data (this Record): 470-560 m.y. Muscovites from pegmatites at Mount McCauley and Dummett give dates of 515 and 516 m.y., respectively. Initial ratios 0.71-0.73. Binders Nunatak 500 m.y. muscovite; Wilson Bluff 560 m.y. muscovite.	Intrudes low grade metasediments and, at Mount McCauley, felsic gneiss. At Binders Nunatak intrudes metasediments possibly related to those exposed at Mount Menzies.

TABLE 1 (cont.)

AGE	LITHOLOGY	DISTRIBUTION (Important localities are underlined)	RELATIONSHIPS & AGE DATA (See also Appendices II and III)	REMARKS
Cambrian	Grey pegmatitic granite.	Central Mawson Escarpment (areas F and G).	Mica ages range from 470 to 500 m.y. with a whole rock isochron age of 569 ± 43 m.y. (initial ratio 0.736). Intrudes gneisses possibly as old as Archaean and crosscuts metamorphosed basic dykes at Harbour Headland.	A very common rock type in the central Mawson Escarpment. Possibly related to slightly younger intrusives in other parts of southern PCM. High initial ratio suggests granite is derived from older crustal material.

MAJOR FOLDING EPISODE IN WHICH THE LATE PROTEROZOIC METASEDIMENTS AND BANDED GNEISS DESCRIBED BELOW WERE DEFORMED. MAJOR FOLDS OF THESE ROCKS EXPOSED AT MOUNT RUBIN AND MOUNT JOHNS; FOLDING AT MOUNT MENZIES AND MOUNT TWIGG POST-DATES EMPLACEMENT OF BASIC DYKES, THAT AT SOUTHERN BLAKE NUNATAKS, SIMILAR IN STYLE TO MOUNT JOHNS FOLDING; INSUFFICIENT EVIDENCE TO DETERMINE IF FOLDING PRE- OR POST-DATES THE BANDED METASEDIMENTS EXPOSED IN NORTHERN BLAKE NUNATAKS AND MOUNT MAGUIRE.

AGE	LITHOLOGY	DISTRIBUTION	RELATIONSHIPS & AGE DATA	REMARKS
Late Proterozoic	Low- to medium-grade calcareous and pelitic metasediments, including metamorphosed sandstones, marls, and shales, and schist; also metaconglomerates and rare intercalated volcanics. Sedimentary structures such as ripple marks and mud cracks are locally preserved. Tight isoclinal folding seen at Mount Rubin. No crosscutting orthoamphibolites and only a few concordant ones at Mount McCauley and Mount Seddon. Metamorphic grade decreases from lower amphibolite facies in the southeast to greenschist facies in the northwest. Thickness - the complete sequence is not exposed but the unit is several kilometres thick at Mount Rubin (Soloviev & Grikurov 1974).	*Blake Nunataks, Cumpston Massif (SE), Goodspeed Nunataks, Mount Dummett, Mount McCauley, *Mount Maguire, Mount Rubin, Mount Scherger, Mount Seddon. *Rocks exposed at these places may be older.	At Mount Rubin Soviet work (Halpern & Grikurov 1975) indicates possible age between 600 and 700 m.y. with a metamorphic age of 495 m.y. Minimum age determined by intrusives at Mount Dummett, Mount McCauley, and Goodspeed Nunataks (see above). Apparent contradiction of Soviet work due to use of different decay constants. Metasediments at Mount Rubin contain jaspilite clasts and possible fossils (Halpern & Grikurov 1975) and Iltchenko (1972) derives Late Proterozoic age from achritarch studies. Absence of crosscutting metamorphosed basic dykes may indicate a maximum age ca 1400 m.y.; clast age of 800 m.y. cited by Halpern & Grikurov, 1975, also gives maximum age for conglomerate.	Correlations between outcrops are made on the basis of similar composition, deformation, and metamorphic grade, and because of the absence of crosscutting metamorphosed basic dykes. Major metabasic at base of Mount Seddon requires further examination to see if host rock same as the rest of the mountain. Mount Rubin and Mount Ruker low-grade metasediments grouped together by Soloviev (1972), but this is disputed by Halpern & Grikurov (1975). Contact with another rock unit only seen at Mount McCauley where there is apparent structural continuity with underlying felsic biotite gneiss of probable Archaean age. The gneiss is intersected by amphibolitized basic dykes.
Late Proterozoic	Banded white and pink felsic biotite gneiss with interbanded amphibolite and minor calc-silicate gneiss. Gross structure is locally apparent but detailed structure is difficult to determine because of complexity, of ourcrop pattern, and lack of marker horizons in accessible outcrops. Orthopyroxene found in felsic gneiss at Mount Izabelle.	Bosse Nunatak, Clemence Massif, 'Dalton Nunataks', Ely Nunatak, Mount Izabelle, Mount Johns, ?Mount Stinear (northern tip), Shaw Massif. Possibly also northern tip of Mawson Escarpment and NW area K.	Dalton Nunataks 945 m.y. (initial ratio 0.7076). Clemence Massif 834 m.y. (initial ratio .7104). Mount Johns 891 m.y. (initial ratio .7060). Not seen in contact with any other rock units and not intruded by metamorphosed basic dykes. Initial ratios indicate that the rocks may be derived from much older crustal material. Similar ages, but significantly higher initial ratios, have been obtained from northern Prince Charles Mountains rocks.	A feature of these rocks is their regular banding and their lack of crosscutting metabasics. The latter may have been deformed into concordant amphibolites; initial $^{87}Sr/^{86}Sr$ ratios indicate a relatively short crustal history. See also McLeod (1959) and Tingey & England (1973).

Table 1 (cont.)

AGE	LITHOLOGY	DISTRIBUTION (Important localities are underlined)	RELATIONSHIPS & AGE DATA (See also Appendices II and III)	REMARKS
Middle Proterozoic	Metamorphosed basic dykes and sills - tholeiitic composition, probably intruded originally as dolerites, few remnants of the original igneous textures and mineral assemblages preserved. Most rocks now amphibolites. Irregular thickness; sills at Mount Menzies over 100 m thick.	Binders Nunatak, Cumpston Massif, Machin Nunatak, Mawson Escarpment (Central and Southern parts), Mount Bayliss, Mount Bird, Mount Bloomfield, Mount Mather, Mount Menzies, Mount Newton, Mount Ruker, Mount Rymill, Mount Scherger (in basal gneisses only), Mount Stinear, Seavers Nunatak. Also known in northern Prince Charles Mountains (Tingey 1972).	Possibly related to basic dykes at Vestfold Hills which are about 1400 m.y. old. No direct age determinations. Rock units not intersected by the dykes are considered from other evidence to be 1000 m.y. old or younger.	See also Crohn (1959), Tingey & England (1973), Arriens (1975), and Halpern & Grikurov (1975). Presence or absence of dykes is used as stratigraphic indicator in other ancient terrains e.g. North Scotland and Greenland, but its reliability is limited.
Early Proterozoic or Archaean	Slates, phyllites, and schists, with banded ironstones and minor quartzites. Total thickness unknown but probably considerable. Ironstones are at least 100 m thick (see England & Langworthy, 1975).	Mount Ruker - glacier-transported debris found throughout Fisher Glacier basin and discovered by Ruker (1963). Possibly related erratics are also known from the Vestfold Hills.	Apparently overlies granitic basement at east end of Mount Ruker although the contact is poorly exposed and may be faulted. Age data for this granite is inconclusive. Metamorphosed basic dykes and sills crosscut the Mount Ruker metasediments. At the western end of Mount Ruker the metasediments are intruded by a coarse pegmatite. Iltchenko (1975) assigned late Proterozoic ages to the metasediments on the basis of acritarch studies, but this is now in doubt by Halpern & Grikurov (1975) who infer a 1700 m.y. age.	Soviet aeromagnetic surveys have suggested that the jaspilites extend outwards from Mount Ruker along a total strike length of 120 km. For details see Soloviev (1972), England & Langworthy (1975), Ravich & others, in press. Soloviev (1972) grouped the Mount Ruker and Mount Rubin metasediments together, but Halpern & Grikurov (1975) dispute this. The Mount Ruker ironstones which were discovered by Soviet geologists (Soloviev 1972) in 1965, are purported to be one of Antarctica's few known mineral resources of economic significance, but their grade is only about 30-40% Fe and they would be subeconomic even in Australia for the foreseeable future.
?Early Proterozoic or late Archaean	Banded, generally grey-green, metasediments, including calcareous and pelitic varieties. Intensely retrogressed at Mount Bird and Mount Newton where they have chlorite-chloritoid greenschist-facies assemblages. Higher-grade assemblages at Keyser Ridge. Thickness unknown.	Mount Newton, Mount Bird, Keyser Ridge.	Not seen in direct contact with any other rock units but imprecise Rb-Sr age between 1800 and 2000 m.y. indicated for cross-cutting foliated pegmatites. Metasediments intruded by coarse biotite pegmatite to form injection gneiss, then intruded by basic dykes, followed by intense but very localised retrogression to chlorite-chloritoid grade greenschist facies (Mount Newton). At Keyser Ridge no retrogression occurred but tourmaline pegmatites here are correlated with some at Mount Bird that post date the retrogression. The Keyser Ridge tourmaline pegmatites are crosscut by siderite veins, and are thought to be related to the Mount McCauley intrusives.	See Tingey & England 1973 and England & Langworthy (1975) for more details. Correlation between Keyser Ridge and the other localities is tenuous. Age determinations give only minimum ages for metasediments. Amphibolites in injection gneiss areas have high-grade assemblages, but elsewhere they are composed of actinolite and chlorite.

Table 1 (cont.)

AGE	LITHOLOGY	DISTRIBUTION (Important localities are underlined)	RELATIONSHIPS & AGE DATA (See also Appendices II and III)	REMARKS
?Early Proterozoic	Banded brown quartzites with calcareous quartzite layers and minor interbanded biotite quartzites, amphibolites, and metapelites. Thickness - several hundred metres.	Blake Nunataks, Mount Twigg, Wilson Bluff.	No direct evidence for the age of these rocks, but at Wilson Bluff they are intruded by 500 m.y. pegmatites and at Blake Nunataks they are faulted against but thought to be overlain by late Proterozoic lower amphibolite-facies metasediments. The quartzites overlie banded gneiss at Blake Nunataks but are overlain by similar rocks at Mount Twigg. Basic dykes have not been seen in exposures of the brown quartzites.	First described by McLeod (1959); later work by Tingey & England (1973). The rocks may predate the nappe structure at Blake Nunataks (S) where they appear to overlie banded gneiss that is correlated with gneiss at Mount Borland which is overlain by possible Archaean quartzites. Reversal of succession at Mount Twigg, where banded gneiss overlies the brown quartzite, is attributed to large-scale folding. Correlations between outcrops are on the basis of lithological similarity and are tentative.
Archaean	Muscovite pegmatites.	Mount Stinear (north of Edwards Pillar).	2580 m.y. Rb-Sr Muscovite age.	Field relationship between the pegmatite and metamorphosed basic dykes not well defined. Pegmatite is metamorphosed.
Archaean	White and green quartzites commonly with fuchsite and kyanite, impure quartzites (now biotite gneiss), conglomerates, pelitic gneiss, pelitic schist, amphibolites, and minor calc-silicate gneiss. Possibly also marble. Commonly have lower amphibolite-facies assemblages with kyanite, staurolite, and muscovite, but retrogression has produced chlorite-chloritoid assemblages in the summit area of Mount Menzies. Some original sedimentary structures preserved locally. Thickness - unmeasured, but believed to be several hundred metres at least.	?Binders Nunatak, Cumpston Massif, Mawson Escarpment A,B,C,D,E (?), Mount Borland, Mount Mather, Mount Menzies, Mount Rymill, Mount Stinear, Seavers Nunatak, ?Machin Nunatak.	Muscovite pegmatite sets minimum age. Sequence commonly intruded by amphibolitized basic dykes and concordant sills whose emplacement predates large-scale folding at Cumpston Massif, Mawson Escarpment, and Seavers Nunatak, with apparent structural conformity, and with unconformity at Mount Borland. Seen close to, and in apparent structural conformity with, basement at Mount Mather. Quartz-rich biotite gneiss which underlies metasediments at Mount Stinear gives a Rb-Sr metamorphic age about 1100 m.y. Retrograde effects in pelitic rocks may be due to this metamorphism, or a later event associated with the widespread 500 m.y. old granite intrusives.	First described by Trail (1963) from the summit of Mount Menzies; later work by Tingey & England (1973). Tentative correlations between mountains are made solely on the basis of similar lithology; there are two identical quartzites on Mount Stinear and green fuchsite-bearing quartzites near the base of the jaspilite sequence at Mount Ruker. Relationship between quartzite and jaspilite sequences obscure. Quartzites originally probably shallow water deposits; conglomerates derived from them by uplift and erosion.
Archaean	Massive, locally dark brown, felsic biotite gneiss with dark green ferrohastingsite. Local metasedimentary intercalations, biotite-rich layers and conformable amphibolites. Thickness unknown.	Cumpston Massif, ?Greenall Nunatak, Mawson Escarpment A,B,C,E, Mount Bloomfield, Mount McCauley, Mount Mather, ?Mount Ruker, Mount Rymill, Mount Scherger, Mount Stinear, ?Mount Twigg, Seavers Nunatak.	Overlain by white quartzite sequence at Cumpston Massif and Mawson Escarpment B. Apparent structural conformity with white quartzite at Mount Mather, but faulted against it at Mount Rymill and Mount Stinear. Overlain unconformably by pelitic metasediments of the white quartzite sequence at Seavers Nunatak.	Geochemical characteristics investigated by Sheraton. Unit definitely basement to the area but correlations based on lithological similarity and therefore questionable. Sedimentary intercalations should be further investigated to discover nature of any earlier formation.

Table 1 (cont.)

AGE	LITHOLOGY	DISTRIBUTION (Important localities are underlined)	RELATIONSHIPS & AGE DATA (See also Appendices II and III)	REMARKS
			Rb/Sr ages Mawson Escarpment B 2822 ± 227 (initial ratio 0.7050). Mawson Escarpment E 2766 ± 92 (initial ratio 0.7210). Intruded at most localities by metamorphosed basic dykes.	
Archaean	Cataclastic felsic augen gneiss associated with calc-silicate gneiss but probably no connection.	Mount Bayliss.	Rb/Sr whole rock age of 2809 m.y. (initial ratio 0.7076). Intruded by metamorphosed basic dykes, younger (?500 m.y.) pegmatites, and Silurian alkali basalt.	First described by Trail (1963). This rock is not seen elsewhere in southern Prince Charles Mountains. Probably the result of intense deformation of a granitic intrusive.
Precambrian	Migmatitic felsic biotite gneiss with interbanded amphibolites and minor calc-silicates and metapelites.	Blake Nunataks (S), Mount Borland, Mount Twigg.	Apparently overlain by white quartzite sequence at Mount Borland. Overlain by brown quartzites at Blake Nunataks and underlain by them at Mount Twigg, the reversal being attributed to large-scale folding. Intruded by 500 m.y. granite-pegmatite at Mount Borland. Not seen to be crosscut by metamorphosed basic dykes.	Correlation and age uncertain and mainly based on apparent stratigraphic position at Mount Borland.
Precambrian	A wide range of metamorphic rocks including migmatic biotite gneiss, marble, metapelites, metabasics, and calc-silicates which are too deformed to allow correlation with other units. Metamorphic grade ranges from middle amphibolite to granulite facies and there are many acid dykes and small intrusives.	Mawson Escarpment C to M, Machin Nunatak, Mount Cresswell	Minimum age defined by 500 m.y. intrusives at Mount Cresswell and in the Mawson Escarpment. Age probably greater than 1200 m.y. and may be Archaean in places, but since complicated by metamorphism.	Group may include metamorphosed Archaean basement and metasediments, and possible equivalents of the banded gneisses of the northeast corner of the southern Prince Charles Mountains. Geology particularly complex in the north Mawson Escarpment.

Note. Where the age of a rock unit is not known from isotopic or other methods it is assigned to the Precambrian and listed in the Table in a position that relates to an inferred age.

b) the relationship between the metasediments exposed at Keyser Ridge, Mount Bird, and Mount Newton, and other rock units in the area;

c) the relationship between rocks of the southern Blake Nunataks, Mount Borland, Mount Twigg, and Wilson Bluff and those of the rest of the Prince Charles Mountains;

d) the relationship between the Archaean gneisses and metasediments at the southern end of the Mawson Escarpment and the upper amphibolite to granulite-facies metamorphic rocks at the northern end;

e) the age of the low-grade partly calcareous metasediments typically exposed at Mount Rubin;

f) the nature and age of the small enclaves of metasediment contained in what are considered to be basement granite gneisses at Cumpston Massif;

g) the age of the amphibolitized basic dykes and sills seen at many places in the southern Prince Charles Mountains;

h) the extent, stratigraphy, and economic potential of the banded ironstones seen in limited exposure at Mount Ruker;

i) the structural evolution of Mount Menzies, Mount Twigg, Cumpston Massif, Mount Mather, Mount Rubin, Mount Johns and other outcrops;

j) the glacial and geomorphological history of the southern Prince Charles Mountains.

Further detailed geological fieldwork and geochronological work is therefore required in the southern Prince Charles Mountains. More geophysical work is also desirable and there is a particular need for gravity (see Wellman & Tingey, 1976) and airborne magnetic surveys. Future investigations would be more problem-oriented than the wide-ranging field surveys for regional mapping that have been completed.

GEOCHRONOLOGY

As an extension of his earlier work in the Windmill Islands near Casey ANARE station, and in the Vestfold Hills near Davis ANARE station (Arriens, 1975), Arriens collected a large suite of samples for geochronological study from the Prince Charles Mountains during the 1973 field season. Arriens' work was part of the overall field-mapping program, which aimed to obtain a broad first pass over the southern Prince Charles Mountains, and there were few opportunities for detailed geochronological sampling. The lack of adequate geological control was an added disadvantage. With these constraints, Arriens made a wide-ranging reconnaissance; sampling aimed at specific geological problems was not possible.

Details of Arriens' samples, his regression data, and muscovite and biotite ages from various samples are listed in Appendix II and summarized in Table 1.

During 1975, a selection of apparently unaltered basic dyke rocks from the Prince Charles Mountain-Amery Ice Shelf area was submitted to the Australian Mineral Development Laboratories (AMDEL) for K-Ar age determination. The results are listed in Appendix III and referred to in the text.

Because the Prince Charles Mountains consist largely of Precambrian basement rocks, geochronological studies are essential for the elucidation of the geological succession in, and geological history of, the area. Geological mapping has led to the identification of several problems that will require detailed geochronological work for their solution.

LOCALITY DESCRIPTIONS

In this Record, localities are described in alphabetical order within sheet areas, and the sheet areas are described in numerical sequence. Thin section descriptions appear in Appendix I in the same order as the locality descriptions. Similar procedures were followed in earlier Records describing geological fieldwork in Antarctica.

As meridians converge towards the geographic poles, 1:1,000,000 sheet areas of the International Map of the World (IMW) in Antarctica are bounded south of 72°S by 18° Longitude and 4° Latitude (compared to 6° Longitude and 4° Latitude at the Equator). Each 1,000,000 sheet area therefore encompasses 3 IMW zones - each 6° Longitude wide - and is appropriately designated, for example, SS40-42, and subdivided into 16 1:250 000 sheet areas. The sheet areas in the southern Prince Charles Mountains are:-

SS40-42/2	Goodspeed Nunataks
SS40-42/3	Mount Cresswell
SS40-42/4	Mawson Escarpment (North)
SS40-42/6	Mount Menzies
SS40-42/7	Cumpston Massif
SS40-42/8	Mawson Escarpment (South)
SS40-42/11	Wilson Bluff
SS40-42/12	Mount Twigg

and they are dealt with in this order.

Some areas were arbitrarily subdivided for convenience of fieldwork, and are identified on the map (Plate 1). Thus, Goodspeed Nunataks were divided into areas A to L, and Mawson Escarpment into areas A to M. Goodspeed Nunataks E, F, G, H, I lie within the Goodspeed Nunataks 1:250 000 sheet area, and localities A, B, C, D, J, K and L are in the Mount Menzies sheet area. Mawson Escarpment A to G lie within sheet area SS40-42/8 (Mawson Escarpment South), and H to M are in sheet area SS40-42/4 (Mawson Escarpment North).

SS40-42 GOODSPEED NUNATAKS

Binders Nunataks

At the easternmost and largest of the three Binders Nunataks, biotite-quartz-feldspar gneiss, with subordinate garnet and, in places, sillimanite-rich, and thin bands of quartzite, are crosscut by orthoamphibolites containing olive-green hornblende, and late-stage muscovite-biotite pegmatites. Garnet, cordierite, sillimanite, and biotite are present in one pelitic schist; in another, kyanite and sillimanite are both present. The situation may be similar to that in the Scottish Highlands, where kyanite persists well after the first appearance of sillimanite, but the presence of cordierite suggests that pressures were slightly lower. An alternative, but less likely, interpretation is: (i) an early high-grade cordierite-garnet-sillimanite metamorphism followed by (ii) a local retrograde kyanite-grade metamorphism.

The southwestern of the two smaller nunataks consists of migmatitic biotite leucogneiss, with massive felsic bands and well-foliated biotite-rich mafic bands. There are also some boudinaged amphibolites, and pegmatites, with biotite and a little garnet, are fairly abundant. The third nunatak consists of white and grey leucocratic to intermediate migmatitic biotite-quartz-feldspar gneiss, with subconcordant amphibolites less than 1 m thick. The gneissic foliation dips 45^{o}S and strikes 110^{o}.

Rb-Sr dating of a pegmatite that intrudes the banded metasediments gave muscovite ages of about 880 m.y. and biotite ages of 500 m.y. The 880 m.y. age suggests some affinity with the banded gneisses of the Mount Johns-Clemence Massif area to the east although the 500 m.y. age is typical of ages associated with the widespread thermal event that affected the Prince Charles Mountains area in early Palaeozoic times. In some ways the gneisses at Binders Nunataks resemble rocks described from the Seavers Nunataks-Mount Menzies area to the south but firm correlations are not possible.

* Goodspeed Nunataks

Glacial 'tidemarks', isolated wind-carved ice domes capping some nunataks, and extensive moraine fields, whose patterns reflect stages in the retreat of local glaciers, all indicate that the Goodspeed Nunataks have been only recently exposed. Bedrock is generally poorly exposed and seen only in small outcrops that locally protrude through the frost-heaved debris that mantles most of the nunataks. Most of this debris is of local origin and almost in-situ, and, although glacial erratics were seen in places, rock distribution patterns in the debris can be confidently interpreted as reflecting those in the bedrock.

* Part of the Goodspeed Nunataks lie within the Mount Menzies sheet area (SS40-42/6).

The nunataks consist of generally well-bedded, grey or brown biotite-grade, greenschist-facies metasediments, in which sedimentary structures such as cross-laminations, mud-cracks, and ripple marks are locally preserved. Pelitic, psammitic, and psammo-pelitic metasediments slightly metamorphosed conglomerates, sandstones, micaceous sandstones, and mica and calcareous schists are characteristic rock types. Biotite, chlorite, and muscovite are common in pelitic and psammitic rocks, and kyanite and cordierite have been found in some metapelites. The more calcareous rocks contain epidote, actinolite, and microcline.

Small quartz veins, about 2 cm thick, crosscut the metasediments at many localities and there are a few pegmatite veins. The matrix of specimen 73281054, a conglomerate from Goodspeed Nunatak E, contains poikiloblastic cordierite such as is common in contact metamorphic zones. Boulders of albite pegmatite are common in the nearby rubble. Beryl- and tourmaline-bearing pegmatites were found on Goodspeed Nunatak G, and the bedding of metasediments on an inaccessible part of Nunatak J is disrupted by a brown intrusive mass. Ill defined Rb-Sr age data for muscovites from Goodspeed Nunataks indicate an age of about 500 m.y.

No amphibolitised dykes were seen in the Goodspeed Nunataks. In general, the rocks exposed resemble the low-grade metasediments of Mount Dummett, Mount Rubin, and possibly south Cumpston Massif, where basic dykes are also absent.

SS40-42/3 MOUNT CRESSWELL

Bosse Nunatak

There are two small nunataks at Bosse Nunatak: the southwestern one appears to consist of granite and was not visited but a gravity station was established on the northeastern nunatak, where east-west aligned glacial striae are locally preserved on polished rock surfaces. The nunatak visited consists of complexly folded interbanded migmatite, mafic gneiss, leucogneiss, granite, and pegmatite. Some acid intrusives are folded; others crosscut the folds. Despite the apparent complexity of the folding, a general strike of 200^{o} was discerned. Metasomatic effects, such as the formation of felsic augen in basic rocks, are common;

together with diagnostic mineral assemblages, and the absence of muscovite, they indicate upper amphibolite facies metamorphism. Some of the mafic bands might be remnants of rocks from which felsic components have been removed during anatexis - that is, melanosomes; others probably represent original basic rocks into which felsic bands have been introduced. Very little retrograde alteration of the amphibolite-facies assemblages has occurred. Rb-Sr biotite ages from Bosse Nunatak approximate 500 m.y. and probably reflect the widespread early Palaeozoic thermal event detected throughout the southern Prince Charles Mountains. The Bosse Nunataks amphibolite facies rocks are correlated with the late Proterozoic migmatitic rocks of the Shaw Massif-Mount Izabelle-Mount Johns area to the east.

Ely Nunatak

Ely Nunatak is a west-northwest trending, vertical-sided ridge midway between Mount Izabelle and Shaw Massif. It consists of complexly folded migmatite, banded gneiss, and mafic gneiss, intersected by younger post-orogenic pegmatite dykes. Calc-silicate gneiss, with calcite, diopside, sphene, and hornblende, is also common. The field occurrence and mineral assemblages of the rocks, including the absence of muscovite, are characteristic of upper amphibolite-facies metamorphism accompanied by anatexis. The Ely Nunatak rocks are quite fresh and show only very minor alteration; they thus resemble upper amphibolite-facies rocks at Shaw Massif, Bosse Nunatak, and Clemence Massif, and the possible granulite facies rocks at Mount Izabelle.

Machin Nunatak

Amphibolitised basic dykes striking about NW are a prominent feature of the small outcrop at Machin Nunatak. Biotite pegmatites and quartz blows crosscut the amphibolites which intrude mainly schistose rocks including some pelitic metasediments. Rock outcrop other than the amphibolite dykes is scarce and the moraine and glacial drift cover is arranged into 'patterned ground', with coarse blocks at the margins of constituent polygons. The amphibolites contain brown-green or olive green hornblende and one sample contains garnet which surrounds clusters of hornblende and quartz, separating them from the plagioclase. A sample of metapelitic bedrock contains garnet, possible cordierite, and possibly also kyanite; two generations of garnet may be indicated as some garnet grains are surrounded by cordierite. The mineral assemblages generally resemble those described from Mount Cresswell but the preservation of the amphibolite dykes prompts interpretation of Machin Nunatak as a small enclave of Archaean basement among rocks, such as those exposed at Mount Cresswell, which appear to be products of the 1000 m.y. metamorphism which resulted in the formation of high grade metamorphic rocks in the Prince Charles Mountains and is discussed in detail by Tingey (in press). [See also Plate 2 - Geological Map]. The Machin Nunataks basement is grouped with the late Archaean metasedimentary unit found at Mount Stinear and many other localities in the southern Prince Charles Mountains. This unit commonly has kyanite grade assemblages apparently as a result of the widespread metamorphism that occurred in the Prince Charles Mountains about 1000 m.y. ago. This metamorphism was of higher grade further north (and possibly further south also) where amphibolite dykes such as those seen at Machin Nunatak are essentially obliterated. In these cases the rocks are mapped either as late Proterozoic metamorphics or undifferentiated Precambrian metamorphics; where the dykes are preserved, the rocks they intersect are mapped either as Archaean or as early Proterozoic (see Tingey, in press).

Mount Bloomfield

Mount Bloomfield, formerly known as Bloomfield Dome, was visited in 1960 by Ruker, who described the rocks as augen gneiss with minor amphibolites.

In 1973 a gravity station was established on the highest point of Mount Bloomfield where well foliated dark brown gneissic granite crops out in roches moutonnées. The foliation (as defined by aligned mafic minerals) strikes 320^{o} and is nearly vertical. Locally derived debris covers much of the exposure but transported material, particularly staurolite-kyanite-muscovite schist was also seen. Elsewhere the gneissic granite is intersected by amphibolite dykes originally intruded as basic igneous dykes. Fault zones near the gravity station are filled with breccias cemented with coarse calcite crystals, up to 3 cm across, and a few small specks of sulphide minerals.

The gneissic granite at Mount Bloomfield closely resembles gneissic granites near the northern end of Mount Stinear and at the northern end of Mount Rymill. These other occurrences are also intersected by amphibolite dykes and all three gneissic granites contain similar mineral assemblages including the distinctive hornblende 'ferrohastingsite'. They can be correlated with some confidence.

Mount Cresswell

The geology of Mount Cresswell is described by Tingey & England (1973) and the little extra work that was done in the 1973 field season concentrated upon the granitic intrusive rocks.

At the eastern tip of Mount Cresswell (in the wind scour), steeply dipping, east-west striking garnet-hornblende-biotite gneiss, garnet amphibolite and minor sillimanite gneiss are intruded by two generations of pegmatite. The first contains quartz, feldspar, very minor muscovite (probably secondary), and garnet which is altered in many places to clots of biotite. A moderately strong foliation in these pegmatites is conformable with that in the host rocks. The second generation is undeformed, has offshoots which crosscut the foliation, and is characterised by graphic intergrowths of quartz and potash feldspar, large books of muscovite, and minor garnet, biotite, and tourmaline. At Gallagher's Knob, the western peak, vertically dipping quartz-biotite gneisses, striking at 120^{o}, are intruded by these second generation pegmatites. Retrogression in those rocks is described in Tingey & England (1973).

Mount Izabelle

The upper surfaces of Mount Izabelle have gentle relief and are mostly covered with weathered, frost-heaved rock debris, but large outcrops occur in the north-facing cliffs. The exposed rocks are migmatitic, diffusely-banded, felsic to intermediate, lower granulite-facies, or upper amphibolite-facies, biotite-hornblende-hypersthene-quartz-feldspar gneiss. Two distinct sets, and styles, of major fold are discernible in the cliffs: (i) an early generation of recumbent eastward-closing isoclinal folds that have been refolded by (ii) a set of open folds with near-vertical axial planes. The isoclinal folds have a similar orientation to the prominent isoclinal fold at Mount Johns (see Tingey & England, 1973), and the axes of both the isoclinal and open folds, and a strong mineral lineation plunge gently to the southwest. On planes that contain the lineation, the rocks have a streaked-out appearance; on others, complex flow folds are visible.

Mount Johns

The best exposures at Mount Johns are found in cliff faces; the upper flatter surfaces of the mountain are covered with locally-derived, moderately weathered debris that almost entirely conceals the bedrock.

In the southeastern face of the mountain, quartzo-feldspathic and hornblende-clinopyroxene-biotite-rich banded gneisses are bent into a large recumbent fold that is probably the dominant structure in the mountain (Tingey & England, 1973). The fold closes to the northeast, and its axial plane dips at a moderate angle to the southwest. Some of the leucocratic and intermediate rocks in the core of the fold strongly resemble charnockitic rocks of the northern Prince Charles Mountains, but do not appear to contain hypersthene.

The southern side and southwest tip of the mountain mainly consist of grey, migmatitic biotite-quartz-feldspar gneiss, but banded metasediments, including quartzites, garnet-sillimanite-bearing gneiss, calc-silicate gneiss, and amphibolites are also present. The migmatites are generally coarse-grained, with massive and strongly foliated biotite-rich bands locally containing garnet and/or sillimanite. In places, rusty-weathering mafic rocks are interbanded with them; they look like mafic granulites, but no hypersthene was found in thin section. Pale pink or white biotite pegmatites, some crosscutting, others concordant, are also abundant.

Near the western tip, banded gneiss similar to that seen elsewhere on the mountain is intruded by veins of pale leucocratic granite.

Specimens collected from Mount Johns yielded a Rb-Sr age of 891 ± 70 m.y., with an initial ratio of 0.7060. The low initial ratio indicates that the age is probably close to that of the formation of the rocks, rather than of a much later metamorphism. Similar ages were obtained from rocks collected at Clemence Massif and 'Dalton Hills' in the Mawson Escarpment North 1:250 000 sheet area. 500 m.y. biotite ages reflect a widespread thermal event that affected rocks in the Mawson Prince Charles Mountains-Amery Ice Shelf area and might be related to similar events documented in other areas of Antarctica and Gondwanaland.

Shaw Massif

The dominant rock type at Shaw Massif is pink, well banded, migmatitic biotite-quartz-feldspar gneiss. Leucocratic varieties are generally pegmatitic, massive, and diffusely banded, whereas more mafic biotite-rich bands have a well-developed foliation. Garnet is locally found in the more mafic gneisses in some places (particularly in the eastern part of the massif), and amphibolites are also common. The latter are generally concordant, but make up only a small proportion of the exposed rocks; they are boudinaged and intruded by numerous pegmatites.

A greater variety of rock types, including obvious metasediments like calc-silicate gneiss and garnet-sillimanite-bearing gneiss is exposed in the saddle near the northwest tip of the massif, but migmatitic biotite-quartz-feldspar gneiss with or without garnet, and granite gneiss predominate. Biotite pegmatites crosscut the gneissic rocks and have prominent mafic selvages at contacts with mafic rocks. Discordant basic dykes were not seen at Shaw Massif and their absence, plus the general similarity of the rock types, is the basis for the correlation of the Shaw Massif rocks with those of Clemence Massif, Dalton Hills, Mount Johns (Tingey & England, 1973), and, closer to Shaw Massif, Mount Izabelle, Bosse Nunatak, and Ely Nunatak. Rb-Sr biotite ages of about 500 m.y. for gneisses from Shaw Massif probably reflect the thermal event detected throughout the southern Prince Charles Mountain area.

Major folds are exposed in the southwestern cliffs of Shaw Massif, and the vertical limb of a large east-west-trending fold is exposed near the northwest tip. Away from the major folds, dips are between 10^{o} and 30^{o} towards the south or southwest. Minor folds mostly plunge at low to moderate angles also to the southwest, and are parallel to a prominent lineation. Intrafolial folds are particularly common in the diffusely banded leucogneiss.

Retrograde alteration is widespread in the Shaw Massif rocks, and relatively more intense in the more strongly folded ones. The alteration is probably related to the folding and is most commonly manifested by the alteration of garnet and biotite to chlorite and saussuritization of feldspars.

Good glacial striae were not seen on Shaw Massif, but striated pebbles were seen in the moraine debris on the saddle near the northwest tip. The debris on the top of the eastern part of the massif is wind eroded and weathered, and has evidently been exposed to sub-aerial weathering for some considerable time. Similar advanced weathering was seen on other massifs around the Lambert Glacier, notably at Mawson Escarpment, Cumpston Massif, and Mount Rubin; it is to some degree related to lithology. Other observations, such as the local preservation of pockets of till with their clay fractions intact, is interpreted as evidence of a recent retreat and lowering of the local ice cover.

SS40-42/4 MAWSON ESCARPMENT (NORTH)

Clemence Massif

The range of rock types exposed on Clemence Massif is generally similar to that on Shaw Massif, although garnet-rich gneiss is relatively more common. Strongly banded, migmatitic, felsic to intermediate, biotite-quartz-feldspar gneiss and garnet-biotite-quartz-feldspar gneiss, with minor interbanded amphibolite, predominate, but well-banded, garnet-rich gneiss is particularly abundant near the northern tip of the massif. Both crosscutting and subconcordant biotite pegmatites are fairly common, particularly near the northernmost peak where they contain conspicuous grains of magnetite up to about 5 cms across. The gneisses range from massive and leucocratic to well-foliated, biotite-rich varieties, and from even-grained to porphyroblastic. Garnet is a common constituent of both felsic and mafic bands, biotite is ubiquitous, and brown hornblende is common in mafic bands. Microcline, plagioclase, and quartz are the main constituents. Retrograde alteration is evident in some rocks; for example, in a calcium-rich gneiss layer exposed near the northern peak, diopside shows strong alteration to calcite, chlorite and actinolite; other minerals present are orthoclase, andesine-labradorite, and quartz.

Dips on Clemence Massif are mostly at low to moderate angles to the west or south. At the northern end of the massif, the overall dip is at 45° to the west; near the central peak it is generally between 15° and 25° to the south or south-southwest, and at the southern end the dip is about 30° to the west-southwest.

Rb-Sr whole-rock age determination indicate an age of 834 ± 304 m.y. and an initial ratio of 0.7104. The low initial ratio is interpreted as indicating that the rocks have had a short crustal history and that the determined age is that of their formation rather than that of a subsequent metamorphism. The Clemence Massif rocks and correlatives at Dalton Hills, Ely Nunatak, Mount Izabelle, Mount Johns, and Shaw Massif, thus form one of the youngest units in the southern Prince Charles Mountains area (Table 1).

'Dalton Hills' (informal name)

These hills, near the northern end of the Mawson Escarpment, consist of pink, strongly foliated, leucocratic biotite-quartz-feldspar gneiss, dipping at 30° to the west-southwest. The rocks resemble the more leucocratic gneiss of Clemence Massif and are intersected by at least two generations of small pegmatite veins. Some conformable lenses of pegmatite are isoclinally folded and are considered to be, at least in part, older than the dominant foliation; by contrast a younger set of coarser-grained, irregular veins crosscuts the foliation. The major constituents of the gneiss are microcline, plagioclase (typically oligoclase), quartz, and biotite. Plagioclase is usually saussuritized, and biotite shows alteration to chlorite. The subordinate mafic bands contain hornblende, as well as biotite.

Specimens collected from Dalton Hills give a Rb-Sr age of 945 ± 97 m.y. with an initial Sr^{87}/Sr^{86} ratio of 0.7042. This confirms the correlation, made on the basis of similar appearance and composition, of these rocks with those at Clemence Massif, Mount Johns, Shaw Massif, Ely Nunatak, Mount Izabelle, and Bosse Nunatak.

MAWSON ESCARPMENT

For convenience of field work, the Mawson Escarpment was divided into areas from A (in the south) to M (in the north). Areas A to G fall within Sheets SS40-42/8, H to M in Sheet SS40-42/4.

The Mawson Escarpment, the largest continuous exposure of bedrock in the Prince Charles Mountains (or, for that matter, in the whole of Australian Antarctic Territory), is approximately 125 km long and 25 km across at its widest point. It is bounded on the east by the so-called Law Plateau*, and on the west by cliffs up to 900 m high that flank the Lambert Glacier, the world's largest glacier. Tributary glaciers from the Law Plateau and from inside the escarpment flow through the escarpment to the Lambert Glacier and divide it into small areas. The escarpment is exposed because of the geologically recent rejuvenation** and consequent downcutting of the Lambert Glacier; its flat top clearly represents an ancient erosion surface that has been covered by ice, but was not necessarily formed by glacial action (Fig. 2). The top slopes gradually northwards, for example, from 1520 m on Mawson Escarpment C to 1277 m on Mawson Escarpment G; in Mawson Escarpment E, the east-west slope is 100 m over a distance of 7 km. On the Lambert Glacier surface, the slope is from 900 m at Mawson Escarpment A to 550 m at Mawson Escarpment G - a distance of about 50 km. Major rift structures that Soviet geologists (Soloviev, 1972; Ravich, pers. comm., 1973) believe to be associated with the Lambert Glacier-Amery Ice Shelf ice drainage system are purported to pass close to the Mawson Escarpment; they are not exposed.

---

* Studies of ERTS/LANDSAT imagery show that this Plateau largely consists of a large northward-flowing glacier.

** This may also be related to regional Cainozoic uplift in the Lambert Glacier basin and attributed by Wellman & Tingey (1981) to isostatic compensation consequent upon vigorous erosion along major glaciers.

The upper surfaces of the escarpment are covered with felsenmeeren of locally-derived frost-heaved debris, till, and snow and ice fields. Bedrock trends are preserved in the locally-derived debris and can readily be interpreted on aerial photographs. Debris at the edge of the cliffs near the Lambert Glacier is deeply weathered, and rotted, and has obviously been exposed to subaerial weathering for considerably longer than the fresher debris nearer the Law Plateau. Thus, as the Lambert Glacier has cut downwards forming the cliffs at the west of the escarpment, the snow and ice cover on the escarpment has retreated to the east.**

The level of the Lambert Glacier is probably still falling, for tributary glaciers from the Escarpment override the main glacier. Nowhere does an apophyse of the main glacier intrude into a tributary valley as would be expected if ice levels were rising relative to the escarpment. At the foot of the escarpment, there are a few lateral moraines, but these progressively melt into the glacier as it flows north; most moraine debris appears to derive from a few large scree slopes rather than from direct erosion by the glacier. The moraines also are not intruded by the main glacier.

Relatively little is known of the subglacial relief of the area, although a near-surface feature that runs from Mawson Escarpment G to Cumpston Massif beneath the Lambert Glacier is visible on ERTS pictures of the area taken when the sun was low. Glaciological investigations to assess the thickness and flow of the Lambert Glacier - Amery Ice Shelf drainage system are summarized by Morgan & Budd (1975), and Allison (1979).

Throughout the Mawson Escarpment, the best rock exposures are found in cliff faces, although many of the flat top surfaces are covered in locally-derived debris that accurately indicates the nature of the bedrock.

** See previous page.

Record 1981/43

16/09/44

Fig. 2. The flat-topped Mawson Escarpment looking north from near area C. The cliffs are about 900 m high and the distant headland about 45 km away.

Photo: J.W. Sheraton
Negative: M.1475

Mawson Escarpment H. Fieldwork revealed serious errors in the then available base maps of the southern part of this area, some outcrops being shown about 10 km south of their true positions.

In the southwestern corner of the area, banded graphitic marble dips south at 30^{o} and is overlain by an apparently intrusive pegmatitic leucocratic garnet granite. Similar, probably related, rocks occur on the northwest side of Mawson Escarpment area G . The marble and the pegmatite are intruded by grey biotite granite probably related to grey granite mapped at areas F and G that has been radiometrically dated at 590 m.y. Near its contact with the marble, the granite contains scapolite and diopside crystals.

In the east-central part of area H, the felsenmeer cover on the upper surfaces of the outcrops is a mixture of felsic, mafic, and, more rarely, intermediate gneiss debris. Vertically dipping, north-south striking, migmatitic gneisses are exposed in the extreme northern part of the area and contain a number of subconformable amphibolites.

Mawson Escarpment I. The rocks exposed here to some extent resemble those mapped nearby in area G (page 70). Massive, garnet- and biotite-bearing pegmatites, between 5 and 10 m thick, intrude rusty-weathering biotite-rich mafic gneiss, massive grey biotite-quartz-feldspar gneiss, amphibolites, and subordinate diopside and garnet-bearing calc-silicate gneiss. The calc-silicates are particularly abundant in the northeast part of the area where they are intruded by medium-grained white, pink, or grey granites. Dips range from moderate to steep and the dominant strike is east-west.

In the southeast corner of the area pegmatite dykes form a dense network enclosing blocks of country rock probably as small as 30 m square. Patches of similar 'boxwork'-like intrusives are seen along most of the eastern margin of area I.

Mawson Escarpment J. The best exposures in this area, as elsewhere in the Mawson Escarpment, are found in cliff faces: the flatter peneplaned upper surfaces of the escarpment are generally mantled with felsenmeer of locally-derived rock debris. The exposed bedrock resembles that described from areas G and I, and comprises dominant generally leucocratic migmatitic gneiss and interbanded mafic gneiss, amphibolite, and metasediments. Mafic layers are biotite-rich and many contain white feldspar porphyroblasts; garnet is not abundant. Pegmatites, including both massive, discordant and subconcordant foliated types are ubiquitous.

In the southeastern part of the area, massive, poorly-foliated felsic migmatitic gneiss is intruded by even-grained granite and biotite pegmatite. Rusty-weathering biotite-rich metapelites are relatively more common in the northern and western parts of the area, and are interbanded with massive leucocratic gneiss. Diopside-bearing calc-silicate gneiss and marble were mapped in the southwest of the area; the marble is even-grained, contains small well-crystallized flakes of graphite, and sphene crystals up to 1 cm across, and resembles graphite-bearing marbles described from Mawson Escarpment G and H .

Dips are mostly at low angles towards the south or west but complex structures, intruded by numerous pegmatites, are associated with the southwestern marbles.

Mawson Escarpment K . In this area strongly-banded felsic to intermediate migmatitic gneiss is the main rock type; it is generally massive, pegmatitic, and poorly foliated, but interbanded mafic gneiss and amphibolite are well-foliated. Crosscutting, and concordant, foliated biotite pegmatites are both abundant, and there are pink to white granites in the southeastern and central parts of the area, and near Barkell Platform.

The mafic gneisses are generally biotite-rich, but there are garnet-bearing varieties, some that contain feldspar porphyroblasts and others that are strongly lineated. Many of the garnet bearing mafic gneisses are thought to be metapelites, although sillimanite is not common.

In the northwestern part of the area, leucocratic gneisses, some of which may be deformed pegmatites, are locally very massive. They also contain thin, diffuse mafic bands, and are interbanded with garnet-biotite-quartz-feldspar gneiss and pyroxene granulites. Diopside-rich gneiss and garnet-sillimanite-cordierite gneiss also occur, and intrusive pegmatites there commonly contain both garnet and biotite.

Most of the pyroxene granulites are even-grained, massive and intermediate to mafic in composition. In hand specimen, they are characterized by dark brown to black hypersthene crystals and contain thin (up to a few cm) coarser-grained segregations composed of the same minerals as the host rock - including hypersthene, clinopyroxene, and hornblende. The orthopyroxene in these rocks is believed to have formed by reaction of hornblende and quartz: hornblende is almost never seen coexisting with quartz whereas minor quartz is not uncommon adjacent to orthopyroxene.

The dominant strike in much of the northwestern part of the area is northeast-southwest - that is, oblique to the east-west structural trend found through much of the Mawson Escarpment. Dips are commonly near vertical.

Barkell Platform. Strongly banded, grey, quartz-rich gneisses with minor concordant white pegmatite bands, amphibolites, and crosscutting, pink granite dykes are exposed near the Barkell Platform Trig. Station. Mafic granulites and amphibolites, with olive-brown hornblende typical of high-grade metamorphic rocks, are widespread over most of the northern part of the Mawson Escarpment, but the Barkell Platform amphibolites contain green hornblende characteristic of middle to lower amphibolite-facies metamorphism. They are thought to be the local retrogressed equivalents of the nearby higher grade rocks.

Mawson Escarpment L. At the southwest end of area L, brown, migmatitic, biotite-quartz-feldspar gneiss, subordinate granitic gneiss, and concordant amphibolite are interlayered in coarse lit-par-lit fashion with red-weathering granite and white pegmatite, both of which may have been formed by local anatexis. Complex folds are locally present in the gneisses and some thin, older pegmatite veins are ptygmatically folded, although younger pegmatites appear undeformed. Some biotite-rich gneiss is of pelitic origin and contains cordierite porphyroblasts, but muscovite is absent. This, together with the widespread occurrence of calcic plagioclase (An_{40}), the presence of orthoclase (in places inverted to microcline), the olive-brown hornblende of the amphibolites, and the probably anatectic granites and pegmatites, indicates metamorphic grade at least as high as the upper amphibolite facies.

In the northeast corner of area L, banded biotite-rich, augen gneiss with subconcordant leucocratic lenses is exposed at gravity station 73070239. About 100 m south of this locality, a red gneissic granite crops out and a coarse, white, garnet-bearing pegmatite is exposed on the north side. Muscovite is absent from these rocks, which are therefore also thought to have formed under upper amphibolite-facies conditions. The geology of this part of area L in some respects resembles that of the 'Dalton Hills' (p. 22) about 16 km to the north.

Interbanded migmatites, amphibolites, and granulites are exposed in the north-central part of area L, about 10 km west of gravity station 73070239. Hypersthene is present in a mafic pegmatitic rock, and hypersthene-bearing ultramafic gneiss was collected from a 30 m thick band of dark, iron-stained rock interlayered between amphibolites and leucocratic migmatites. The amphibolites are spectacularly intruded by acid pegmatites of possible anatectic origin. Metamorphic conditions in the area were thus evidently high grade - probably at least upper amphibolite facies and sufficient for the local development of hypersthene in rocks of appropriate composition. Rb-Sr biotite ages from this area reflect the widespread 500 m.y. thermal event detected at many localities in the southern Prince Charles Mountains, although the main metamorphism was probably at about 1000 m.y. ago.

<u>Mawson Escarpment M.</u> Granulite facies rocks occur throughout area M; they also occur in the nearly northern part of area K and possibly in the north-central part of area L.

In the western corner of area M, the most common rocks are mesocratic, migmatitic, locally garnet-bearing biotite-quartz-feldspar gneisses, intruded more or less parallel to the vertical, east-northeast foliation, by coarse leucocratic pegmatites. One such pegmatite intersects a prominent concordant 3 m thick band of mostly fine-grained mafic granulite that is, like most other mafic granulites in MacRobertson Land, brownish coloured due to its hypersthene content. In the granulite, hypersthene and diopside are subordinate to olive brown hornblende, plagioclase is of labradorite composition, and quartz is absent. Pegmatitic veins within the main mass of the granulite consist of orthopyroxene, clinopyroxene, and bytownite, but lack hornblende. Why the veins contain minerals more refractory than those in the host rock is not yet explained. A thinner layer of melanocratic rock about 10 m away from, and parallel to, the basic granulite just described is relatively much richer in clinopyroxene and may, like other conformable melanocratic rocks in the area, be of calc-silicate origin.

Further north along the elongate western side of area M, slightly migmatitic quartz-rich metasediments are intersected by at least two generations of pegmatite dykes. Basic granulites also occur, and generally contain less hornblende and more orthopyroxene than those described above. One large mafic layer interbanded between a leucocratic gneiss and a garnet-rich pelitic gneiss may be of sedimentary origin.

In the southwestern corner of area M, flat-lying, light to dark coloured, hypersthene-poor gneiss, interlayered on a scale ranging from a few cm to several metres, is crosscut by thick veins of leucogranite. One mafic granulite contains the assemblage cordierite-hypersthene-anthophyllite and thus differs markedly from normal mafic granulites: it is the high-grade equivalent of a cordierite-anthophyllite rock.

Mafic rocks and apparently conformable garnet leucogneiss occur in the southeastern part of area M. They are folded, and intruded by coarse-grained leucocratic pegmatites. Mafic rocks of two distinct compositions are present - one is a brown, fine-grained hornblende-bearing two-pyroxene granulite, the other a blue-grey diopside-plagioclase rock. The latter is a metamorphosed calc-silicate, whereas the hornblende granulites contain assemblages more typical of metamorphosed mafic igneous rocks.

SS40-42/6 MOUNT MENZIES

Mount Bayliss

Mount Bayliss was first visited by Trail (1963) who described the geology in detail and drew a schematic cross section; mapping at Mount Bayliss during 1973 confirmed Trail's account.

Extensive moraine fields, as distinct from almost in-situ felsenmeer, surround Mount Bayliss and record ancient ice flow patterns. Roches moutonées and glacial striae roughly parallel to present day ice flow directions were observed on the small nunatak at the west end of Mount Bayliss, and a spectacular glacial erosion surface is exposed along the southeast face of the mountain.

Aerial inspection of the northern face showed that the amphibolite which lies on top of much of the mountain is exposed in cliff sections near the northwestern tip. Light-coloured dykes that intersect the amphibolite are probably pegmatites.

Towards the eastern end of the mountain, the amphibolite is underlain by grey to pink, massive augen gneiss that dips at low angles to the north-northeast and is thought to be a deformed, metamorphosed granite. It is exposed towards the eastern end of the mountain and its main constituents are quartz, microcline, altered plagioclase, and chloritized biotite, with common accessory epidote and sphene: one specimen also contains small amounts of dark green strongly pleochroic hornblende (?ferrohastingsite). The gneiss is cut by sheared, but slightly discordant amphibolites and pegmatites, as well as by an unusual mafic alkaline dyke which is fresh and retains an igneous texture. It consists of K-richteritic amphibole (magnophorite) (pleochroic from pale yellow to pink), arfvedsonite (usually moulded around magnophorite), brown micas (biotite and phlogopite), and alkali feldspar, with accessory anatase, opaques, and apatite. Detailed petrographic and geochemical studies of this rock, which has strong affinities with the originally leucite-bearing mafic rock described by Trail (1963) from Mount Bayliss, are described by Sheraton & England (1980).

Whole rock Rb-Sr geochronological studies indicate an age of 2809 $\pm$ 411 m.y. for the augen gneiss and an initial $^{87}Sr/^{86}Sr$ ratio of 0.708. The age may be either that of the deformation that gave the rock its present texture or of the intrusion of the parent rock. Potssium-Argon geochronology studies of the alkaline intrusive dyke give ages of about 420 m.y. (see Appendix II).

Mount Mather

A white quartzite unit, probably related to, and correlated with, the white quartzites described from the summit area of Mount Menzies by Trail (1963), and Tingey & England (1973), caps Mount Mather and is presumed to overlie the banded migmatitic rocks exposed at the base of the southwest corner of the mountain. The contact between the two units is not exposed, but both strike in about the same direction and appear to be structurally concordant. Both the migmatites and the quartzite are intersected by metamorphosed basic dykes, and probably related amphibolites are interleaved with the quartzite.

The quartzite unit grades upwards into impure quartzite and interbedded finely laminated pelitic schists, which are well exposed, although intensely deformed, near the northeast tip of the mountain. In this outcrop, the schists are squeezed out and boudinaged between more competent bands of impure quartzite. Calc-silicate gneiss similar to that found in association with the white quartzites at Mount Borland and Mount Menzies was found together with quartzite float at the southwest corner of the mountain, but not in outcrop.

Mineral assemblages in the quartzites and pelitic schists commonly include kyanite (locally altered to pyrophyllite), blue-green hornblende, garnet, chlorite, biotite, and muscovite. They indicate lower amphibolite-facies metamorphism; there is no evidence for earlier higher-grade metamorphism.

The migmatitic rocks near the southwest tip of the mountain are probably related to more massive granitic rocks seen in an inaccessible cliff exposure about 200 m to the northeast. They include biotite-quartz-feldspar gneiss, two distinct types of amphibolite, mafic gneiss, and pegmatite, and are intersected by pink biotite granite dykes that do not intersect the overlying quartzites. Samples of the granite dykes have yielded a poorly defined Rb-Sr whole rock isochron age of 1780 m.y.

Petrographic and field evidence suggest that the migmatitic rocks at Mount Mather resulted from upper amphibolite-facies metamorphism, probably accompanied by anatexis. Alteration of garnet to chlorite and biotite, conversion of brown biotite to green biotite, and alteration of other mafic minerals to epidote and plagioclase are all evidence for subsequent retrograde metamorphism, which are also affected by the granite dykes.

Both the migmatitic basement rocks and the quartzites are cross-cut by amphibolitized basic dykes; concordant amphibolites interleaved with the quartzites were probably emplaced as basic sills at the same time. The amphibolites contain blue-green hornblende characteristic of lower amphibolite-facies metamorphism, but there are no signs of previous higher-grade metamorphism.

Thus, although the basement rocks and quartzite-rich metasediments at Mount Mather are in apparent structural conformity, there appears to be a distinct difference in the metamorphic history of the two units. The structural conformity may have been imposed by the effect of a possible low-angle thrust that caused the severe distortion of pelitic metasediments at the northeast corner of the mountain and might be related to the nappe seen on Mount Menzies by Tingey & England (1973). The basement rocks have undergone upper amphibolite-facies metamorphism, intrusion of granite dykes, and retrograde metamorphism, but the quartzites and crosscutting and conformable amphibolites only show signs of lower amphibolite-facies metamorphism. The retrograde metamorphism of the basement rocks could be related to this.

The Rb-Sr age data is too unreliable to be of much use, and the indicated age about 1800 m.y. is much less than the age of the quartzite unit at Mount Stinear (2580 m.y.) with which the Mount Mather quartzites are correlated on the bases of similar lithology and stratigraphic position. If the granite dykes at Mount Mather are younger than the quartzites, then the fact that they do not intersect the latter could be interpreted as evidence for the quartzites having been emplaced on top of the basement rocks by faulting, possibly the thrust faulting referred to above.

Mount Menzies

(See also Tingey & England, 1973)

On the western flank of the great northern cirque of Mount Menzies, green quartzites, white kyanite-bearing quartzites, and concordant amphibolites constitute the upper limb of a nappe structure that moved southwards. Tingey & England (1973) considered these rocks to be the lower limb of a nappe which moved northwards. Sedimentary structures in the quartzites demonstrate that the rocks are the right way up and thus more likely to be part of the upper limb of a southward directed nappe. Tingey & England (1973) considered that a zone of severely-disturbed and distorted rocks about 2 km north of Pardoe Peak might be the root zone of the northward-moving nappe, but it is now interpreted as the nose of the southward-moving nappe. Interpretation of the structure of this area is particularly difficult as the best outcrops are in large, inaccessible, vertical cliff faces that are not easily photo-interpreted. The greenish quartzites are a distinctive member of the Mount Menzies sequence and commonly contain the chromium mica fuchsite.

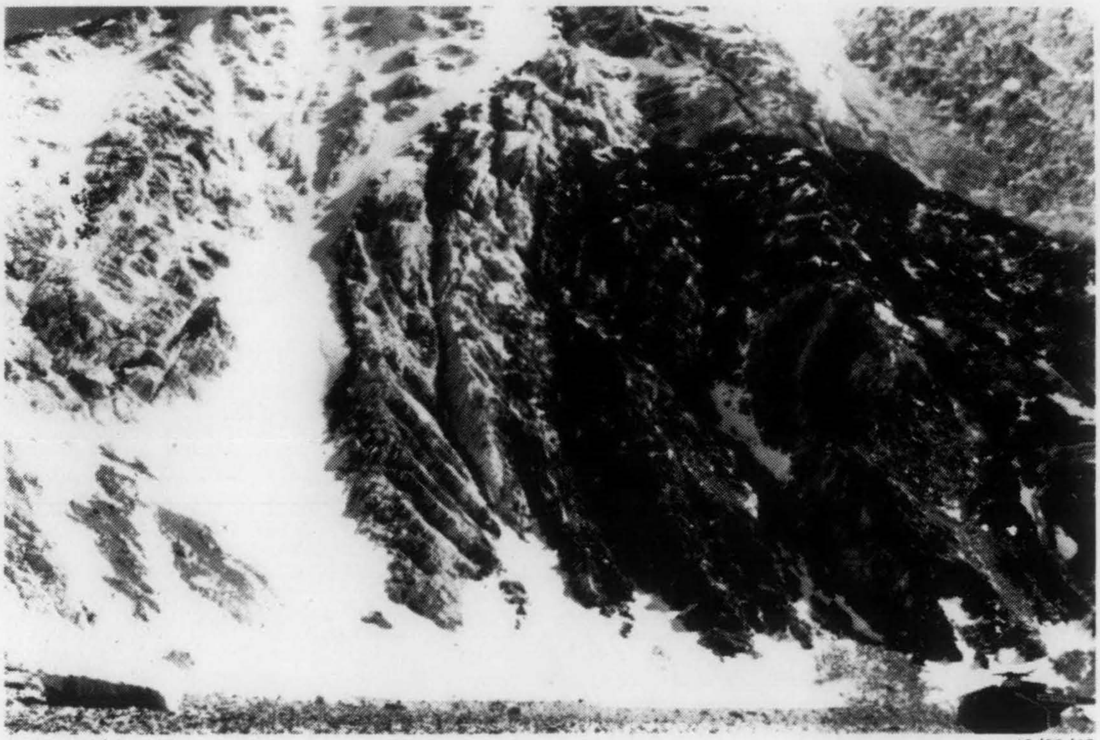
The green quartzites, some of which are cross-laminated, are interbedded with minor chlorite-biotite-garnet schists, and rare staurolite schists. Locally, garnets are replaced by clots of biotite. Green fuchsite-bearing quartzites are widespread in the southern Prince Charles Mountains and are known from Mount Mather, Mount Borland, south Mawson Escarpment, Cumpston Massif, Mount Rymill, Mount Stinear (Tingey & England, 1973), and from Mount Ruker, where they are associated with banded iron formations.

At the northwestern tip of Mount Menzies, tightly-folded impure kyanite quartzites and semi-pelitic schists are exposed. The schists contain epidote, carbonate, biotite, chlorite, muscovite, quartz, and opaques. Garnet is present in some specimens, but has been replaced in others by chlorite and/or biotite.

Large and small-scale folding is common in schists exposed in a spur north-northwest of Pardoe Peak on the northern face of the mountain. Axial-plane foliation is developed locally, and a strong lineation dips roughly north at angles between 20^{o} and 40^{o} - parallel to minor fold axes. The schists contain biotite, chlorite, muscovite, quartz, and opaques, and some have epidote and carbonate. Garnet is present in some samples, in others it has been replaced by chlorite and/or biotite. Calcareous schists are relatively abundant, and rusty-weathering impure marbles and associated more schistose rocks that contain abundant amphibole (actinolite or tremolite) and epidote, resemble rocks mapped near the southern tip of the Mawson Escarpment. Rusty-weathering marbles were also found at Mounts Bayliss, Borland, and Mather and elsewhere on Mount Menzies.

Rocks similar to those described from the northwest end of Mount Menzies are exposed at the base of the northeast corner of the mountain. They include tightly folded garnet-muscovite-biotite schists, psammitic schists, and quartzites. Some of the schists contain abundant actinolite, and many of them exhibit patchy, localised recrystallisation manifested by the development of randomly oriented actinolite crystals, and obliteration of the foliation. A strong lineation developed on foliation planes of schistose metasediments may be evidence of multiple folding. Some of the quartzites at this locality are relatively coarse-grained (up to 2-3 mm), most contain biotite and muscovite, but no kyanite was observed. Crosscutting amphibolites, presumably originally intruded as basic dykes, and concordant amphibolites that were probably emplaced as sills both occur here.

Green and white quartzites, interbedded with grey-brown quartzites with minor pelitic layers, crop out at the western end of Mount Menzies together with concordant amphibolites. Crosscutting amphibolites are rare but suggest an intrusive origin for all the metabasic rocks. On the north side of a prominent ice fall, one concordant amphibolite was examined in detail: its centre consists of massive black amphibolite with green hornblende, and plagioclase (An_{40}), but the margins are pale green, weak and fissile, and consist largely of sericite, chlorite, carbonate, and opaques. Actinolite-bearing quartz veins are common within the amphibolite, particularly near the edges, but do not penetrate far into the adjacent quartzites. The alteration at the margins of the amphibolites, and probably also the quartz veins, are thought to be due to retrograde alteration during deformation.



Record 1981/43 16/09/45

Fig. 3. Folded quartzites and metasediments at the southeast corner of Mount Menzies.

Photo: R.J. Tingey
Negative: GB1088

400 m north of this locality, grey-green calcareous schists invaded by basic rock - now converted to amphibolite - occur with strongly banded garnet-biotite-chlorite-actinolite schists, black flinty rocks, and garnet-rich layers. Brown calc-silicates from here resemble those from the northern side of Mount Menzies, and elsewhere in the southern Prince Charles Mountains. In some of the metasediments, sedimentary features that resemble fluting, cut-and-fill structures, and graded bedding are preserved despite the lower amphibolite-facies metamorphism. The general strike is north-northwest and dips are near-vertical.

The southern side of Mount Menzies is largely ice-covered, and the only exposures are on inaccessible ridges (arêtes) between neighbouring ice falls. Dips appear to be generally near-vertical, and the commonest rocks quartzite and amphibolite.

Near the southeast corner of Mount Menzies, the core of a large anticline is beautifully exposed in a small cirque (Fig. 3). The folded rocks are quartzites, pelitic quartzites and pelitic schists; cross laminations in a quartzite layer confirm that the fold is an anticline with a near-vertical axial plane foliation that strikes 030. A large shear zone that intersects the cliff face above the fold nose and the fold itself may be related to nappe structures seen near Pardoe Peak (cf. Tingey & England, 1973) and the recumbent fold structures seen elsewhere in the southern Prince Charles Mountains.

England Nunatak near the southern tip of Mount Menzies, consists of dark green metabasic rocks, with a foliation that strikes 110 and dips 80°S.

The 1973 mapping at Mount Menzies showed that the retrogression of kyanite to chloritoid and chlorite (cf. Tingey & England, 1973) is confined to a small area near the summit of the mountain. The structure of Mount Menzies is highly complex, as is the range of rock types and their geological history: to date only a very general survey of the Mountain has been possible and further work is clearly required. Mount Menzies as the highest mountain in the Prince Charles Mountains has probably had a unique glacial-geomorphological history. A preliminary account of this is given by Derbyshire & Petersen (1978) while Wellman (in press) interprets moraine tide marks in north facing cirques on Mount Menzies as possible evidence for glacial surging of the Fisher Glacier.

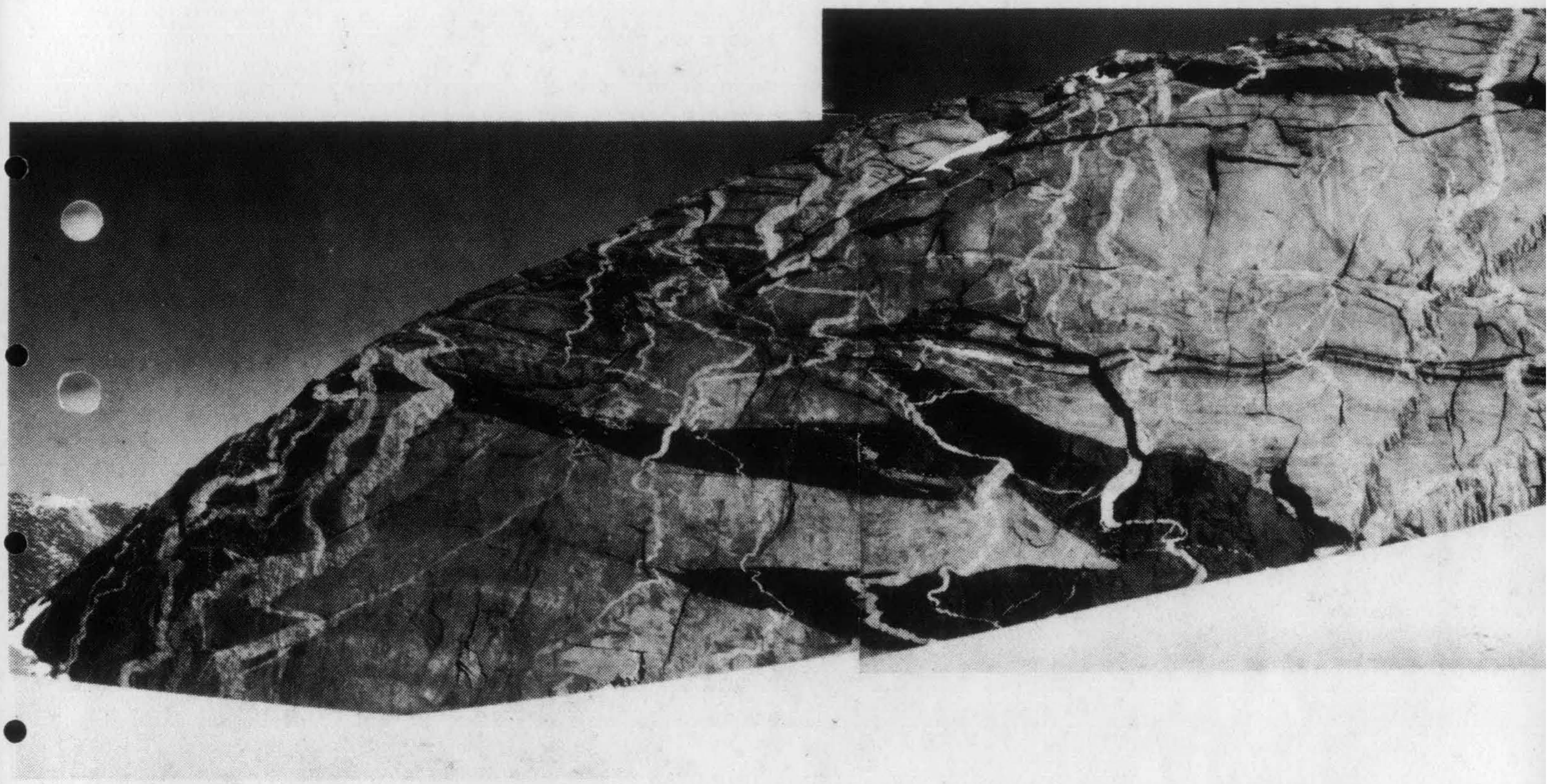
Mount Scherger

Ruker (1963) visited Mount Scherger in 1960 and reported outcrops of quartz-feldspar schist that he thought resembled rocks he had examined at Mount Dummett, Mount Seddon, and Mount Rymill. Tingey visited Mount Scherger in 1972 and collected specimens of mica schist, pegmatite, and adamellite (Tingey & England, 1973). The mica schists contain conformable quartz veins that locally contain kyanite, biotite, and muscovite. Some of the kyanite is altered to sillimanite (var. fibrolite) by the contact metamorphic effect of crosscutting felsic intrusives.

In 1973, Mount Scherger was mapped in more detail by Australian geologists and was visited by a Soviet geological party that camped at nearby Mount McCauley. Brown micaceous metasediments similar to those examined in 1972 are exposed on the northern face of the mountain; they also contain conformable, locally kyanite-bearing, quartz veins. The metasediments and quartz veins are isoclinally folded, and intersected by successive intrusions of muscovite pegmatite, granite, and pegmatite dykes. Neither concordant nor discordant amphibolites were seen in the metasediments. (Possible correlations of the metasediments of Mount Scherger and Mount McCauley are discussed later.)

A small nunatak at the northeast tip of Mount Scherger contrasts with the rest of the mountain in that it consists of foliated biotite-quartz-feldspar gneiss which is intersected by amphibolite dykes. The gneiss and amphibolites were folded together and metamorphosed to amphibolite-facies grade before the successive intrusion of biotite pegmatites and aplites (Fig. 4).

The contact between the brown metasediments and the felsic gneiss is not exposed, but the gneiss is thought to be the basement upon which cover sediments (now metamorphosed) were laid. Similar basement-cover relationships are also exposed at Mount McCauley and elsewhere in the southern Prince Charles Mountains. The crosscutting acid intrusives at Mount Scherger are correlated with similar intrusives at Mounts McCauley and Dummett that have been dated at 490 m.y. (Appendix II).



Record 1981/43 16/09/46

Fig. 4. Basement gneiss and amphibolite intersected by pegmatites at a small nunatak at the northeast tip of Mount Scherger.

Photos: R.N. England
Negatives: GA9691, 93

SS40-42/7 CUMPSTON MASSIF

Cumpston Massif

Cumpston Massif, a large flat-topped massif bounded by near-vertical 1000 m high cliffs, lies at the confluence of the Mellor and Lambert Glaciers, and is a prominent landmark in the southern Prince Charles Mountains. It had never been visited before the 1973 field season. The best rock exposures are in the cliffs and therefore mostly inaccessible, and the top of mountain is mostly covered by ice and snow, although loose, locally-derived rubble and scattered small outcrops occur near the cliff edges. These outcrops are quite deeply weathered and wind eroded, and honeycomb weathering was seen in places; they have evidently been exposed and free of permanent ice cover for some time, but some glacier-polished surfaces and striae were found. Access to the base of the cliffs is possible but falling rocks are a potential hazard. In the middle of the day considerable rock falls result from loosening by the sun's heat: the falls are mostly confined to well defined scree slopes and the majority can be easily avoided.

At Patrick Point, the northern tip of the Massif, isoclinally-folded leucocratic gneiss, biotite-quartz-feldspar gneiss, and minor interbanded amphibolite and basic gneiss are intruded by discontinuous amphibolites, biotite pegmatites, and concordant quartz-epidote veins. Prominent, thick (up to 100 m) northwest-striking black metabasics obliquely intrude the whole sequence further south along the east face of the massif and were first noted by McLeod (1959). They are deformed and foliated, but obviously of intrusive origin. The concordant amphibolites at Patrick Point range in thickness from a few centimetres to several metres and may be either interbanded metasediments, conformable thin intrusives, or more probably sheared-out, originally crosscutting intrusives. Stages in the shearing out of originally discordant basic intrusives are well exposed along the east face of the massif with obvious dyke forms to the south and concordant remnants to the north. Fig. 5 illustrates an intermediate stage in the sequence, Fig. 6 an advanced one.

Further south along the eastern cliffs of Cumpston Massif, compositional layering in the leucogneiss is more prominent and discordant basic rocks common. 8 km south of Patrick Point, green fuchsite-bearing quartzites with some garnetiferous layers are overlain by a pure white quartzite and crosscut by thick metabasics presumably of intrusive origin. This quartzite sequence resembles that described from the summit area and great cirque of Mount Menzies (this Record and Tingey & England, 1973) except that there are markedly fewer concordant metabasics. The white quartzites strike roughly SE - that is, parallel to the axis of Cumpston Massif; they also are exposed in its southern cliffs.

Weakly metamorphosed biotite quartzites, in which current bedding, ripple marks, and mud cracks are preserved, are exposed near and at the southeastern tip of Cumpston Massif. They are probably the youngest rocks in the local stratigraphic sequence, and are correlated with other low grade quartzites mapped at Mount Rubin (see Tingey & England, 1973) by virtue of their similar composition and deformation and the lack of either concordant or discordant basic intrusives.

Although the broad sequence of acid gneiss - 'Menzies quartzite - 'Rubin' quartzite can be distinguished in the eastern cliffs of Cumpston Massif, and is undoubtedly thick, estimates of the actual thickness and determination of stratigraphic relationships is hindered by the inaccessibility of outcrops and probable structural complications. Although most of the rocks have approximately the same orientation and apparent dips are gentle and towards the south, true dips are steep and southwestwards. Isoclinal folding is evident throughout the sequence, and considerable unconformities may be obscured by the strongly-developed axial-plane foliation.

Few outcrops were visited in the central part of Cumpston Massif, but photogeological studies show that some of the large metabasics can be traced to the western side of the mountain, as can at least part of the ;Menzies' quartzite sequence. However, in places, the metasediments appear to be truncated on the west side by a foliated granite; the contact was not examined in the field, but is interpreted as a fault (Plate 2).

Fig. 5. Sheared out metabasics exposed on the eastern side of Cumpston Massif. These rocks were originally emplaced as discordant basic intrusives but have been sheared out to become almost subconcordant to the metamorphic foliation. The cliff face is about 500 m high.

Photo: R.N. England
Negative: GA9708

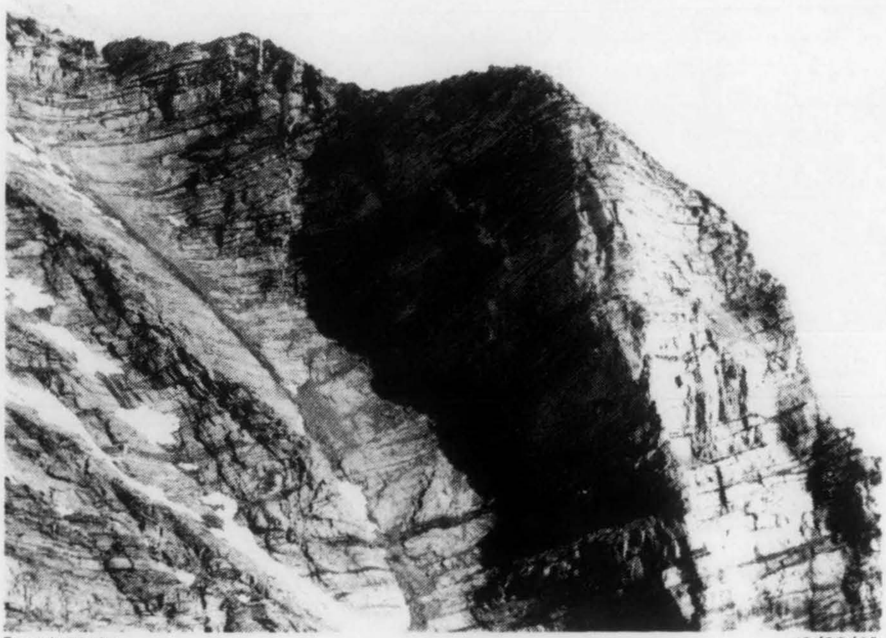


Fig. 6. Intensely folded and sheared leucogneiss and amphibolite near the northwest tip of Cumpston Massif. These rocks represent the more advanced stage of the shearing out process illustrated in Fig. 5.

Photo: R.J. Tingey

Negative: M.1470

In the northwest part of the Massif, between Patrick Point and the large tributary glacier that drains west from Cumpston Massif into the Mellor Glacier, tightly and complexly-folded biotite leucogneiss, with conformable amphibolites, quartz-rich metasediments, and pegmatites, strike about east-west and dip to the south. They are crosscut by a few thin pegmatites and appear to grade southwards into banded garnet, staurolite, and muscovite-bearing pelitic gneiss, with both concordant and discordant amphibolites that contain blue-green hornblende characteristic of lower amphibolite-facies metamorphism. One pelitic gneiss contains the assemblage staurolite + kyanite + garnet + cordierite + biotite + quartz, which, if in equilibrium, would be univariant. Univariant metamorphic assemblages are exceedingly rare, and it is more likely that this one is not in equilibrium but has resulted from the combined effects of an early high-grade cordierite-garnet metamorphism and a later, retrograde, kyanite-staurolite grade event. The partial replacement of garnet by chlorite also indicates retrogression but may be the result of an even later metamorphism.

The western part of Cumpston Massif, south of the large tributary glacier, consists almost entirely of generally massive pink biotite-quartz-feldspar gneiss and discordant amphibolites. The gneiss is weakly foliated, but a local schistosity is developed particularly near amphibolites. The gneiss is considered to be a deformed intrusive which ranges in composition from granite to granodiorite; its principal ferromagnesian mineral is biotite but hornblende (?ferrohastingsite) is also common.

Amphibolites constitute about 5 percent of this part of the massif and were emplaced as a complex network of dykes. They divide the massive felsic granite gneiss into roughly ellipsoidal blocks, and are foliated and deformed; none appear to retain any original igneous textures. Contacts with the gneiss are now mostly gradational over about 1 metre as both rocks have been deformed together. Some of the more deformed amphibolites are rich in biotite and, in one example, microcline; they may be an early generation of dykes into which potassium has been introduced from the surrounding gneiss. The less-deformed amphibolites contain less biotite and may represent a second generation of dykes. Alternatively, there may be only a single suite of dykes, the extent of K metasomatism merely being a function of the degree of deformation.

Enclaves , some up to several hundred metres wide, are contained within, and have the same foliation as, the felsic gneiss. Their relationships with the gneiss are obscure; they may be large xenoliths, deformed roof pendants, or downfaulted or thrust blocks of country rock. They include impure quartzites, calc-silicate gneiss, metapelites, and banded biotite-quartz-feldspar gneiss. Dips are generally northeast at about 10 or 15°. Should the granite gneiss be as old as similar gneisses in the southern part of the Mawson Escarpment, the metasediments, if xenoliths, would probably be more than 3000 m.y. old.

Greenall Nunatak (informal name)

Greenall Nunatak, a small outcrop south of Mount Rubin and northeast of Mount Bird, consists of migmatites and banded biotite-quartz-feldspar gneiss, with interbanded pegmatites and minor lenses of amphibolite, all intersected by small veins of quartz-feldspar pegmatite about 20 mm thick.

These rocks do not contain muscovite, and are probably of upper amphibolite-facies grade. They contrast markedly with the low-grade metasediments that crop out nearby at Mount Bird and those at Mount Rubin and Mount Ruker, and are probably a local exposure of the basement rocks of the area.

Glacial striae are well preserved on top of Greenall Nunatak and are aligned about 060 - roughly parallel to the modern flow of the nearby Collins and Mellor Glaciers.

Keyser Ridge

Keyser Ridge was approached by Trail (1963), but severe crevassing on the Geysen Glacier prevented his party from getting there. It consists of a central dome with ridges running northeast and southwest, and its southern side is covered with wind-fluted ice domes and snow fields; extensive moraine fields, in which patterns of ice recession are recorded, occur near the northeast tip. Most of the limited outcrop in the northeast part of the ridge consists of amphibolite and good glacial striae are preserved in roches montonées at a small nunatak at the northeast tip.

The northeast side of the summit ridge consists of dark grey biotite schists, semi-pelitic schists, quartzites, and both foliated and massive amphibolites. Exposure is poor, but bedrock patterns are preserved in frost-heaved debris that covers the flatter surfaces: bigger exposures can be seen in cliff faces on the northern face of the ridge, but they are not accessible. Near the summit, southwest of the locality just described, much of the surface debris is white leucocratic biotite gneiss with pegmatite veins, some concordant, and others discordant.

Migmatitic gneisses, and coarse-grained, slightly foliated biotite-quartz-feldspar gneiss, much of it leucocratic and poorly banded, are exposed in cliffs at the northwest side of the central dome. Biotite schists are also present and amphibolites, many boudinaged, and intruded by numerous pegmatites, are common. Undeformed pegmatites, up to 5 metres thick, are abundant and contain biotite, muscovite, tourmaline, some garnet, and, more rarely, beryl. Locally, some such pegmatites appear to grade into, and may therefore have developed by melting of, massive slightly foliated gneiss. The metasediments and migmatites of the central dome strike about 345° and dip nearly vertically.

At the southwest end of Keyser Ridge, leucocratic gneisses, interlayered metasediments (including calc-silicates), and minor concordant amphibolites, strike about 280, dip south at 50°, and are intruded by two generations of discordant coarse-grained pegmatites. The less deformed younger pegmatites are rich in tourmaline and crosscut by late stage veins of siderite. Tourmaline-rich bande in the metasediments may be related to the pegmatites.

About 300 m northeast of this locality - towards the central summit - alkali-feldspar-rich pegmatitic, muscovite granite is exposed in roches moutonées that protrude from a mantle of loose debris comprising locally-derived frost-heaved rocks and transported glacial erratic. Kyanite-staurolite-chloritoid schists are common in the debris and are thought to be of local origin; it is not possible to tell if the chloritoid is in equilibrium with the staurolite or of later retrograde origin.

The basement rocks at Keyser Ridge are correlated with those at Mount Newton and Mount Bird on the basis of broadly similar rock types, the presence of concordant amphibolites, and the presence of tourmaline-bearing pegmatitic muscovite granites. They differ markedly from the rocks exposed at the nearest mountain to Keyser Ridge - Mount Ruker.

Rb-Sr muscovite ages of 2000 m.y. and 1700 m.y. have been obtained from specimens collected at Keyser Ridge, and a similar but poorly defined age has been obtained from deformed pegmatitic rocks at Mount Newton. The late-stage tourmaline-bearing pegmatites at Keyser Ridge are probably related to the 500 m.y. intrusive episode detected throughout the southern Prince Charles Mountains area; a tourmaline-bearing pegmatite at Mount Cresswell gives an ill defined muscovite age of about 500 m.y.

Mount Bird

Mount Bird consists of two conical hills aligned along a NE-SW axis and a flat rock bench at the northeastern end. Good glacial striae are preserved on roches moutonnées over much of the mountain, and indicate ancient ice flow patterns more or less parallel to those of the present day.

Bedrock is well exposed on the hills but the bench is mostly covered by loose, locally-derived rock debris. Most of the mountain consists of well-bedded metasediments, minor concordant amphibolites, and some crosscutting amphibolites, intruded by tourmaline-bearing pegmatites. The metasediments have low-grade greenschist-facies mineral assemblages resulting from retrograde metamorphism and generally resemble greenschist facies metasediments previously mapped at Mount Newton (Tingey & England, 1973).

The southern peak of Mount Bird consists of banded grey-green metasediments, including pelitic (schists) and calc-silicate schists with minor concordant and discordant amphibolites. These rocks are intruded by both discordant and subconcordant tourmaline-bearing muscovite pegmatites which are crosscut by veins of siderite up to 5 mm thick. Some of the metasediments have a distinctive spotted appearance identical to rocks mapped at Mount Newton (Tingey & England, 1973). The assemblage quartz + relict garnet + chloritoid + sericite + relict sillimanite + chlorite is typical of the pelitic metasediments on the southern peak of Mount Bird and, like the low grade rocks at Mount Newton, is the product of retrograde metamorphism upon originally higher-grade garnet-sillimanite-bearing rocks.

Similar rocks were mapped on the northern peak and in the rock bench at the northeastern end of the mountain. Retrogression was evidently more intense in this latter area, and deformation of the pegmatites, including distortion and fracturing of tourmaline crystals, clearly indicates that it occurred after these pegmatites were emplaced.

Greenschist-facies metasediments from all parts of Mount Bird contain very similar retrograde mineral assemblages, but retrogression in the amphibolites was evidently less uniform. For example, some amphibolites are mattes of fine-grained actinolite and chlorite, whereas others contain the higher-grade assemblage hornblende + cummingtonite + garnet + plagioclase.

Because of their similar appearance, lithology, and metamorphic grade, the rocks at Mount Bird are correlated with those examined previously on the southern part of Mount Newton (Tingey & England, 1973). In some respects they resemble rocks mapped at Mount Cresswell and are also correlated with those described in this Record from Keyser Ridge.

Mount Dummett

Mount Dummett consists of narrow arêtes in its eastern part, but broadens out to the west where there is a flat bench on which bedrock is exposed in roches moutonnées surrounded by loose rock debris including both locally derived and transported rocks. The bench is bounded by ice and snow-covered cliffs to the south, and to the north by cliffs that provide the best bedrock exposures on the mountain. The northern faces of the central and eastern parts of the mountain also provide good exposures, but elsewhere bedrock exposure is confined to the tops of narrow ridges and arêtes.

The main rock types at Mount Dummett are low-grade, well-banded schists, with some marbles, conglomerates, and quartzites; a small intrusive stock of unfoliated muscovite granite and associated dykes of beryl-bearing muscovite pegmatite is exposed at the western end of the mountain. The main geological features of Mount Dummett as outlined above were first described by Ruker (1963) and a few rocks were collected in 1972 (Tingey & England, 1973).

Green epidote-rich, and brown calcareous schists, and quartzites, which crop out on the northeastern spur of Mount Dummett, resemble the calcareous metasediments of Mount Rubin (Tingey & England, 1973; this Record), but are probably of slightly higher metamorphic grade. On the eastern spur, impure carbonate-rich quartzites and quartzite pebble conglomerates are common, and contain thin sigmoidal quartz veins.

On the southern spur of the mountain, well-bedded calcareous metasediments, containing the biotite-grade, greenschist facies assemblage biotite + calcite + epidote + potash feldspar + magnetite + quartz, dip 45° SE and strike 070°. They are interbanded with minor quartz-rich layers and intruded by a few pegmatites that are probably related to the larger intrusives at the western end of the mountain. These calcareous metasediments particularly resemble rocks mapped at Goodspeed Nunataks F and G, and at the northeastern tip of Mount McCauley.

Most of the central part of Mount Dummett consists of well-banded calcareous schists, the commonest type being dark grey biotite schist with prominent large, randomly orientated plates of biotite. Many bands are grey-green and contain abundant epidote, with or without actinolite/tremolite; others are diopside-rich, and a few are composed almost entirely of this mineral. Locally, small pods of pinkish marble are common and one example contains minor chalcocite mineralisation.

Unfoliated muscovite leucogranite, and beryl-bearing pegmatites intrude green and brown impure quartzites, pelitic schists, marbles, and calc-silicates at the western end of Mount Dummett. They closely resemble, and are clearly related to, intrusives at Mount McCauley that have given a Rb/Sr muscovite age of about 500 m.y. (Appendix II), and 490 m.y. (Halpern & Grikurov, 1975).

The metasediments in this part of Mount Dummett are predominately brown, in contrast to the dark olivine-green colour of other outcrops. The colour difference might be attributable to contact metamorphism around the intrusives although this is difficult to prove from petrographic work. For example, low-grade greenschist-facies assemblages are found quite close to the intrusives, and some greenish quartzites 20 m from the contact have the low-grade assemblage quartz + epidote + actinolite.

High-grade assemblages are, however, developed in rafts of metasediment almost totally enclosed by intrusives, and sillimanite (var. fibrolite) has formed in pelitic schists at the expense of muscovite, chlorite, or, in one example, of kyanite. If the formation of fibrolite in place of kyanite is, as seems likely, a contact metamorphic effect the kyanite may be of regional metamorphic origin and presumably a product of the metamorphic episode that produced greenschist facies assemblages at other outcrops on Mount Dummett. Kyanite is also known at nearby Mounts McCauley and Scherger and may likewise have been produced there in a locally higher grade ramification of the more widespread late Proterozoic greenschist facies metamorphism. Alternatively the kyanite, which is only found in brownish coloured rocks close to granitoid intrusives could have formed during granitoid emplacement as a result of local shearing and been subsequently contact metamorphosed.

The schists and other metasedimentary country rocks at Mount Dummett are correlated with low-grade metasediments at Mount Rubin, Mount Seddon, Goodspeed Nunataks, and possibly Cumpston Massif, Mount Maguire, and Blake Nunataks, on the bases of lithological similarity, similar metamorphic grade, and lack of crosscutting metabasics. They are thought to be relatively young, possibly even Cambrian, and certainly latest Precambrian in age (Grikurov & Soloviev, 1974). Halpern & Grikurov (1975) report that the Mount Dummett metasediments contain jaspilite clasts, evidence that they are younger than the jaspilite-bearing rocks of Mount Ruker (England & Langworthy, 1975).

Mount McCauley

Mount McCauley was first visited in 1960 by Ruker who reported (1963) that a stock of muscovite granite intrudes brown micaceous quartzite (Fig. 12). Soviet geologists led by B. Lopatin of the Institute for Arctic and Antarctic Geology, Leningrad, camped at Mount McCauley during 1973 and made detailed traverses and measured sections. Halpern and Grikurov (1975) reported a 490 m.y. Rb-Sr muscovite age for a muscovite pegmatite from Mount McCauley; this has been confirmed by Australian work (Appendix II).

The bulk of Mount McCauley consists of broadly folded brown metasediments: tight to isoclinal folding was seen in places, but is not nearly as common as at Mount Scherger. Impure quartzites, with minor muscovite, and mica schists are common, and are interbanded with pelitic schists, calc-silicate schists, and amphibolites. As noted before, these rocks resemble the contact-metamorphosed metasediments at the western end of Mount Dummett and those at Mount Scherger.

At the northwest corner of Mount McCauley, the metasediments overlie, apparently conformably, well-foliated biotite-quartz-feldspar gneiss, which is similar to that of the nearby nunatak at the northeast tip of Mount Scherger. The gneiss contains a few small streaks of amphibolite and some minor biotite-rich bands that also contain a little greenish muscovite; it is in general more massive and migmatitic than the overlying metasediments. The contact between the gneiss and the metasediments was not examined in detail, but there is no obvious sign of an unconformity, and the two units appear to be in structural concordance. Their relationship is obscured by the close network of granite and pegmatite intrusives in this part of the mountain and probably by structural complications also.

Biotite, muscovite, and sillimanite are characteristic of the pelitic schists, which also contain garnet, hornblende, cummingtonite, and cordierite. The sillimanite is in the form of fibrolite, and is believed to have formed in some rocks by the contact metamorphism of kyanite, and in others by partial replacement of muscovite. Specimen 73281347 contains both sillimanite and cordierite, apparently formed by the contact metamorphism of kyanite, staurolite, and biotite.

Calc-silicate schists, typically containing sphene actinolite, epidote, carbonate, plagioclase, quartz, and, in some cases, abundant diopsides, are particularly common near the northeastern tip of the mountain. Such rocks also occur at Mount Dummett. No discordant amphibolites were seen and the concordant ones, which may be either metamorphosed sediments, basic extrusives, or concordant basic intrusives, contain the typical middle amphibolite facies assemblages, pale green hornblende + plagioclase (An_{50}) $\pm$ garnet, with minor biotite and opaques.

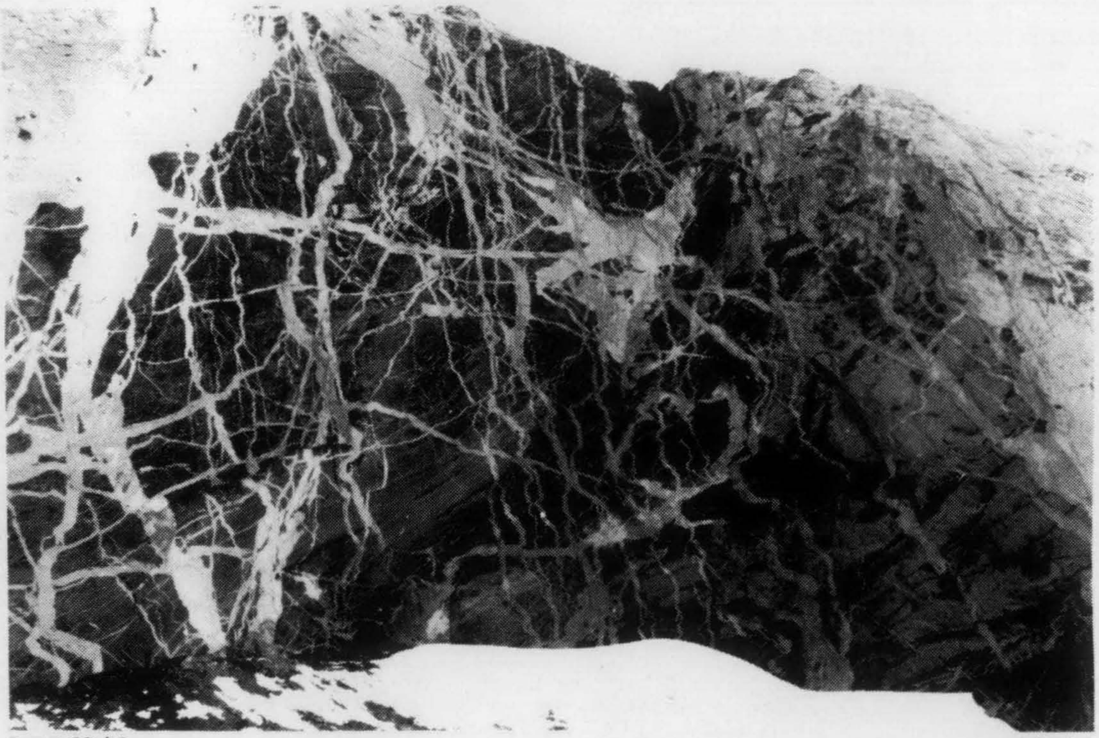


Fig. 7. Dense network of pegmatite and granite dykes intruded into massive biotite-bearing granite gneiss at the northwest tip of Mount McCauley.

Photo: J.W. Sheraton
Negative: M.1474

Both the metasediments and the felsic gneiss are intruded by a complex network of granites and muscovite pegmatites that locally encloses large masses of country rock. This complex is superbly displayed in cliff exposures at the northwest end of the mountain near where the granite forms a small stock (Fig. 7); elsewhere the granites occur as large veins and pipes, and are everywhere intersected by muscovite pegmatites. The granite consists of quartz, albite, microcline, muscovite, biotite, and garnet, and some of the pegmatites contain beryl. The Mount McCauley intrusives are thus very like those mapped at Mount Dummett and Mount Scherger.

Contacts between the granite and the country rock are sharp, reaction zones were not seen; the emplacement of the granites resulted in contact metamorphism of the country rocks, although this was evidently not accompanied by significant metasomatism.

The metasediments at Mount McCauley are correlated with those at Mount Scherger and Mount Dummett on the basis of lithological similarity, absence of crosscutting basic intrusives, and the presence of similar undeformed acid intrusives. Wider correlations with rocks exposed at Mount Rubin and in the Goodspeed Nunataks are also possible. The intrusives give a minimum age of about 500 m.y. for the metasediments, which are thought to be of late Proterozoic age (about 1000 m.y.). Before the intrusion of the granites, the metasediments, like those at Mount Dummett, were perhaps metamorphosed to kyanite grade - that is lower amphibolite-facies conditions with high pressures. This metamorphism has been detected at a number of localities, including Mount McCauley and Seavers Nunatak (Tingey & England, 1973). It post-dates the widespread emplacement of basic dykes in the southern Prince Charles Mountains (see Table 1).

Mount Newton

The geology of the southern part of Mount Newton was described by Tingey & England (1973) who noted that the greenschists that crop out at the southern peak are retrograde equivalents of rafts of high-grade metasediments contained in an injection gneiss some 300 m to the north.

The most common rock exposed on the central peak of Mount Newton is massive garnet-sillimanite-cordierite gneiss interlayered with minor quartzo-feldspathic gneiss. Minor conformable bande of amphibolite and garnet-biotite-quartz-felspar gneiss also occur. A few biotite pegmatites intrude the metasediments and locally form patches of injection gneiss. Some apparently fresh, undeformed quartz tholeiite dykes also crosscut the gneiss.

Petrographic studies have shown that the metasediments and the pegmatites have been metamorphosed under high-grade conditions and later subjected to retrograde metamorphism that has produced greenschist-facies assemblages in some of the metasediments. Retrograde metamorphic effects are particularly intense in the pelitic metasediments but are less well developed in the felsic bands and the pegmatites. The quartz tholeiite dykes apparently postdate the retrograde metamorphism.

The metamorphic history of the rocks on the main peak of Mount Newton is thus similar to that deduced for those of the southern peak as a result of the 1972 work. The quartz tholeiite dyke resembles a specimen collected from west Mount Ruker in 1972 (Tingey & England, 1973), and specimens of both were submitted to AMDEL for K-Ar age determination. Both gave very similar but spuriously old ages of about 3700 m.y. presumably because of enrichment in radiogenic argon (Appendix III).

Further work at Mount Newton is described by England & Langworthy (1975) who worked mainly at the northern end of the mountain.

<u>Mount Rubin</u>

Mount Rubin, a large flat-topped mountain with a central ice dome, lies between the Fisher and Mellor Glaciers, and is bounded on the south side by ice-covered slopes and on the other sides by vertical cliffs up to 700 m high. It was first visited in 1965 by Soviet geologists (Iltchenko, 1972; Soloviev, 1972) who grouped the low-grade metasediments mapped there with metasediments at Mount Ruker into the 'Sodruzhestvo Series' (Soloviev, 1972). Iltchenko (1972) described 'Riphean' achritarchs from Mount Rubin.

Mapping was continued at Mount Rubin in 1972 when an Australian party made reconnaissance traverses at the eastern end of the Mountain (Tingey and England, 1973) and a Soviet party mapped the central part in detail (Grikurov and Soloviev, 1974). The Soviet work revealed a complex structure including recumbent folds, and the presence of conglomerate bands. These may represent a late Proterozoic glaciation episode equivalent to that known from other continents but as yet unknown from Antarctica. Halpern and Grikurov (1975) reported an 800 m.y. Rb-Sr metamorphic age for clasts from this conglomerate and a 490 m.y. Rb-Sr whole rock metamorphic age for phyllites. The 1972 Australian work at Mount Rubin showed that well cleaved tightly folded dark brown calcareous schists and phyllites are intruded by small biotite-, actinolite- and chlorite-bearing quartz lenses and vugs (Tingey & England, 1973).

During the 1973 season, Mount Rubin was mapped in more detail and landings were made at several places at the foot of the cliffs. East of the snow dome, the mountain consists mostly of isoclinally folded, dark grey, phyllitic metasediments, with a well developed axial plane cleavage. Massive dark grey or dark green impure quartzites, pelitic metasediments, and slates are common, and conglomerates with round grey quartzite clasts crop out near the southeastern tip of the mountain. Many of the metasediments are calcareous and contain prominent rhombs of carbonate - probably dolomite; similar calcareous metasediments have been mapped at Mount Seddon, Mount Dummet, Mount McCauley, Goodspeed Nunataks, Cumpston Massif, and possibly also at Mount Maguire and Blake Nunataks. The conglomerates resemble those mapped at Goodspeed Nunataks.

Complexly folded and contorted, well-bedded calcareous metasediments crop out near the middle of the north face of Mount Rubin. They consist of thin-bedded calcareous sandstones, marls, and shales, and are folded in a large anticline with an amplitude of at least 500 m. Current bedding, ripple marks, and load casts are preserved, and demonstrate that the major structure is anticlinal but complicated by distortions resulting from the almost diapiric action of some incompetent white marly siltstones (see England & Langworthy, 1975).

Prominent 600 m tall cliffs to the east of the folded beds consist of steeply-dipping, southeast-striking, well-bedded dark brown calcareous sandstones, with thin shaley interbeds; in this general area there are also some very large scree slopes. The detailed structure of this central part of Mount Rubin is complex and is illustrated in Fig. 2 of Grikurov & Soloviev (1974); graded bedding and possible ripple marks indicate the attitude of the rocks. A few possible fossil casts were seen in the calcareous sandstones during the 1973 visit, but subsequent work (England & Langworthy, 1975) failed to confirm them. All rocks from this part of Mount Rubin contain the assemblage calcite + greenish brown biotite + sericite + quartz + opaques, evidently the result of low-grade, probably greenschist facies, regional metamorphism. A few small quartz veins with chlorite, biotite, and carbonate locally crosscut some beds.

Further west, the northern face of Mount Rubin changes alignment from east-west to northeast-southwest. At the corner, well-bedded grey to brown calcareous sandstones are conformably overlain by grey-weathering phyllitic metasediments. Graded bedding in the sandstones indicates that they are not inverted; dips are southwest and the strike 120°. Well-rounded sand grains are preserved in the sandstones, which have therefore not been greatly recrystallized. Lenticular carbonate (dolomite and calcite) aggregates, about 5 cms long, are widespread throughout the sandstones, and the phyllitic rocks contain small quartz lenses with minor quantities of chlorite. Mineral assemblages in the sandstones and phyllites commonly include carbonate, chlorite, epidote, muscovite, and green biotite - typical products of greenschist facies regional metamorphism.

At the western end of Mount Rubin, massive grey-green impure quartzites and slaty, locally calcareous, metasediments are the commonest rocks, but conglomerates with grey quartzite clasts were also found. These rocks are similar to those described from other parts of the mountain.

Neither crosscutting basic dykes nor concordant amphibolites were found at Mount Rubin; the metasedimentary sequence there is thought to post-date the intrusion of the amphibolitized basic dykes observed at many places in the southern Prince Charles Mountains, including nearby Mount Ruker. Soloviev (1972) and Iltchenko (1972) grouped the Mount Rubin metasediments and the low-grade ironstone-bearing metasediments at Mount Ruker into the 'Sodrushestvo Series' of Riphean or late Precambrian age, but Halpern & Grikurov (1975) think that the Mount Rubin rocks are younger because conglomerates among them contain ironstone fragments. The Mount Rubin rocks were derived by the erosion of (and presumably deposited on) a basement of granite gneiss, quartzite-rich metasediments, like those at Mount Stinear, and ironstone-bearing metasediments, such as those at Mount Ruker. The basement-cover contact is not exposed at Mount Rubin so their relationship is not known. It is therefore possible, although unlikely, that the Mount Rubin rocks are part of a conformable sequence with the Mount Ruker rocks, as Soloviev (1972) suggested. The presence of amphibolitized dykes at Mount Ruker and their absence from Mount Rubin does not lend support to this hypothesis.

Glacial Geology. The top of Mount Rubin is covered with a felsenmeer of mostly locally derived rock debris, commonly arranged as patterned ground. Bedrock exposure is poor, but its patterns are preserved in the felsenmeer and can easily be mapped on aerial photographs. Glacial striae and roches moutonnées were not found, probably because the bedrock is typically well-cleaved and generally soft. However, a glacial pavement about 100 m above present ice level is exposed at the bend in the north side of the mountain, and has presumably been exposed only for a short time.

The lateral moraines of the Fisher Glacier along the northern side of Mount Rubin consist of grey clay and dust, and mostly locally-derived boulders. The moraines are ice-cored, with loose rock debris lying on the ice, and are dangerous to walk upon in warm weather; they form hummocky terrain with melt lakes in depressions and debris-covered ridges. At the eastern end of the mountain, the moraine forms an arcuate tail, about 17 km long, that is progressively incorporated into the main glaciers.

In places, the moraine debris contrasts with local outcrop: for example, at the bend in the northern face of the mountain, local concentrations of ironstone boulders were found, but a thorough search failed to reveal any outcrop.

Shear patterns in the Fisher Glacier close to Mount Rubin are thought to illustrate a 'boundary layer' effect of the glacier flow near to the mountain (Tingey & England, 1973).

Mount Ruker

Mount Ruker consists of gently rounded hills at the eastern and western ends, separated by a flat central plateau. It is largely covered by felsenmeeren of locally-derived rock debris and till. The southern slopes are covered with snow and ice, but on the north face, next to the Geysen Glacier, and the east face next to the Fisher Glacier, cliff faces up to 800 m high provide good exposures of bedrock. Exposures on top of the mountain are poor, but bedrock patterns are preserved in the felsenmeer and can be mapped from aerial photographs.

On the north face of the mountain, three large embayments contain till deposits arranged in arcuate patterns that illustrate stages in the retreat of local glaciers (see England & Langworthy, 1975) and small apophyses from the nearby regional glaciers. Higher glacier levels are also demonstrated by the 100 m thick till deposits on the upper surface of the mountain near the westernmost embayment (England & Langworthy, 1975), and by glacial striae on granite roches moutonnées on the eastern peak. The thick tills on top of the mountain are thought to have been deposits by a surge of the Fisher Glacier (Wellman, in press).

Mount Ruker was first visited in 1965 by geologists of the Soviet Antarctic Expedition who reported greenschist-facies metasediments with jaspilites 70 m thick and assigned them, along with low-grade metasediments at nearby Mount Rubin, to the Middle Proterozoic 'Sodruzhestro Series' (named after the Sodruzhestro Mountains, the range comprised of Mount Rubin, Mount Ruker, and Keyser Ridge). Iltchenko (1972) described acritarchs from Mount Ruker and inferred a Riphean age for the Sodruzhestro Series, but subsequent Soviet mapping in 1972 (Halpern & Grikurov, 1975) has cast doubts on the grouping together of the Mount Rubin and Mount Ruker metasediments.

In 1972, ANARE surveyors established a trigonometrical station on the western peak of Mount Ruker and recovered specimens of low grade metasediments, amphibolite, and dolerite from the loose surface debris in the area (Tingey & England, 1973).

Mount Ruker was investigated in more detail in 1973, and gravity stations were established on the eastern and western peaks. The 'jaspilites' discovered by Soloviev (1972) were examined in outcrop in, and around, the easternmost, and largest, embayment on the north side of the mountain, and granite was mapped at several places. Low-grade metasediments and amphibolites were also examined.

Most of Mount Ruker east of this largest embayment consists of metamorphosed, but not strongly deformed, grey biotite granite intersected by amphibolite dykes, and containing small lenses and xenoliths of amphibolite and schistose metasediment. A soft green variety of the granite found in the cliffs at the eastern end of the mountain largely consists of clay minerals (possibly kaolinite) and may be the result of local late stage hydrothermal alteration. In places the grey granite is intersected by biotite pegmatite but elsewhere both grade into pink granite. The age of the basement granitic rocks at Mount Ruker is estimated to be between 2500 and 3200 m.y. by Halpern and Grikurov (1975) who constructed isochrons from scattered Rb-Sr whole rock analyses by assuming $^{87}Sr/^{86}Sr$ initial ratios. Arriens' whole rock Rb-Sr data do not as a group adequately define an isochron although 4 out of the 13 analyses define an isochron that indicates an age of 1442 ± 152 m.y. with an initial $^{87}Sr/^{86}Sr$ ratio of 0.8902. This age is not regarded as that of the formation of the basement rocks; rather, it is thought to reflect later metamorphic effects.

Metasediments including some 'jaspilites' (these are more accurately termed banded ironstones) southeast of the large embayment are poorly exposed and can only be mapped from the distribution of surface debris. The relationship between the granite and the metasediments was investigated, but, because of the poor exposure, no firm conclusion was reached. Further investigations in 1974 (England & Langworthy, 1975) failed to establish the exact relationship, but an unconformable or faulted contact is thought to be more likely than an intrusive one.

The low-grade metasediments originally described by Soloviev (1972) are well exposed in cliffs along the northern face of Mount Ruker, and in the eastern flanks of the easternmost embayment. They are intersected by discordant orthoamphibolites that now largely consist of actinolite. Banded iron formation crops out in the eastern side of the embayment, and in cliff sections a few hundred metres to the west of it. At the latter locality, the banded iron formations are about 100 m thick (the maximum known from the area) and a dark blue-grey colour. They contain a few calcareous intercalations. The average iron content is about 35%; thus, although the occurrence is interesting, it is unlikely to be commercially attractive in the foreseeable future. England & Langworthy (1975) examined the banded ironstones in more detail during the 1974 field season. Airborne magnetic surveys conducted by the Soviet Antarctic Expedition have delineated magnetic anomalies possibly associated with the banded iron formations. Soviet reports indicate that the anomalies are about 120 km long, and spread east and west of Mount Ruker, but no detailed maps are yet available.

Bedrock is poorly exposed near the westernmost embayment on the north side of Mount Ruker, but tightly folded, greenish-grey chlorite-sericite schists, containing concordant chlorite and sericite-bearing quartz-rich segregations, crop out in the cliff faces. The summit and the northern and western slopes of the western peak of the mountain are covered with loose, but evidently locally-derived, debris, mainly well-cleaved black slates, phyllites, and siliceous metasediments. A few dolerite fragments were also found, but outcrop of any description is minimal over the whole area. However, at one place about 200 m north of the western Mount Ruker gravity station, a small (about 3 m long and 1 m wide) biotite granite intrusive intersects and disrupts the foliation of the metasediments. A similar, and probably related, granite is thought to intrude orthoamphibolites on the southeastern slopes of Mount Ruker's western peak. Bedrock is not exposed at this locality, and the intrusive relationships are deduced from examination of surface debris, and from the presence of basic streaks and xenoliths in the granite boulders. The granite contains strongly saussuritized and sericitized plagioclase, microcline, quartz, and biotite, with secondary muscovite and epidote.

The granites at each end of the mountain look alike in thin section but their field relationships differ. The western granite appears to be considerably younger than the eastern one although the presence of epidote indicates that it has undergone greenschist facies metamorphism. It has yielded a poorly defined Rb-Sr muscovite age of about 500 m.y.

Mount Rymill

Mount Rymill consists of two north-south aligned, flat-topped ridges separated by an east-west-trending saddle, probably the surface expression of a major fault. The southern ridge is at about 1550 m elevation, the northern one at about 1200 m. The mountain was first visited by Ruker (1963) who discovered red siltstone debris containing Glossopteris plant fragments at the western side of the central saddle. During the 1973 season Soviet geologists and geophysicists camped at this locality and made traverses by foot to accessible parts of the mountain. The Glossopteris-bearing siltstone debris is common over an area about 60 m long and 30 m wide and, because it is soft and friable, it is not thought to have been transported far. However, despite an extensive search throughout the southern Prince Charles Mountains no outcrop was found; the debris appears to be restricted to this one locality at Mount Rymill.

Rock exposure on the northern ridge is confined to cliffs at the northern end where brown-weathering granite gneiss is intersected by minor pegmatites, and two generations of amphibolite dykes. The granite gneiss contains quartz, sericitized plagioclase, clots of ferrohastingsite, biotite, and sphene, with clear and unaltered microcline of probable secondary origin. It looks like, and is correlated with, dark brown, ferrohastingsite-bearing granite gneiss at Mount Stinear (Tingey & England, 1973; this Record) and Mount Bloomfield (this Record). One set of amphibolites - probably the older - contains ragged prisms and sheaths of green hornblende, and granular plagioclase, whereas the younger set is coarser-grained, has a relict sub-ophitic texture, and contains ragged mats of pale actinolite, and moderately calcic plagioclase. The granite gneiss and the older dykes have undergone lower amphibolite or upper greenschist-facies metamorphism, but the actinolite-bearing dykes have been altered by a lower greenschist-facies metamorphism that has apparently had little effect upon the other rocks.

The flat top of Mount Rymill's northern ridge is covered with loose debris arranged into a particularly fine example of patterned ground. No trends that could be interpreted as reflecting bedrock trends are discernible in the debris, which is therefore mapped as till. Nonetheless, there are local concentrations of particular types of debris that might be locally derived; for example, pelitic schists, containing muscovite, kyanite, and randomly-orientated staurolite crystals up to 5 cm long, are very common in places.

The central saddle of the mountain is snow filled, but flanked on the south side by good exposures of massive white to dark green fuchsite-bearing quartzite, interbanded with dark grey to green semi-pelitic and psammitic biotite-chlorite-muscovite schists, and intruded by both concordant and discordant amphibolites. These rocks resemble, and are therefore correlated with, sequences described at Mount Menzies (Trail, 1963; Tingey & England, 1973) and Mount Stinear (Tingey & England, 1973). In places the quartzite is strongly deformed with numerous minor folds, and commonly, a strong lineation that plunges west at between 30 and 40^{o}. Axial-plane cleavage is locally developed in all the metasediments and dips are near vertical with approximately east-west strike. The amphibolites examined contain pale green hornblende, sodic plagioclase (albite or oligoclase), and opaques.

The 'Menzies' type metasediments are restricted to the northern flanks of Mount Rymill's southern ridge which mostly consists of pink to red even grained unfoliated biotite granite, intersected by meta-dolerite dykes. The contact between the granite and the metasediments is not exposed; the intersection of the granite by the metadolerite dykes is interpreted as evidence that it is probably of Archaean age. However granite specimens have yielded a Rb-Sr whole rock isochron age of 1197 $\pm$ 238 m.y. with an initial $^{87}Sr/^{86}Sr$ ratio of 1.1139; the exceptionally high initial ratio indicates that the age relates either to the metamorphism rather than the original crystallization of the granite or to crystallization of a granitic melt derived from parent rocks that had had a long crustal history. Given the field interpretation of an Archaean age, the Rb-Sr age is thought to reflect a metamorphic episode that affected the granite after the intrusion of the dolerite dykes, and converted those dykes into metadolerites. In thin section, the granite is not greatly deformed but locally obvious recrystallization was probably caused by the metamorphism which converted the original dolerite dykes into metadolerites.

Bedrock is widely exposed on top of the southern ridge of Mount Rymill and glacially transported debris is rare. Ice polished and ice scratched surfaces are preserved on granite roches moutonnées and the striae indicate ice flow directions parallel to those in modern local glaciers.

Mount Seddon

Mount Seddon, a steep-sided nunatak on the northern flanks of the Fisher Glacier, was first visited by Ruker (1963) who reported that it consists of well-stratified, fine-grained, hard, calcite-sericite-quartz greenschist, intruded on the northeastern side by a large amphibolite dyke. Hill Nunatak, at the northwest tip of Mount Seddon, consists of similar rocks. Geologists from the Soviet Antarctic Expedition also visited Mount Seddon in 1965 (Soloviev, 1972), and Iltchenko (1972) mentions Late Precambrian achritarchs from there. An Australian observer, J. Haigh, accompanied the Soviet field party, and collected a few rock samples that were described by AMDEL (1967).

Mount Seddon is bounded by vertical cliffs up to 820 m high on the southern and eastern sides and by precipitous ice and snow slopes on other sides. Bedrock is poorly exposed on top of the mountain, but locally-derived debris forms a felsenmeer in which bedrock trends are retained. The best exposures of bedrock are in the cliffs to which there is limited access both at the top and at the base.

The northern ridge of the mountain consists of well-jointed, locally slaty metasediments. Most of them are impure quartzites that contain quartz, biotite, muscovite, chlorite, minor feldspar, and opaques, but some are more calcareous and contain carbonate crystals up to 3 mm across. Similar dark-coloured low-grade metasediments, with minor green-stained quartzite, are exposed in the saddle between the northern and southern ridges of the mountain, and are intersected by a quartz vein about 4 m thick.

Metagreywacke, metamorphosed micaceous sandstone, and fine-grained, slaty siliceous metasediments, are exposed in the cliffs near the southern end of the mountain. Some of them contain pyrite and prominent black biotite crystals, and the principal constituents are epidote, calcite, chlorite, biotite, muscovite actinolite, and quartz. Ripple marks are preserved on some bedding planes and the rocks are intersected by quartz-chlorite and quartz chlorite-carbonate veins. These are common over much of the mountain.

White weathering quartzites and the amphibolite noted by Ruker (1963) are exposed in the eastern cliffs of the mountain. The amphibolite is about 200 m thick and subconcordant, although small, apophyses interleave with metasediments next to the contact. It was not examined in the 1973 field season.

The metasediments are folded anticlinally about an axial plane that strikes about east-west and the amphibolite occupies the core of this structure. Dips in the central and southern part of the mountain are to the south or southwest at about 80°: those on the northern ridge are about 60° to the north. Complex folds parasitic to the main structure are exposed in the eastern cliffs.

The sequence exposed at Mount Seddon, particularly the more calcareous parts, bear a strong resemblance to those seen at Mount Dummet and Mount Rubin, except that amphibolites are absent from those localities. Soviet geologists have also correlated the Mount Seddon and Mount Rubin rocks. The amphibolite at Mount Seddon occurs near the base of the sequence, and needs a more thorough examination than has been made to date. It is possible that rocks older than the late Proterozoic Mount Rubin type metasediments are exposed with, and intruded by, the amphibolite at Mount Seddon. However, concordant amphibolites are found in metasediments at Mount McCauley that are also correlated with the Mount Rubin rocks.

Mount Stinear

Traverses on Mount Stinear in 1972 were reported by Tingey & England (1973) who correlated the white quartzite exposed at Edwards Pillar with that described by Trail (1963) from the summit of Mount Menzies. Foliated granitic rocks and biotite-quartz feldspar gneisses were also described from exposures to the north and to the south of the Edwards Pillar Trigonometrical station. The quartzites and gneisses on

Mount Stinear were described as being intersected by amphibolite dykes and a muscovite pegmatite dyke was also noted. Interbanded quartzites with minor pelitic layers interlayered with garnet-bearing amphibolites were described from the southern end of Mount Stinear.

More landings were made on Mount Stinear in 1973 and Dr Grew, a United States visiting scientist with a Soviet Antarctic Expedition party camped on Mount Rymill, accompanied the ANARE geologists for some field traverses.

A large cirque on the southeastern side of the mountain - to the south of the trig. station - is now occupied in its lower part only by a small glacier that flows eastwards onto the Lambert Glacier, and contributes debris that forms the prominent arcuate moraine tail at the northeastern tip of the mountain. This debris, being dark coloured, absorbs more heat than the surrounding ice and is progressively melted into the glacier.

White quartzite, with minor green fuchsite-bearing streaks, is interbanded with minor pelitic metasediments, and intersected by ortho-amphibolite at the southern end of the arête that forms the cirque's western wall. The quartzite, which is here about 20 m thick, is identical to that previously mapped near Edwards Pillar (Tingey & England, 1973), and grades northwards and upwards into grey conglomerate composed principally of grey quartzite clasts and a few pebbles of basic volcanic and granitic rocks. Minor bands of finer-grained grey pelitic metasediments are intercalated with the conglomerate, and demonstrate that the sequence is steeply dipping, with an east-west strike. These intercalations become more common near the top - that is, towards the northern end - of the conglomerate, where garnet-mica schist and calc-silicate schist also occur.

The conglomerates were also examined at the foot of the mountain some 800 metres below. There they appear more deformed than in the higher outcrop and contain uniformly oriented clasts that are flattened and stretched along their long axes. Metasediments, including grey biotite schists, staurolite schists, garnet-bearing calcareous metasediments, and para-amphibolites, are associated with the conglomerates, and contain lower amphibolite-facies assemblages, with blue-green hornblende, kyanite, staurolite, and muscovite. Evidence of higher-grade metamorphism, before the lower amphibolite-facies event, is afforded by replacement of garnet by staurolite, and growth of new euhedral garnet around fragments of older, altered and broken garnet. Subsequent retrograde metamorphism has produced secondary chlorite and sericite.

At least two generations of amphibolite dykes intersect the conglomerates, but there is no appreciable mineralogical difference between them. Both contain typical lower amphibolite-facies assemblages.

Superficially, the Mount Stinear conglomerate resembles those seen at Goodspeed Nunataks and Mount Rubin (this Record), but they are intersected by amphibolite dykes. Such dykes do not occur at the other localities, where the conglomerates are considered to be of Late Proterozoic age. The Mount Stinear conglomerates conformably overlie Archaean quartzites and are probably Archaean themselves. The various conglomerates are probably similar because they are composed of clasts derived from a similar source, the most likely being the 'Menzies Quartzite'.

An east-west trending vertical fault terminates the conglomerate-metasediment sequence at its northern end. Slightly impure grey quartzite on the north side of the fault grades into banded locally migmatitic biotite-quartz-feldspar gneiss which is continuous with that mapped south of Edwards Pillar by Tingey & England (1973). This gneiss is interpreted as a metamorphosed impure quartzite or greywacke; it is also potash rich and contains no plagioclase feldspar. It has given a Rb-Sr whole rock isochron age of 1042 m.y. with an initial $^{87}Sr/^{86}Sr$ ratio of 0.875. The high initial ratio suggests that the age is probably related to metamorphic effects.

The northern end of Mount Stinear consists of biotite-quartz-feldspar gneiss intersected by amphibolite dykes and intruded by pink pegmatitic biotite-muscovite-garnet granite. Calc-silicate and quartz rich intercalations in the gneiss are probably of sedimentary origin. Further south foliated ferrohastingsite-biotite granite gneiss (see Tingey & England, 1973) is faulted against quartzites that are correlated with those exposed at Edwards Pillar. The fault plane at the contact is marked by a dark grey to black fissile, and very fine-grained fault gouge. Nearby, the quartzites contain a few streaks of impurity and weather yellowish brown; the ferrohastingsite-biotite granite gneiss on the north side of the fault contains siliceous patches that may be relicts of quartzite xenoliths while calcite veins which are common around another patch may mark the site of a calcareous xenolith. However, evidence that the original granite intruded the quartzites is poor, although another younger granite may have been emplaced more or less along the line of the fault. Quartzite samples collected near the fault have lower amphibolite-facies assemblages (garnet, biotite, muscovite, staurolite, kyanite), but show no evidence, such as conversion of kyanite to sillimanite, for contact metamorphism. However this conversion, plus that of staurolite to cordierite, is seen in thin sections of a loose boulder of kyanite-staurolite-muscovite schist that probably rolled down from higher up the mountain and is presumed to be due to intrusion of muscovite pegmatite of the type reported by Tingey & England (1973) and dated at 2580 m.y. On balance, the granite gneiss is thought to have been the basement on which the quartzites were deposited. The xenoliths in it are probably remnants of earlier, reworked, and now largely obliterated, metasediments; similar granite gneiss at Cumpston Massif also contains metasedimentary xenoliths.

The geology of Mount Stinear is complex, but the ferrohastingsite-biotite granite gneiss in the northern part of the mountain is thought to be the oldest unit, and, by analogy with similar rocks in the southern Mawson Escarpment, between 2800 and 3000 m.y. old. It is overlain by the quartzites with interbanded pelitic metasediments, which are overlain by conglomerates and possibly the impure quartzites that are now converted to felsic biotite gneiss. All these units are intersected by amphibolite dykes and probably by muscovite pegmatite. Tingey & England (1973) thought that a muscovite pegmatite that intersects quartzites near Edwards Pillar was younger than the amphibolite dykes. The muscovite pegmatite has since given a Rb-Sr muscovite age of 2580 m.y. and a re-examination of the outcrop suggests that field relationships are equivocal because of poor exposure.

Whatever the relationship between the amphibolites and the pegmatite, the latter defines a minimum age for the white quartzites on Mount Stinear and, by inference, for similar rocks exposed elsewhere in the southern Prince Charles Mountains. The very high initial $^{87}Sr/^{86}Sr$

ratio of 0.875 revealed by Rb-Sr dating of banded biotite feldspar-quartz gneiss exposed to the south of Edwards Pillar is interpreted as evidence that the age relates to a late metamorphism of the rocks well after their original formation. This late metamorphism may be the one which converted the original basic dykes to amphibolites. If this is so the basic dykes were emplaced between about 2600 and 1050 m.y. ago. Tholeiitic dykes that form a complex network in the Vestfold Hills have been dated at about 1400 m.y. (Arriens, 1975); those at Mount Stinear and elsewhere in the southern Prince Charles Mountains are thought to be of a similar age (Tingey, in press).

MAWSON ESCARPMENT SOUTH SS 40-42/8

Mawson Escarpment

For the convenience of fieldwork, the Mawson Escarpment was divided into segments A to M. Areas H to M fall within Sheet SS40-42/4; areas A to G are within Sheet SS40-42/8 (Mawson Escarpment South).

For a general description of the Mawson Escarpment see page 23.

Mawson Escarpment A

The southern part of this area is relatively flat and not greatly (200 m) elevated above the nearby glacier. It consists of calcareous metasediments, quartzites, garnet schists, staurolite schists, and both concordant and discordant amphibolites. A prominent band of white marble up to 100 m wide contains abundant large prismatic crystals of almost colourless tremolite which are randomly orientated, but tend to be concentrated in discontinuous bands and near quartz veins. Rusty-weathering, crumbly impure marbles and calcareous schists contain rosettes, up to 15 cm across, of pale green tremolite, some of them surrounded by epidote-rich zones; grey, biotite- and actinolite-bearing schists are common. Similar, and possibly correlative, calcareous metasediments from Mount Menzies, Mount Bayliss and Mount Mather are described elsewhere in this Record.

Quartzites, some of them greenish, pelitic schists, and strongly deformed conglomerates also occur here, as does a coarse-grained, undeformed, apparently concordant amphibolite dyke. However, the relationships of this dyke are not clear as its contacts are not exposed.

At the southern tip of the main part of locality A, grey, well-bended migmatitic biotite-quartz-feldspar gneiss is the major work type, some of it possibly of sedimentary origin. Both concordant and discordant pegmatites are abundant. These two localities, and the one just described, are discussed in more detail by England & Langworthy (1975).

Near the northwest tip of area A thick (several hundred metres or more) bands of metasediment, principally quartzites, including green fuchsite bearing varieties, and staurolite- and garnet-bearing semipelitic or psammitic schists, are interleaved with biotite quartz feldspar gneiss. Contacts between the gneiss and the metasediments are sharp rather than gradational and both rock types are tightly folded together about east-west axes. Dips range from 40^{o} to vertical both north and south. The gneiss also has complex isoclinal intrafolial folds which are not evident in the metasediments. These intrafolial folds may be relics of an earlier pre-metasediment deformation and could be interpreted as evidence that the gneiss might have formed a basement upon which the sediments were deposited. However, any original unconformable contacts must have since been obliterated by folding and faulting.

The metasediments at the northwestern tip of Mawson Escarpment A closely resemble, and are correlated with, 'Menzies' type metasediments that occur at Mawson Escarpment B and other places throughout the southern Prince Charles Mountains. At Mount Stinear, the age of these metasediments is known to be greater than 2580 m.y.

Mawson Escarpment B

This area was briefly visited in 1960 by an ANARE field party that collected rocks described by Ruker (1963). In 1972, the area was named Rooster Point, after a prominent rooster-shaped snow field on the western cliffs, and a survey station was established near the eastern edge of the area. A few rock specimens were collected and described by Tingey & England (1973) who noted, as did Ruker (1963), that the area consisted of granitic gneiss traversed by amphibolite dykes.

At the foot of the western cliffs of Rooster Point, vertically or steeply dipping pelitic gneiss, with green fuchsite-bearing quartzite and concordant amphibolite, strikes at 275^{o}. The quartzite resembles rocks seen at the northwest tip of Mawson Escarpment A and at other localities throughout the southern Prince Charles Mountains. The sequence is therefore tentatively correlated with 'Menzies' type metasediments. The metasediments grade northwards into biotite leucogneiss with minor mafic bands, rare pelitic gneiss, and sheared conglomerate. The biotite leucogneiss is in sharp, but apparently concordant, contact with massive grey leucogneiss of probably intrusive origin, whose poorly developed foliation is parallel to that of the other rocks. The quartzites grade into the grey leucogneiss over about 300 m.

The quartzite-bearing pelitic rocks reappear at the northwest tip of the area, about 3 km from the original locality. They appear to be folded around, and with, the massive leucogneiss and the intervening rocks and thus may have been originally deposited upon them.

The massive gneiss at Mawson Escarpment B gives a Rb-Sr whole rock age of 2822 $\pm$ 227 m.y. with initial $^{87}Sr/^{86}Sr$ ratio of 0.7050. The low initial ratio suggests that the age determined is that of the crystallization of the intrusive precursors of the gneiss. Ferrohastingsite, the distinctive dark green hornblende characteristic of basement gneisses in other parts of the southern Prince Charles Mountains, is present in some samples of the leucogneiss, but most contain blue green hornblende. The ferrohastingsite gneisses in the remainder of the southern Prince Charles Mountains are thought by analogy with the Mawson Escarpment B leucogneiss to be also Archaean in age.

All the units are intersected by at least three generations of amphibolitised basic dykes essentially composed of blue-green hornblende, actinolite, biotite and plagioclase; in some dykes the hornblende rims actinolite. The distribution of amphibolite debris on top of the escarpment clearly shows how bedrock trends are preserved in this (almost in-situ) rock cover (see Tingey & England, 1973).

The metamorphic history of the southerh part of the Mawson Escarpment - areas A to C - is complex. Some rocks contain kyanite, garnet, and staurolite, others contain cordierite, and sillimanite may be present in at least one sample. It is possible that the cordierite and sillimanite result from a later metamorphism than the kyanite, garnet and staurolite although the evidence is equivocal. In one rock cordierite surrounds and invades garnet crystals and, in another, possible sillimanite appears to be replacing kyanite and muscovite. There is also some evidence that the kyanite-garnet-staurolite assemblages replace earlier high grade assemblages: for example, garnets commonly occur as aggregates of small euhedra which may have replaced earlier large garnets. Cordierite envelopes some of these aggregates and may have formed during the breakdown of the older garnets although it may also be a high grade relic itself. Cummingtonite is present in some pelites and anthophyllite in others; there minerals together with kyanite-garnet and staurolite are taken to be indicative of amphibolite facies metamorphism.

The basic dykes have also been metamorphosed under amphibolite facies conditions, some contain cummingtonite, others retain relict igneous textures. As at other localities in the southern Prince Charles Mountains, the dykes pre-date a phase of amphibolite facies metamorphism which is thought to be a peripheral effect of the 1000 ± 200 m.y. high grade metamorphism documented in the northern Prince Charles Mountains (see Tingey, in press).

Mawson Escarpment C

Most of the top of area C is covered with fine-grained, weathered rock debris of probable local derivation, and only a few small patches of bedrock are exposed there.

In the cliffs at the southwest corner of the area, banded biotite-quartz-felspar gneiss is crosscut by randomly orientated amphibolite dykes. The gneiss is folded and strikes about 295°; the axis of one small fold plunges 36° to the west. Pelitic metasediments and green quartzites, similar to those examined at the northwest corner of area B, were not seen in outcrop, but are common in the lateral moraine of the Lambert Glacier and in the float at the side of the central glacier of area C; they have probably been derived from nearby.

Further north on the south side of the central glacier of area C, banded biotite-quartz-feldspar gneiss, with a few sub-concordant amphibolites, is crosscut by dykes of biotite granite and biotite pegmatite, and minor veins of epidote. The relationship between the granites and the pegmatites has not been defined, but the pegmatites appear to have been intruded along the margins of granite dykes. They may therefore have been generated during the final stages of the granite magmatism.

Both the gneiss and the intrusives are displaced by late-stage faults whose fault planes are now infilled with epidote.

Mawson Escarpment D

Migmatites and minor granite, intruded by a few amphibolitized basic dykes, are exposed at the southwestern tip of this area. Migmatites from the southeastern tip have a larger component of hornblende-rich mafic gneiss and have been significantly retrogressed, with partial replacement of hornblende by colourless amphibole and production of epidote, sphene, and chlorite. In the central part of area D, layers of mafic gneiss about 1 m thick are folded with migmatites about north-trending axial planes that dip gently to the east. Small pods of granite intrude these rocks, which are also crosscut by amphibolite dykes.

Migmatite debris is predominant in the felsenmeer on top of the escarpment at the northwest corner of area D, but coarse-grained marble, diopside-bearing calc-silicate, and quartzite are also abundant. In the cliffs below, vertically dipping banded migmatites were seen.

Area D is thus composed essentially of banded migmatites with a few crosscutting amphibolites and rare small pods of granitic intrusive. The migmatites are probably the product of upper amphibolite-facies metamorphism, but have been retrogressed during a later metamorphism that converted the basic dykes to amphibolite.

Mawson Escarpment E

Photogeological studies indicate that this area is occupied by steeply dipping banded rocks folded around a central core of more massive rocks. The folding is on a large scale, with an amplitude of about 8 km and wavelength about 13 km; the fold axis is near-vertical, and the strike ranges from 140° in the northern part of the area to 250° in the southern part.

The banded rocks in the southwest of the area are composed of interlayered light-coloured granitic gneiss, darker coloured pelitic gneiss, and minor discontinuous layers of mafic gneiss; interbanded biotite-rich and quartzofeldspathic gneisses occur in the central part. Migmatitic sillimanite-bearing gneiss and quartz-rich gneiss constitute most of the felsenmeer on top of the escarpment in the northwest corner of the area, and a small outcrop that protrudes through the felsenmeer is composed of fibrolite, a finely crystalline variety of sillimanite. All these rock types are crosscut by reddish-brown biotite granite dykes that are more common and closer spaced towards the east.

The presence of sillimanite, and of cordierite and anthophyllite, in some metasediments, indicates high-grade, probably upper amphibolite-facies metamorphism. Quartz-rich gneiss in the northwestern corner of the area contains the distinctive dark green amphibole ferrohastingsite that is characteristic of gneisses that are thought to constitute granite basement elsewhere on the Mawson Escarpment and in the southern Prince Charles Mountains. The central core of more massive granitic gneiss around which the banded rocks are folded may be basement to them but this has not been clearly demonstrated.

Specimens of banded gneiss and leucogneiss from Mawson Escarpment E have given an Rb-Sr whole rock age of 2766 $\pm$ 92 with an initial $^{87}Sr/^{86}Sr$ ratio of 0.7210. The relatively high initial ratio prompts speculation that the dated rocks may have been derived from even older Archaean rocks.

The felsenmeer cover on the flat upper escarpment surface in area E is generally fine=grained and deeply weathered. It is largely composed of small fragments of pebble size or smaller and retains no trace of glacial action. Ventifacts are particularly common however, and the general impression is that this part of the escarpment has been exposed to subaerial weathering for some considerable time. By contrast, the felsenmeer debris towards the snowline along the eastern edge of the escarpment is coarser grained with more rounded cobbles and boulders; here the escarpment has not been so long exhumed from the regional ice cover.

A small valley in the southern part of the area is now filled with till arranged in patterns that record the progressive retreat of a small local alpine glacier. The valley is a natural sun trap and its small glacier has ablated away.

Mawson Escarpment F

In the southern part of this area, interbanded fine to medium-grained dark biotite-garnet-quartz-feldspar gneiss and leucocratic garnet gneiss strike 110^{o} and dip vertically. They are intruded by many large (up to 50 m thick), irregular deformed pegmatites that are crosscut by an undeformed even-grained grey biotite granite. Such exposures are typical of the large bench which constitutes all but the northern and eastern extremities of the area.

Tongues of grey biotite-granite also intrude interbanded calc-silicate gneiss, para-amphibolite, and marble in the east-central part of the area. The marble, which consists of calcite, forsterite, and phlogopite, strikes 110 and dips 45^{o}N; other rocks at this locality have similar attitudes and the general strike is about east-west.

In the northern part of the area, interbanded dark biotite-garnet-quartz-feldspar gneiss, para-amphibolite, and quartzite, is intruded lit-par-lit, and, in places, in a boxwork pattern, by coarse, pegmatitic, biotite leucogranite dykes. The rocks are also intersected by massive grey granite similar to that described above.

The age of the grey granite has been determined as 569 ± 43 m.y. and the initial $^{87}Sr/^{86}Sr$ ratio was 0.7363. This age is comparable to that of the muscovite granites at Mount Dummett and Mount McCauley. The grey granite at Mawson Escarpment F is clearly a local manifestation of a thermal event that affected wide areas of Antarctica - and, for that matter, Gondwanaland - about 600 m.y. ago.

Mawson Escarpment G

This area was briefly visited in 1972 and described by Tingey & England (1973); they noted that Harbour Headland, the site of a trigonometrical station established in the 1972 season, consisted of biotite granite gneiss enclosing large rafts of mostly pelitic metasediments, and crosscut by a network of late stage pegmatites.

During the 1973 field season, other parts of the area were visited. Much of the southwestern part is composed of grey even-grained granite intersected by abundant pegmatite dykes and enclosing rafts and xenoliths of metasediment up to 100 m thick - essentially the same rocks described by Tingey & England (1973). The metasediments consist of garnet-staurolite-biotite-quartz-feldspar gneiss, some of it also containing sillimanite and cordierite, with some impure quartzite and amphibolite.

At least two types of granite are present at this locality. The grey, even-grained granite mentioned above is intruded by white leucocratic garnetiferous granite with a slight flow foliation. Pegmatites containing biotite, muscovite, and some garnet are associated with this granite and locally grade into it; the granites and pegmatites are thought to be comagmatic, and probably related to the Cambrian granite mapped in area F.

Similar rocks occur in the eastern and northern parts of Harbour Headland, but, although pegmatites are numerous, granites are less common. On the southeast side of the Headland, well-banded, grey biotite-quartz-feldspar gneiss, with interbanded amphibolites, is crosscut by thin amphibolite dykes and intruded by white to pink granite and and pegmatites. Because they are metamorphosed, the amphibolites are thought to be older than the unmetamorphosed pegmatites.

On the northern side of Harbour Headland, strongly banded rocks, ranging from white massive leucocratic gneiss to well-foliated biotite schists and amphibolites, are the predominant country rocks, and are intruded by both subconcordant and crosscutting biotite muscovite pegmatites some of which also contain tourmaline and garnet. Most of the biotite schists are rusty-weathering and contain garnet, but, although cordierite is present in one section, none of the aluminium silicate polymorphs (andalusite, kyanite, sillimanite) was seen. Hypersthene and cummingtonite, together with pale brown hornblende, occur in three of the specimens collected. The cummingtonite forms a rim between hornblende and hypersthene in one section - its presence together with hyersthene probably indicates upper amphibolite-facies metamorphism, although a few grains of clinopyroxene are present in one of the hypersthene-bearing rocks. Two-pyroxene granulites are only seen in the northern part of the Mawson Escarpment in areas K,L and M.

The gneisses were strongly deformed before intrusion of the pegmatite dykes, and small isoclinal and intrafolial folds are common. Many concordant amphibolites are boudinaged and agmatites have been formed where mafic layers have broken up, and been intruded by pegmatites.

On the northern edge of area G, grey-white-weathering marble forms a prominent marker band that strikes about 300^{o} and dips 20^{o}S. It is overlain by massive biotite-quartz-feldspar gneiss and underlain by pelitic and metasedimentary schists; all units are invaded by muscovite-bearing biotite pegmatites. Only one locality was visited, but other marbles may be present lower down the hillside.

The pelitic schists contain biotite and garnet, and most also contain cordierite and sillimanite; staurolite is absent, its place probably having been taken by sillimanite and cordierite. Layering in the schists is disturbed by small lenses and concordant streaks of quartz and feldspar with which coarse segregations of garnet are commonly associated. Locally these felsic segregations give the schists an 'augen' appearance.

The schists are separated from the marble by a 1 m thick subconcordant muscovite pegmatite. Fine-grained grey calc-silicates are interlayered with the marble near this contact, and contain diopside, actinolite, bytownite, and calcite, with minor clinozoisite, prehnite, and talc. The marble itself is about 40 m thick, and consists of calcite, with diopside, forsterite, talc, antigorite, and possibly wollastonite. The biotite-quartz-feldspar gneiss overlying the marble was not examined in detail, but is very thoroughly permeated with pegmatites and migmatitic in appearance, with local varieties that could be described as augen gneiss.

The metamorphic geology of area G is complex. Relict staurolite and possibly kyanite are present in pelitic rocks in the southern part, but are partly replaced by cordierite and sillimanite, probably as a result of contact metamorphism resulting from the Cambrian granites and pegmatites. It was not seen elsewhere in the area, and higher grade, probably upper amphibolite-facies, conditions are indicated by the hornblende-cummingtonite-hypersthene rocks on the northern side of Harbour Headland, and, possibly the sillimanite-cordierite assemblages on the northern flanks of the area. Thus, metamorphic grade increases from middle amphibolite-facies in the south to upper amphibolite-facies in the north. This regional metamorphism probably followed the intrusion of basic dykes, and produced hornblende and other metamorphic minerals in them. Intrusion of granites and pegmatites came later and local contact metamorphic effects may have produced local high-grade assemblages which contain sillimanite and cordierite.

SS40-42/11 WILSON BLUFF

Blake Nunataks

The two Blake Nunataks and Mount Maguire form a northeast-oriented curve that is convex to the east, and separates the Lambert Glacier in the east from the Mellor Glacier in the west. The outcrops are all flat topped and bounded on the northern, western, and southern sides by vertical cliffs up to 600 m high; eastern slopes are less precipitous and may indicate that the Lambert Glacier here is not eroding the outcrops as vigorously as the Mellor Glacier is on the other sides.

Ruker (1963) inspected the Blake Nunataks from the air and noted that they consisted of dark grey, regularly banded rocks that he thought might be unmetamorphosed sediments. Tingey & England, 1973, described specimens of lower amphibolite-facies grade metamorphics from the flanks of Mount Maguire and illustrated (their Fig. 23) a spectacular fold structure exposed in the western face of the southern Blake Nunatak.

The southern of the two Blake Nunataks consists of a small, nearly isolated outcrop at the southern tip, and three rounded hills aligned about northeast. The southernmost outcrop consists of vertically dipping, east-west striking brown quartzites, invaded by abundant irregular pegmatites - rocks that are identical to, and correlated with, the brown calcareous quartzites and pegmatites mapped nearby at Wilson Bluff by McLeod (1959), and Tingey & England (1973), and described elsewhere in this Record. A narrow isthmus separates this outcrop from the main nunatak, and may mark the trace of an east-west trending fault.

The southern part of the main nunatak consists of thick-banded, coarse-grained, leucocratic gneiss and interlayered mafic hornblende-biotite gneiss spectacularly folded into a large recumbent fold that is splendidly exposed in cliff sections on the west side. This fold, which has an amplitude of at least 300 m (Tingey & England, 1973), probably represents part of a nappe that moved southwards; the quartzites at the southernmost tip of the mountain may be remnants of the nose of this nappe. Excellent pinch-and-swell and boudinage structures are contained within the main fold, and small-scale recumbent folds associated with it strike east-west.

The central hill of the nunatak - that is, at the northern end of the fold structure - is composed of quartzite, with a few concordant mafic gneisses and rare pegmatites, all apparently conformably overlying the banded gneiss of the recumbent fold. They strike 135° and dip 40° NE, and are probably equivalent to the quartzite at the southernmost tip of the nunatak.

Well-banded dark garnet-hornblende-biotite-quartz-feldspar gneiss intersected by a few widely scattered thin veins of malachite or chrysocolla is exposed in the northern hill of the nunatak. The relationship between these rocks and those from the central and southern parts of the nunatak is not directly known, but similar ones occur in the northern nunatak and at Mount Maguire. They may overlie and postdate by a considerable margin the strongly folded gneisses and quartzites of the nappe structure or be affected by that structure. Poor outcrop and lack of time prevented a proper appraisal of the relationship.

A varied series of metasediments, including quartzites, semi-pelitic schist, pelitic schist, amphibolites, and pure white marbles, are exposed on the northern Blake Nunatak. The pelitic rocks include garnet-biotite schists and garnet-staurolite-biotite schists, and mostly occur near the northeast tip. Some semi-pelitic schists contain garnet; actinolite-biotite-garnet schists, with randomly orientated actinolite crystals up to 5 cm long, and impure fissile quartzites, with biotite and muscovite, are also common. The marble, having behaved incompetently during deformation, has locally intrusive contacts, and adjacent amphibolites and actinolite schists are boudinaged and crosscut by numerous quartz-chlorite and quartz-chlorite-carbonate veins.

The metasediments have apparently been gently folded and are subhorizontal although some monoclinal flexuring has occurred. Metamorphic grade is middle amphibolite-facies, with garnet, kyanite, and staurolite, although one specimen contains cummingtonite; local alteration of biotite to chlorite and saussuritization of plagioclase is attributed to subsequent retrograde metamorphism. The felsic rocks in the recumbent fold may be slightly higher grade than the banded rocks further north - for example, epidote, chlorite, and blue-green hornblende are present in the banded rocks, but microcline and green hornblende are seen in the felsic gneisses - and this could be interpreted as indicating their greater depth of burial during metamorphism. It is also evidence in favour of the banded rocks being younger than, and unconformably overlying, the folded gneisses.

Amphibolite dykes do not crosscut either the recumbently folded gneisses or the banded metasediments although subconcordant and concordant amphibolites in the recumbent fold may be streaked out remnants of originally crosscutting dykes (see, for example, Escher and others, 1975).

Stages in such a streaking out progress are exposed in the eastern cliffs of Cumpston Massif where there are obviously discordant mafic bodies in the south but concordant streaks in the north. An exposure at Mount Twigg also illustrates the process (Tingey, 1980; see also Fig. 9).

The banded metasediments in the northern parts of the Blake Nunataks seem to be less deformed than the recumbently folded gneisses and crosscutting basic dykes appear to be absent. Low grade metasediments at Mount Rubin, Mount Seddon, Mount Dummett, Mount McCauley, Mount Scheigh, Cumpston Massif and the Goodspeed Nunataks are also free of amphibolite dykes and, like the Blake Nunataks metasediments, contain a notable proportion of calcareous rocks. These similarities plus an apparently similar degree of deformation may point to correlation between the metasediments at Blake Nunataks and the other localities. The Blake Nunataks metasediments are identical to, and therefore correlated with, those exposed at nearby Mount Maguire [see Tingey and England, 1973; also this Record].

The regional correlation possibilities must be regarded as tentative as the Blake Nunataks metasediments also have features that suggest correlation with the Archaean quartzite bearing sequence at Mount Menzies, Mount Stinear and Cumpston Massif. There are, for example, common rock types, notably pelitic schists with kyanite, garnet, and staurolite. Furthermore, although the Blake Nunataks metasediments are flat layered and apparently less deformed than the nearby gneissic rocks there is some evidence that the folding which produced the recumbent fold could have postdated the lower grade metasedimentary rocks elsewhere in the southern Prince Charles Mountains. For example, Grikurov & Soloviev, 1974, and England & Langworthy, 1975, document large-scale recumbent type folding from the central part of Mount Rubin. The subhorizontal rock layering and diapiric action of the marble at Blake Nunataks is consistent with subhorizontal thrusting which could also have caused streaking out of amphibolites in the metasediments as well as the gneiss. Mineral flattening in some rocks is supporting evidence. If the Blake Mountains metasediments were involved in the horizontal thrusting that caused the recumbent fold in gneisses in the southern Blake Nunataks the absence of amphibolite dykes to discriminate older and younger rocks becomes invalid. There is as yet little field evidence that the metasediments have been horizontally thrust, and further field research is clearly needed. On the map (Plate 2) accompanying this Record the Blake Nunataks metasediments are tentatively correlated with those at Mount Rubin and elsewhere.

Mount Maguire

Mount Maguire, like the Blake Nunataks, is flat topped and bounded by near-vertical cliffs on the northern, southern, and western sides. It consists of well-banded, gently dipping, dark grey metasediments that are best exposed in the cliffs; the top of the mountain is covered by broken, locally-derived, rock debris, and bedrock is poorly exposed there. Trends in the distribution of the debris reflect those in the bedrock and can be interpreted on aerial photographs.

Mount Maguire was briefly visited in 1972, and Tingey & England (1973) described well-banded, grey meta-quartzites, and metapelites, with lower amphibolite-facies mineral assemblages that contain quartz, blue-green hornblende, biotite, muscovite, garnet, chlorite, and calcite.

Although the metasediments appear from a distance to be virtually undisturbed, investigations in 1973 showed that they are intersected by small faults, quartz veins, and pegmatite dykes, and disrupted by irregular masses of white, probably carbonate-rich, rock that appear to have acted diapirically.

Grey garnet and amphibole-bearing pelitic schists, with minor, conformably interbanded basic igneous rocks, and a few carbonate-rich interbands, are exposed at the northeast corner of the mountain. Fragments of carbonate-rich metasediments are widespread in the loose debris around this locality, and are probably exposed higher up the cliffs. Some of the bedded rocks contain structures that might be of primary sedimentary origin or, possibly, intrafolial fold structures. Such folds would indicate a higher degree of deformation than is apparent from the brief examination of Mount Maguire that has so far been made. Mineral assemblages in these rocks resemble those described by Tingey & England (1973), but widespread, though not intense, alteration of mafic minerals has produced secondary chlorite, epidote, and sericite. Actinolite is also present.

The metasediments at Mount Maguire closely resemble, and are correlated with, metasediments in the northern part of the Blake Nunataks and, by inference, with low-grade metasediments elsewhere in the southern Prince Charles Mountains. Soviet work at Mount Rubin and Mount Seddon indicates a possible late Proterozoic age for the metasediments there and by analogy those at Blake Nunataks and Mount Maguire are thought to be the same age.

Wilson Bluff

Wilson Bluff was described by McLeod (1959) and Tingey & England (1973), and little extra work was done there during the 1973 season. The mountain largely consists of brown-weathering quartzite, extensively invaded by biotite pegmatites. Photogeological studies show that there the quartzites are banded and other rock types may be present.

Pegmatite specimens collected at Wilson Bluff have given a Rb-Sr mineral age of 500 m.y., approximately the same as a Gondwanaland-wide thermal event noted by Krylov (1972) and others. Biotite pegmatite and granite intrusives of this age are known at Mount McCauley and other localities in the southern Prince Charles Mountains; rocks at the Mawson Coast yield similar mineral ages.

An interesting geomorphological feature is a 100 m drop in ice level from the outer to the inner edge of the large, amphitheatre-like, embayment on the north side of Wilson Bluff; this drop is attributed to ablation in the northward facing embayment. There is evidence at Wilson Bluff for a recent fall in regional ice levels: for example, in this northern embayment, the moraine between the mountain and the ice retains patterns presumably left when the ice was higher than at present. Were the ice rising, the moraine would be overridden or intruded by the ice and the ablation effect noted above would not be likely.

SS40-42/12 MOUNT TWIGG

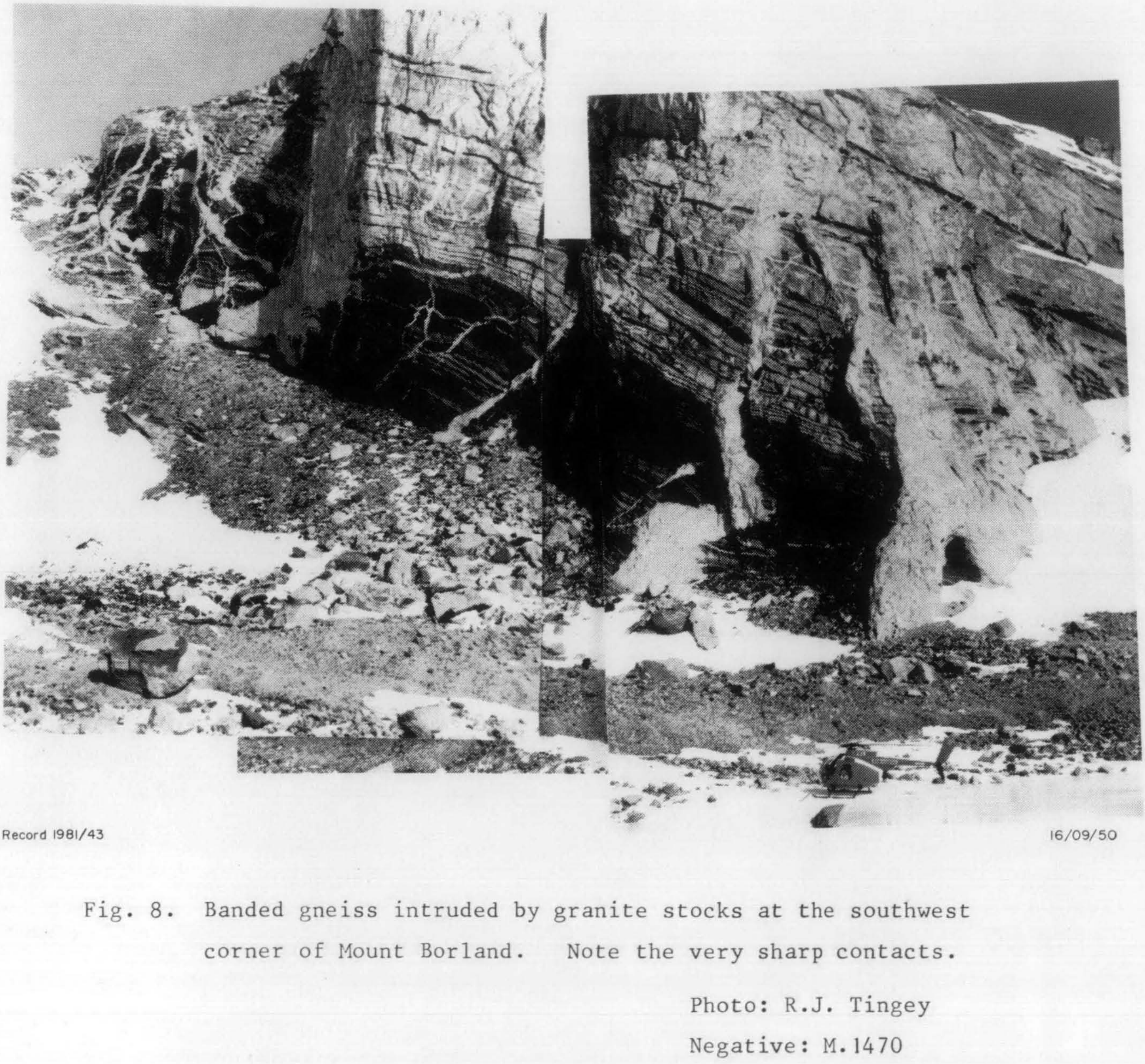
Mount Borland

Mount Borland, the southernmost mountain of the Prince Charles Mountains, consists of rounded dome-like hills that are mostly covered with loose rock debris. Better exposures are in cliff faces on the northern and southwestern faces of the mountain.

The southwest part of Mount Borland and some small nunataks nearby consist of regularly banded gneiss intruded by biotite pegmatite and biotite granite dykes. White mica is rare in these intrusives. At the southwest corner of the mountain, interbanded biotite-quartz-feldspar gneiss, leucogneiss, mafic gneiss, amphibolites, and minor brown-weathering calc-silicate gneisses are extensively invaded by acid intrusives (Fig. 8). Mafic gneiss and biotite-quartz-feldspar gneiss predominate near the base of the exposure, and grade upwards into more leucocratic gneiss.

Banded light and dark coloured gneisses intruded by small stocks and veins of granitic pegmatite are exposed in cliffs surrounding a large embayment near the northeast corner of Mount Borland. Interbanded impure quartzites and pelitic schists, capped by white quartzite closely resembling the 'Menzies-type' quartzite that is widespread throughout the southern Prince Charles Mountains, overlie the light and dark coloured gneisses without any obvious unconformity; the intrusives thin towards the top of the gneiss and only a few thin stringers penetrate the impure quartzites and pelitic schists.

The 'Menzies-type' quartzite is also seen on the central peak of the mountain, where it overlies, again without any apparent disconformity, red-weathering biotite-quartz-feldspar gneiss, migmatite, and mafic gneiss. There is no sign here of the impure quartzites and pelitic schists seen near the northeast corner of the mountain, and the quartzites appear to unconformably overlie and lap on to the gneiss. The apparent structural continuity between the two units could have arisen during deformation.



Record 1981/43 16/09/50

Fig. 8. Banded gneiss intruded by granite stocks at the southwest corner of Mount Borland. Note the very sharp contacts.

Photo: R.J. Tingey
Negative: M.1470

The Mount Borland rocks generally have high to medium-grade amphibolite-facies assemblages: sillimanite is common in metapelites, coexisting in apparent equilibrium with muscovite in some specimens. Hornblendes in amphibolites in the northeast part of the mountain are blue-green, but those from the mafic gneiss at the southwestern part are brown-green, possibly indicating that the former area was less deeply buried during metamorphism than the latter. Secondary alteration is common, and manifested by widespread production of sericite, in particular, at the expense of biotite.

Banded light and dark gneiss similar to that at the southwest tip of Mount Borland is exposed at the southeast tip of Mount Twigg, and overlies massive brownish-weathering quartzite, possibly correlated with quartzites at Wilson Bluff and the southernmost Blake Nunatak. Coarse-banded gneiss underlies the quartzite at Blake Nunataks and is spectacularly folded in what may be a nappe structure (see p. 73 and Tingey & England, 1973). The relationships between the banded gneiss, the brown-weathering quartzite, and the 'Menzies-type' quartzite are not well-defined, but the banded gneisses are presumed to be basement to both quartzites. Elsewhere in the Prince Charles Mountains, the 'Menzies' quartzite is intersected by amphibolite dykes, but such dykes are not seen at Mount Borland.

Rb-Sr dating of the intrusives in the southwest part of Mount Borland gives biotite ages of about 520 m.y., and the intrusives, like the pegmatites at Wilson Bluff, are considered to be related to the widespread 500 m.y. thermal event detected throughout the southern Prince Charles Mountains.

Mount Twigg

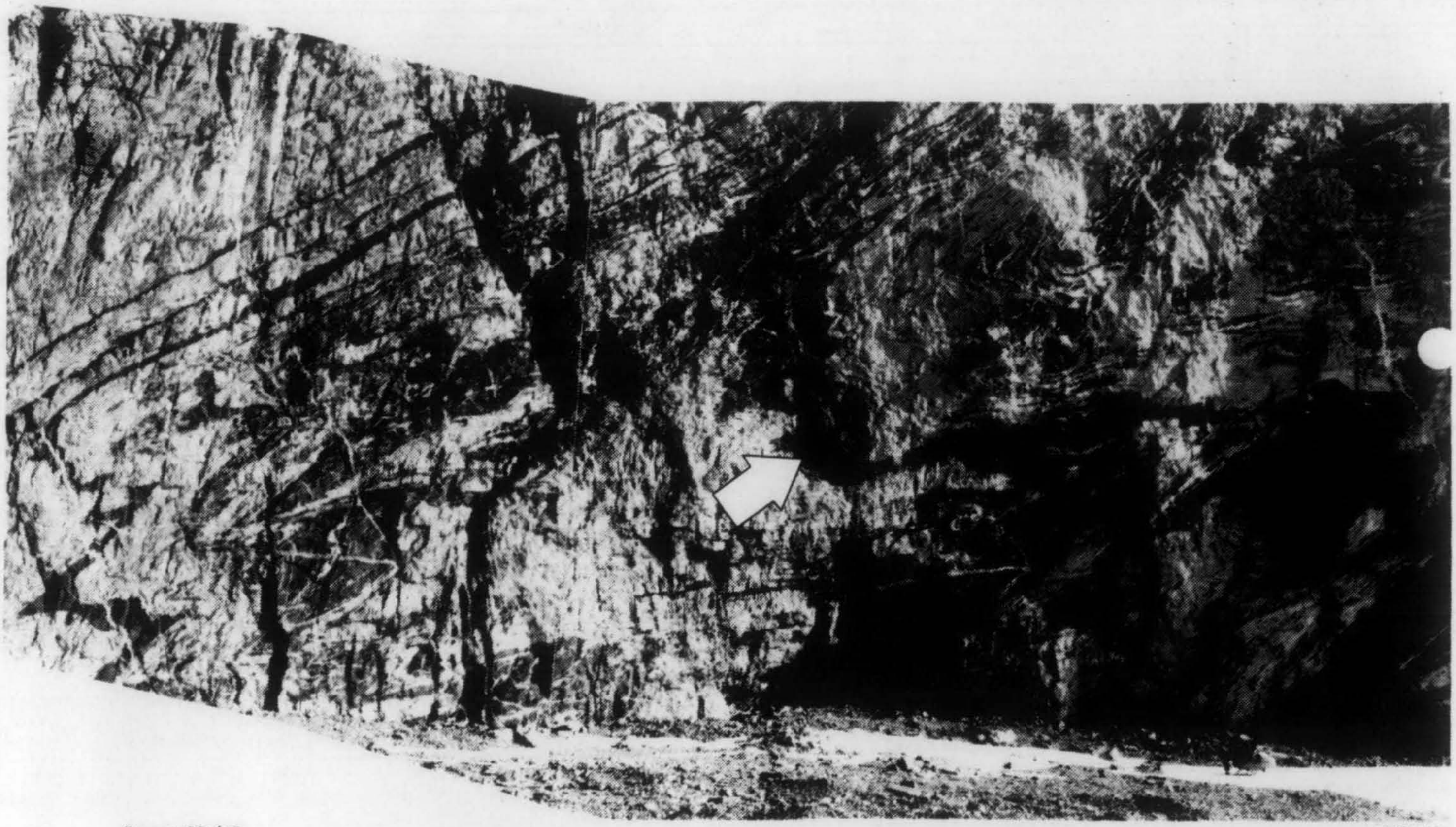
Mount Twigg, which stands at the confluence of the two southern arms of the Lambert Glacier, consists of four rounded hills bounded on the western, northern, and eastern sides by vertical cliffs. The gentler upper slopes of the mountain are mantled by felsenmeeren of loose, mostly locally-derived rock debris, and bedrock is poorly exposed, although bedrock trends are preserved in the felsenmeer. Bedrock is well exposed in the cliff faces and the geology (Fig. 9) is locally complex.

The southwestern part of Mount Twigg mostly consists of migmatitic biotite-muscovite-quartz-feldspar, with interbanded amphibolites and quartz-rich, pelitic, and basic rocks, intruded by abundant tourmaline-bearing biotite-muscovite pegmatites. In places, the gneiss is highly contorted on a scale of about 1 metre, but, on a larger scale, folding is gentle and dips are at shallow or moderate angles. Pelitic gneiss containing biotite and sillimanite, usually in clots several centimetres long, is particularly common near the southwest tip of the mountain. Garnet is found in bands throughout the migmatites and is especially common in the quartz-rich and semi-pelitic bands. Many of the amphibolites are boudinaged and tightly folded and some contain garnet; some contain prominent crystals of a green mineral, probably apatite, near pegmatite contacts.

At least two generations of pegmatite can be distinguished. The older consists of massive leucocratic garnet-biotite-muscovite pegmatites up to several metres wide; these are intersected by thin (10-15 cm) pegmatites with abundant muscovite and a little garnet.

The northwestern part of Mount Twigg also consists of migmatitic gneiss crosscut by abundant garnet-biotite-muscovite pegmatites. The migmatites are diffusely banded and contain mafic pods and schlieren, and scattered amphibolites. Distinctive pelitic metasediments are less common than in the southwestern part of the mountain, and the most abundant rocks are grey, well-banded and foliated biotite-quartz-feldspar gneiss, coarser-grained biotite leucogneiss, and concordant pegmatitic segregations. Some bands that contain sillimanite with or without garnet, are of metasedimentary origin; hornblende-bearing mafic bands are generally boudinaged or occur locally as isolated fold noses. Amphibolites are scattered throughout the section, but are thin and therefore constitute only a small proportion of the total; two types are distinguished, and one, although strongly folded, appears slightly discordant (see Fig. 9).

The relationship between the felsic migmatites and the interbanded distinctively metasedimentary rocks is not clear in this part of Mount Twigg. In places the felsic migmatites overlie the metasediments, elsewhere the situation is reversed. The migmatites are, in the main, broadly folded but in a few localities notably in a cliff section about



Record 1981/43

16/09/51

Fig. 9. Intensely folded felsic gneiss and amphibolite on the west side of Mount Twigg. The arrow points to a deformed metabasic intrusive that was emplaced before the main folding. The cross-cutting pegmatite vein postdates the folding. Note helicopter for scale.

Photo: J.W. Sheraton
Negatives: M.1474; 1475

midway along the western side of the mountain they are tightly folded [Fig. 9; see also Tingey, in press]. Discordant amphibolites are generally absent from the Mount Twigg rocks but remnants of one can be seen in the fold structure illustrated in Fig. 9: this is evidence that the migmatites at Mount Twigg predate the dyke rocks and as such are perhaps equivalent to the Archaean basement gneisses exposed elsewhere in the southern Prince Charles Mountains. The fold illustrated in Fig. 9 is intersected by pegmatites attributed to the pervasive 500 m.y. thermal metamorphic episode detected elsewhere in the southern Prince Charles Mountains and is thought to be of the same vintage as the structures seen at Mount Menzies, Mount Johns, Mount Rubin and Blake Nunataks, for example. In other words the fold is thought to have been formed about 800 m.y. ago.

In cliff sections at the southeast tip of Mount Twigg coarse banded light and dark gneiss overlie brownish weathering quartzite. Irregular pegmatites invade the quartzite but few penetrate the gneiss. Similar quartzites and banded gneiss occur in the southern Blake Nunataks (see this Record) but there, although the structure is complex, the quartzite appears to overlie the gneiss. The brownish quartzite at the southeast tip of Mount Twigg and those at Blake Nunataks can be correlated with quartzites described from Wilson Bluff by McLeod (1959) and Tingey & England (1973). The presence of major structures at Blake Nunataks and at Mount Twigg raises the possibility that the relative position of the migmatites and quartzites at southeastern Mount Twigg may be due to structural rather than depositional circumstances.

At the easternmost point of Mount Twigg, micaceous flaggy quartzites, with subordinate diopside-rich bands and thin subconcordant pegmatites, are exposed in the cliff sections. The diopside-rich bands also contain secondary actinolite, the product of retrograde metamorphism. The quartzites strike 225^{o} and dip 27^{o}N. Similar strike directions were observed over much of the eastern part of the mountain. To the west dips are steeper; further west again dips are again shallow.

Isoclinally folded quartzites that strike 100^{o} and dip 30^{o} N are exposed at the northern tip of the mountain, but southwest of this locality the strike swings to about 080^{o}. A lineation defined by aligned biotite crystals on foliation planes strikes 055^{o}. The quartzites commonly contain biotite, and concordant amphibolite bands, ranging from a few cm to 3 m wide, are widespread, but calcareous layers are not as abundant as in the Wilson Bluff quartzite.

Mount Twigg thus appears to consist of quartzites overlain by interbanded gneiss, migmatite, and quartzite, intruded by late-stage garnet-biotite-muscovite pegmatites. The quartzites are tentatively correlated with the calcareous quartzites exposed at Wilson Bluff, and the other rocks are thought to be equivalent to the banded gneiss exposed in a large recumbent fold on the southwestern face of the southernmost Blake Nunatak. At Blake Nunataks, the gneiss is overlain by quartzites considered to be equivalent to those at Wilson Bluff and the reversal of this succession at Mount Twigg is tentatively attributed to large scale folding like that illustrated in Fig. 9.

NORTHERN PRINCE CHARLES MOUNTAINS

Towards the end of the field season, two visits were made to the northern Prince Charles Mountains. The first, to Fisher Massif, the Beaver Lake area, Mount Collins, and Mount Willing, was primarily concerned with gravity observations, and with apparent errors in the existing topographic maps of the Beaver Lake area. The gravity results were reported by Wellman & Tingey (1976). The topographic map of the Beaver Lake area has been amended following a barometer traverse from Fox Ridge to the southern end of Jetty Peninsula, which showed that Flagstone Bench is about 200 m high, with cliffs on the northern (Beaver Lake) side and merging with the ice plateau to the south. The old topographic maps had depicted it as a ridge between Beaver Lake and the ice plateau that reached 600 m above the level of Beaver Lake, but this had been questioned as a result of observations made during compilation of the Beaver Lake 1:250 000 geological map.

The field party also visited the southwestern part of Manning Massif (to the west of Beaver Lake), and collected samples of a vesicular basalt flow that is exposed there and which was first sampled in 1971 (Tingey, 1972). The basalt is olivine leucitite and its K-Ar age about 50 $\pm$ 2 m.y. (Tingey, 1976) [see also Appendix III]. Wellman & Tingey, 1981, cite the age of this flow as evidence that a major erosion surface exposed widely in the Prince Charles Mountains is of preglacial origin.

Oriented samples of fine-grained reddish siltstone were collected from the Permian sedimentary sequence at Glossopteris Gully near Radok Lake (cf. Mond, 1972). These were examined at the Research School of Earth Sciences, ANU, but found to be unsuitable for palaeomagnetic determination. However, there is a good chance that more suitable redbed deposits could be found elsewhere in the Beaver Lake area.

The northern ranges of the northern Prince Charles Mountains were also visited, mainly for gravity work, but samples for geochronological and geochemical analysis were obtained. Sheraton and Arriens then remained at the Moore Pyramid Camp and collected more geochemical and geochronological samples from nearby mountains.

ECONOMIC GEOLOGY

The Prince Charles Mountains are between 250 km and 700 km from the Antarctic coast, which is itself 5000 km from the nearest continent, and accessible by ship for only two months of the year. Some of the world's largest glaciers pass among the mountains and make surface transport very hazardous and difficult.

Because they are so remote and logistics costs are so high, the Prince Charles Mountains offer no realistic prospects for the economic exploitation of mineral resources in the foreseeable future. Although exposure is good by Antarctic standards, it is sparse by other standards and, as must be apparent from this Record, the area has not been exhaustively explored. (ANARE geologists have done about 1 man-year's fieldwork in an area of about 50,000 km^2).

Conventional methods of geochemical exploration cannot be applied in Antarctica because of the absence of soils and stream drainage, but geophysical methods offer some prospect for the possible detection of anomalies hopefully caused by mineral deposits. Geophysical surveys could most effectively be used for extrapolating the extent of exposed mineral deposits - Soviet geologists have traced the Mount Ruker ironstone deposits for 120 km using aeromagnetic methods - and scintillometer surveys might detect anomalies that could be examined in more detail by ground surveys.

Soviet geologists apparently regard the Mount Ruker ironstones as an important deposit, despite its relatively small surface extent and its modest grade (35-40% Fe). In the Soviet Union, amounts of overburden (> 150 m) that would preclude the exploitation of the deposit in Western countries have been removed to allow open-cut mining, and no doubt the Soviet view of economic geology differs markedly from the Australian experience. Nevertheless, it is difficult to believe that even Soviet requirements for iron ore are such as to justify in the foreseeable future the exploration of the modest deposits so far known from the Prince Charles Mountains.

Soloviev & Grikurov (1974) comment on the kimberlitic affinities of the alnoite sills at Radok Lake, and other alkaline rocks, possibly associated with a major rifting structure under the Amery Ice Shelf-Lambert Glacier (Wellman & Tingey, 1976), are described in this record. However, ages for these rocks range from 430 m.y. (Mount Bayliss magnophorite basalt) to 52 m.y. (Manning Massif olivine leucitite), and they are related only in space. The detection of kimberlites by the usual methods is precluded by the absence of streams and is only likely if a geologist actually stumbles over one!

Other mineral deposits might be associated with pegmatites near the various intrusives known in the Prince Charles Mountains, but are unlikely to be of more than academic interest.

ACKNOWLEDGEMENTS

We are grateful to our colleagues in the field for their co-operation and assistance, and particularly to the Division of National Mapping surveying and aerial photography team lead by John Manning, and to Lem Macey (OIC Mawson and Mount Cresswell bases) and his Mawson party for a well-supplied and well-organised base camp facility. Logistic support for all fieldwork was provided by the Antarctic Division, Department of Science for the Australian National Antarctic Research Expedition.

REFERENCES

ALLISON, I.R., 1979 - The mass budget of the Lambert Glacier drainage basin, Antarctica. Journal of Glaciology, 87, 223-35.

AMDEL, 1967 - The petrography of some rocks from the Prince Charles Mountains, Australian Antarctic Territory. Australian Mineral Development Laboratories, AMDEL Report MP 817-67.

ARRIENS, P.A., 1975 - The Precambrian geochronology of Antarctica. Abstracts of the First Australian Geological Convention, Adelaide, May 1975. Geological Society of Australia, Inc., 97-98.

BEGIAZOROV, P., ed., 1969 - TECTONIC MAP OF THE POLAR REGIONS OF THE EARTH. Ministry of Geology of the U.S.S.R., Moscow.

CRADDOCK, C.C., 1972 - GEOLOGICAL MAP OF ANTARCTICA, scale 1:15 000 000. American Geographical Society, New York.

CRADDOCK, C.C., (editor), in press - ANTARCTIC GEOSCIENCE. University of Wisconsin Press, Madison, Wisconsin.

CRAWFORD, A.R., 1974 - Indo-Antarctica, Gondwanaland, and the distortion of a granulite belt. Tectonophysics, 22, 141-57.

CROHN, P.W., 1959 - A contribution to the geology and glaciology of the western part of Australian Antarctic Territory. Bureau of Mineral Resources, Australia, Bulletin 52.

DERBYSHIRE, E.R., & PETERSEN, J.A., 1978 - A photo-geomorphic map of the Mount Menzies nunatak, Prince Charles Mountrina, Australian Antarctic Territory. Zeitschrift fur Gletscherkunde und Glazialgeologie, 14, 17-26.

ENGLAND, R.N., & LANGWORTHY, A.P., 1975 - Geological work in Antarctica, 1974. Bureau of Mineral Resources, Australia, Record 1975/30 (unpublished).

ESCHER, A., ESCHER, J.C. & WATTERSON, J., 1975 - The reorientation of the Kangamiut dike swarm West Greenland. Canavian Journal of Earth Sciences, 12, 158-73.

FEDEROV, L.V., in press - Geological structure of the Prince Charles Mountains, East Antarctica. In CRADDOCK, C.C. (editor) - Antarctic Geoscience. University of Wisconsin Press, Madison.

FEDEROV, L,V., GRIKUROV, G.E., KURININ, R.G., & MASOLOV, V.N., in press - Crustal structure of the Lambert Glacier area from Geophysical data. In CRADDOCK, C.C. (editor) - Antarctic geoscience. University of Wisconsin Press, Madison.

FILSON, R.B., 1966 - The lichens and mosses of MacRobertson Land. ANARE Scientific Report, Series B (2), Publication No. 82.

FOWLER, K.F., 1971 - Ice thickness measurements in MacRobertson Land, 1957-59. Bureau of Mineral Resources, Australia, Bulletin 105.

GREW, E.S., 1975 - With the Soviets in Antarctica, 1972-1974. Antarctic Journal of the United States X(1), 1-8.

GRIKUROV, G.E., & SOLOVIEV, D.S., 1974 - Geological structure of the mountains framing the Lambert Glacier from Field (Studies by the Seventeenth Soviet Antarctic Expedition in January-February 1972). Bulletin of the Soviet Antarctic Expedition 8 (10), (Bulletin 88), 543-48.

HALPERN, M., & GRIKUROV, G.E., 1975 - Rubidium strontium data from the Southern Prince Charles Mountains. Antarctia Journal of the United States, X (1), 9-15.

HUMPHREYS, A.L., 1972 - Report on the Prince Charles Mountains Survey, Phase Four (1971-72). Antarctic Division, Department of Supply, Australia, (unpublished internal report).

ILTCHENKO, L.N., 1972 - Late Precambrian acritarchs of Antarctica. In ADIE, R.J. (editor) - Antarctic Geology and Geophysics. Universitetsforlaget, Oslo, 599-602.

KRYLOV, A. Ya., 1972 - Antarctic geochronology - a review. In ADIE, R.J. (editor) - Antarctic Geology and Geophysics. Universitetsforlaget, Oslo, 491-94.

MACEY, L.E., 1973 - Prince Charles Mountains Survey - Phase Five, 1972-73. Antarctic Division, Department of Science, Australia, (unpublished internal report).

McLEOD, I.R., 1959 - Report on geological and glaciological work by the 1958 Australian National Antarctic Research Expedition. Bureau of Mineral Resources, Australia, Record 1959/131 (unpublished).

McLEOD, I.R., 1964 - An outline of the geology of the sector from longitude 45°E to 80°E, Antarctica. In ADIE, R.J. (editor) - Antarctic Geology. North Holland, Amsterdam, 237-47.

MOND, A., 1972 - Permian sediments of the Beaver Lake area, Prince Charles Mountains. In ADIE, R.J., (editor) - Antarctic Geology and Geophysics. Universitetsforlaget, Oslo, 585-89

MORGAN, V.I., & BUDD, W.F., 1975 - Radio-echo sounding of the Lambert Glacier Basin. Journal of Glaciology, 15 (73), 103-11.

RAVICH, M.G., & FEDEROV, L.V., in press - Geological structure of MacRobertson Land and Princess Elizabeth Land, East Antarctica. In CRADDOCK, C.C. (editor) - Antarctic Geoscience. Univertisy of Wisconsin Press, Madison.

RAVICH, M.G., FEDEROV, L.V., & TARUTIN, O.A., in press - Iron deposits of the Prince Charles Mountains. In CRADDOCK, C.C. (editor) - Antarctic Geoscience. University of Wisconsin Press, Madison.

RUKER, R.A., 1963 - Geological reconnaissance in Enderby Land and Southern Prince Charles Mountains, Antarctica. Bureau of Mineral Resources, Australia, Record 1963/154 (unpublished)

SHERATON, J.W., & ENGLAND, R.N., 1980 - Highly potassic mafic dykes from Antarctica. Journal of the Geological Society of Australia, 27, 129-35.

SOLOVIEV, D.S., 1972 - Geological structure of the mountain fringe of the Lambert Glacier and Amery Ice Shelf. In ADIE, R.J. (editor) - Antarctic Geology and Geophysics. Universitetsforlaget, Oslo, 573-77.

TINGEY, R.J., 1972 - Geological work in Antarctica - 1971. Bureau of Mineral Resources, Australia, Record 1972/132 (unpublished).

TINGEY, R.J., 1974 - Application of ERTS imagery in geological mapping and other field operations in Antarctica. Bureau of Mineral Resources, Australia, Record 1974/131 (unpublished).

TINGEY, R.J., 1976 - Basic and alkaline intrusive rocks in the Prince Charles Mountains. In Geological Branch Summary of Activities 1975. Bureau of Mineral Resources, Australia, Report 194, 73.

TINGEY, R.J., in press - The Prince Charles Mountains - an Antarctic Archaean cratonic block. In CRADDOCK, C.C. (editor) - Antarctic Geoscience. University of Wisconsin Press, Madison.

TINGEY, R.J., & ENGLAND, R.N., 1973 - Geological work in Antarctica, 1972. Bureau of Mineral Resources, Australia, Record 1973/161 (unpublished).

TRAIL, D.S., 1963 - The 1961 geological reconnaissance in the southern Prince Charles Mountains Antarctica. Bureau of Mineral Resources, Australia, Record 1963/155 (unpublished).

TRAIL, D.S., 1964a - The glacial geology of the Prince Charles Mountains. In ADIE, R.J. (editor). Antarctic Geology. North Holland, Amsterdam, 143-51.

TRAIL, D.S., 1964b - Schist and granite in the southern Prince Charles Mountains. In ADIE, R.J., (editor). Antarctic Geology. North Holland, Amsterdam, 492-97.

TRAIL, D.S. & McLEOD, I.R., 1969 - Geology of the Lambert Glacier region. American Geographical Society Antarctic Map Folio Series, Folio 12, Sheet 12.

WELLMAN, P., in press - Surging of the Fisher Glacier, East Antarctica; evidence from geomophololgy. Journal of Glaciology.

WELLMAN, P. & TINGEY, R.J., 1976 - Gravity evidence for a major crustal fracture in eastern Antarctica. Bureau of Mineral Resources, Australia. Journal of Australian Geology and Geophysics, 1, 105-08.

WELLMAN, Peter, & TINGEY, R.J., 1981 - Glaciation, erosion and uplift over part of East Antarctica. Nature, 291 (5811), 142-44.

WHITE, M.E., 1962 - Report on the 1961 plant fossil collections. Bureau of Mineral Resources, Australia, Record 1962/114 (unpublished).

Appendix 1

Thin section descriptions - southern Prince Charles Mountains

The thin section descriptions are arranged, like the Record, in alphabetical order of locality, and in numerical order of 1:250 000 map sheet area. Cards with more detailed descriptions are filed in the Bureau of Mineral Resources where the thin sections are also available for inspection.

SS40-42/2 GOODSPEED NUNATAKS

Sample	Assemblage	Classification
BINDERS NUNATAKS		
R8832	Labradorite, quartz, garnet, hornblende (green), biotite.	Felsic gneiss
R8833	Labradorite (reverse zoned), hornblende (pale olive), quartz, biotite, opaques	Amphibolite
R8834	?Andesine (sericitised), hornblende. (olive green), garnet, quartz, biotite, opaques.	Garnet amphibolite
R8835	?Labradorite (reverse zoned), hornblende, (olive green), quartz, opaques, sphene (rimming opaques).	Amphibolite
73281385	Oligoclase-andesine, microcline, quartz, biotite, garnet.	Felsic gneiss
73281613	Quartz, albite (sericitised), tourmaline	Quartzite
73281614	Labradorite, hornblende (olive green), quartz, biotite, opaques.	Amphibolite
73281615	Andesine, orthoclase, quartz, garnet, biotite, sericite, opaques, apatite.	Leucogneiss
73281616	Quartz, labradorite, garnet, biotite, cordierite, sillimanite, muscovite (secondary).	Pelitic gneiss
73281617A	Andesine-labradorite, quartz, K-feldspar, biotite, muscovite, garnet.	Felsic gneiss (quartz-rich)
73281617B	Andesine, quartz, garnet, biotite, sillimanite (replacing kyanite), rutile.	Pelitic gneiss
73281618	Andesine, quartz, garnet, biotite, sillimanite, rutile.	Pelitic gneiss
73281692	Oligoclase, K-feldspar, quartz, hornblende, biotite, sphene, opaques.	Felsic gneiss
GOODSPEED NUNATAK E		
73281052	Quartz, muscovite, biotite (very pale), chlorite, opaques, apatite.	Quartzite
73281053	Kyanite, biotite, white mica, albite, magnetite, rutile, zircon.	Pelitic schist
73281054	Quartz, cordierite (poikiloblastic, possibly of contact metamorphic origin), biotite (pale), chlorite (after garnet and biotite), white mica, magnetite.	Metaconglomerate
73281055	Quartz, biotite, white mica, chlorite (after biotite), opaques.	Metaconglomerate
73281056	Albite, quartz, muscovite, kyanite, ?beryl (in hand specimen).	Pegmatite (deformed)
GOODSPEED NUNATAK F		
73281057	Quartz, biotite, white mica, chlorite, opaques.	Psammo-pelitic schist
73281058	Albite, K-feldspar, quartz, muscovite + chlorite + rutile (after ?biotite), tourmaline, magnetite, calcite.	Altered pegmatite
73281059	Quartz, actinolite, epidote, biotite, sphene.	Calc-silicate schist

SS40-42/3 MOUNT CRESSWELL

Sample	Assemblage	Classification
BOSSE NUNATAK		
73281007	Oligoclase, microcline/orthoclase, garnet, biotite, quartz, muscovite (secondary), opaques.	Garnet-rich gneiss
73281008	Andesine (An43), orthoclase, garnet, biotite, quartz, opaques.	Garnet-rich gneiss
ELY NUNATAK		
73281009	Hornblende, diopside (altered to hornblende), labradorite (An55), sphene, quartz, opaques.	Calc-silicate gneiss
73281010	Diopside, scapolite, microcline, biotite (greenish-brown), sphene, quartz, calcite.	Calc-silicate gneiss
73281011	Diopside (partly altered to hornblende, hornblende, labradorite (An60), biotite, sphene, quartz, opaques.	Calc-silicate gneiss
73281012	Diopside, labradorite (An60), biotite (greenish-brown), hornblende (after diopside), quartz, opaques.	Calc-silicate gneiss
73281072	Bytownite, hornblende (brownish-green), biotite, quartz, K-feldspar, opaques, apatite.	Amphibolite
73281073	Diopside, labradorite, hornblende + biotite + carbonate (secondary), quartz, sphene.	Calc-silicate gneiss
MACHIN NUNATAK		
73281418	Plagioclase (strongly zoned), hornblende (brownish-green), garnet (around hornblende + quartz aggregates), quartz, sphene, opaques.	Metadolerite dyke margin
73281419	Labradorite (zoned), hornblende (olive green) quartz, sphene, opaques.	Metadolerite dyke
73281420	Labradorite, quartz, garnet (possibly 2 generations, the older surrounded by ? cordierite), biotite, muscovite, ? kyanite (in hand specimen).	Pelitic gneiss
MOUNT BLOOMFIELD		
R8836	Microcline, albite (phenocrysts), quartz, biotite, ferrohastingsite, sphene.	Altered granite
R8837	Orthoclase, albite (sericitised phenocrysts), quartz, opaques.	Sheared granite
73281013	Hornblende (blue-green & green-brown), plagioclase, quartz, epidote, sphene, opaques	Sheared granite
73281014	Orthoclase/microcline, quartz, ferrohastingsite, biotite, sphene, epidote, ?allanite, carbonate (matrix).	Brecciated granite
73281015	Microcline, plagioclase, quartz, ferro-hastingsite, biotite, sphene, diopside (relict), epidote, ?allanite, calcite.	Foliated granite

Sample	Assemblage	Classification
MOUNT JOHNS		
	For details of rocks collected in 1972, see Tingey and England (1973).	
65280252	Andesine (An33), orthoclase (locally perthitic), quartz, biotite, apatite, zircon.	Felsic gneiss
65280253	Plagioclase (An30), quartz, biotite, cummingtonite, hornblende (green), apatite, zircon, opaques.	Felsic gneiss (Quartz-rich)
73281086	Andesine (An33), quartz, K-feldspar, garnet, biotite, apatite, opaques.	Felsic gneiss
73281087	Andesine (An33), quartz, hornblende (green), biotite, K-feldspar, opaques.	Felsic gneiss
73281320	Andesine-labradorite (An50), orthoclase, quartz, hornblende (green), biotite, apatite, opaques.	Felsic gneiss
73281321	Andesine, orthoclase, quartz, hornblende (green), biotite, apatite, opaques.	Felsic gneiss
73281322	Microcline, oligoclase, quartz, biotite (slightly chloritised), garnet.	Leuco-granite
73281369	Andesine-labradorite, quartz, garnet, biotite, opaques, sillimanite (in hand specimen).	Felsic gneiss (aluminous)
73281370	Labradorite, quartz, hornblende (pale olive), biotite (partly chloritised).	Felsic gneiss
73281371	Quartz, diopside, scapolite, sphene.	Calcareous quartzite
73281372	Microcline perthite, quartz, plagioclase, garnet, biotite, (partly altered to garnet + perthite), opaques.	Felsic gneiss
73281373	Oligoclase, K-feldspar, quartz, garnet, biotite (partly altered to garnet & K-feldspar), carbonate, muscovite (secondary), sillimanite (in hand specimen).	Felsic gneiss (aluminous)
73281374	Oligoclase, orthoclase, quartz, biotite, hornblende (green), opaques.	Felsic gneiss
73281375	Oligoclase, orthoclase, quartz, biotite, hornblende (green), apatite, ?allanite, opaques.	Felsic gneiss
73281376	Oligoclase-andesine, orthoclase, quartz, biotite, apatite, opaques.	Felsic gneiss
73281684	Labradorite, hornblende (pale green), quartz, sphene.	Amphibolite
73281685	Labradorite, hornblende (olive green), quartz, opaques.	Amphibolite
73281686	Plagioclase, orthoclase, quartz, biotite, chlorite (secondary), garnet, hornblende (dark brownish green), apatite, opaques. Possibly originally hypersthene-bearing.	Felsic gneiss
73281687	Oligoclase, K-feldspar, quartz, biotite, opaques.	Felsic gneiss
SHAW MASSIF		
73281075	Diopside, scapolite, calcite, quartz, sphene, epidote (secondary), ?edenitic hornblende (secondary).	Calc-silicate gneiss

Sample	Assemblage	Classification
GOODSPEED NUNATAK G		
73281060	Quartz, biotite (poikiloblastic), muscovite, opaques.	Quartzite
73281061	Albite, quartz, muscovite.	Deformed pegmatite
73281062	Quartz, albite, white mica.	Quartz vein
73281063	Quartz, white mica + chlorite (after ?biotite).	Quartz vein
73281064A	Actinolite, epidote, quartz, plagioclase, chlorite, rutile, opaques, apatite.	Calc-silicate
73281064B	Actinolite, epidote, andesine, quartz, carbonate, rutile, opaques.	Calc-silicate
73281065	Albite, quartz, chlorite + sericite (after ?biotite), opaques.	Altered pegmatite
73281066	Quartz, biotite (greenish-brown, slightly altered), white mica, chlorite, opaques.	Quartzite
73281067	Quartz, microcline, chlorite (after biotite), muscovite, opaques.	Quartzite
GOODSPEED NUNATAK I		
73281068	Quartz, microcline, chlorite (after biotite), muscovite, opaques.	Quartzite
73281069	Quartz, biotite, (poikiloblastic), muscovite, chlorite, K-feldspar, opaques.	Psammo-pelitic schist
73281070	Quartz, biotite, muscovite, microcline, epidote, opaques.	Metaconglomerate
73281134	Quartz, microcline (poikiloblastic), biotite (poikiloblastic), muscovite, opaques.	Psammo-pelitic schist
73281135	Quartz, microcline (poikiloblastic), biotite (poikiloblastic), muscovite, opaques.	Psammo-pelitic schist
73281136	Quartz, K-feldspar, biotite, muscovite, opaques.	Quartzite

Sample	Assemblage	Classification
MOUNT CRESSWELL		
	For details of rocks collected before 1973, see Tingey and England (1973).	
73281101	Andesine, quartz, K-feldspar, biotite, garnet, muscovite, apatite, zircon.	Felsic gneiss
73281102	Oligoclase, quartz, biotite, muscovite (after ?K-feldspar), sillimanite, apatite, opaques.	Felsic gneiss (aluminous)
73281103	Labradorite (strongly reverse zoned), hornblende (pale green), garnet, biotite, quartz, opaques.	Garnet amphibolite
73281104	Hornblende (pale brownish-green), garnet, labradorite, biotite, quartz, (sphene) opaques (garnet shows marginal alteration to hornblende + plagioclase).	Garnet amphibolite
73281105	Saussuritised plagioclase, hornblende (brownish-green), biotite (partly chloritised), quartz, sphene.	Amphibolite
73281106	Garnet, biotite, sillimanite (replacing biotite), muscovite (secondary), apatite, zircon.	Pelitic gneiss
73281107	Quartz, andesine, biotite, muscovite, apatite.	Felsic gneiss (quartz-rich)
73281108	Quartz, albite, biotite, muscovite, garnet, apatite, zircon.	Felsic gneiss (quartz-rich)
73281109	Oligoclase, quartz, biotite, muscovite, zircon.	Felsic gneiss
73281110	Labradorite, hornblende (pale olive-brown), garnet (skeletal), quartz, biotite, opaques.	Garnet amphibolite
73281111	Andesine, quartz, garnet, biotite, muscovite, apatite, zircon, opaques.	Felsic gneiss
73281112	Oligoclase, quartz, garnet, biotite, opaques.	Felsic gneiss
73281113	Plagioclase (strongly reverse zoned,albite-labradorite), hornblende (brownish-green), garnet, biotite, quartz, K-feldspar, sphene, opaques.	Garnet amphibolite
73281114	Quartz, muscovite, tourmaline.	Quartzite
73281493	Labradorite, quartz, garnet, biotite.	Felsic gneiss
73281494	Labradorite, quartz, garnet, biotite, apatite.	Felsic gneiss
73281498	Labradorite, hornblende (pale green), garnet (some replacement by hornblende + plagioclase), biotite, quartz, perthite.	Garnet amphibolite
MOUNT IZABELLE		
65280254	Plagioclase, orthoclase, quartz, biotite, apatite, zircon, opaques.	Felsic gneiss
65280255	Andesine (An33), hornblende (greenish-brown), biotite, quartz, apatite, zircon, opaques.	Amphibolite
73281071	Andesine (An33), quartz, hypersthene, hornblende (brown), biotite, opaques.	Felsic gneiss

Sample	Assemblage	Classification
73281137	Oligoclase, microcline, quartz, biotite, apatite, opaques.	Felsic gneiss
73281138	Oligoclase, orthoclase/microcline, quartz, biotite, apatite.	Felsic gneiss
73281139	Oligoclase, microcline, quartz, biotite, apatite, opaques.	Felsic gneiss
73281140	Plagioclase (about An50, sericitised), hornblende (greenish brown), diopside, quartz, sphene, calcite, apatite, opaques.	Amphibolite (?calc-silicate)
73281141	Plagioclase, K-feldspar, quartz, garnet, biotite, zircon.	Felsic gneiss
73281142	Oligoclase, quartz, K-feldspar, garnet, biotite, apatite, zircon.	Felsic gneiss
73281143	Oligoclase, quartz, K-feldspar, garnet, biotite, apatite, zircon, opaques.	Felsic gneiss
73281144	Microcline, quartz, albite, biotite, apatite, opaques.	Leucogneiss
73281145	Microcline, quartz, plagioclase, garnet, biotite, muscovite (secondary white mica).	Felsic gneiss
73281146	Oligoclase, quartz, K-feldspar, biotite, sillimanite, garnet, white mica, zircon, opaques.	Felsic gneiss (aluminous)
73281147	Diopside, epidote, hornblende (some secondary), scapolite, sphene, quartz.	Calc-silicate gneiss
73281148	Microcline perthite, quartz, albite, biotite, zircon, opaques.	Leucogneiss
73281149	Plagioclase (saussuritised), microcline, quartz, garnet, biotite (partly chloritised), muscovite (secondary), apatite, opaques.	Felsic gneiss
73281300S	Plagioclase (saussuritised), microcline, quartz, garnet, biotite (partly chloritised), muscovite (secondary).	Leucogneiss
73281301	Orthoclase/microcline, quartz, albite (altered), garnet (partly altered to chlorite and white mica), biotite (partly chloritised), opaques.	Leucogneiss
73281302	Oligoclase, hornblende (greenish brown), biotite, quartz, opaques.	Amphibolite
73281303	Bytownite, hornblende (pale green), diopside, quartz.	Amphibolite

SS40-42/4 MAWSON ESCARPMENT (NORTH)

Sample	Assemblage	Classification
CLEMENCE MASSIF		
	For details of rocks collected in 1958, see McLeod (1959).	
R8154	Oligoclase antiperthite, quartz, biotite, carbonate (secondary), opaques.	Felsic gneiss
73281019	Andesine, hornblende (brown), biotite, quartz, calcite, apatite, opaques.	Sheared amphibolite
73281020	Andesine (An35), quartz, K-feldspar, garnet, biotite, apatite, opaques.	Felsic gneiss
73281021	Andesine (An38), hornblende (brown), quartz, biotite, apatite, ?allanite, opaques.	Mafic gneiss
73281022	Plagioclase (zoned), microcline, quartz, biotite, apatite, opaques. Myrmekite locally well developed.	Felsic gneiss
73281023	Andesine (An40), microcline, quartz, garnet, biotite (slightly chloritised), apatite.	Felsic gneiss
73281024	Hornblende, labradorite, clinopyroxene (relict), biotite.	Amphibolite
73281025	Andesine (An40), quartz, K-feldspar, hornblende, apatite, opaques.	Felsic gneiss
73281026	Andesine (An35), quartz, orthoclase, garnet (slightly altered), biotite, muscovite (secondary), apatite, opaques.	Felsic gneiss
73281027	Oligoclase-andesine (An30), microcline, quartz, garnet, biotite (slightly altered), apatite, zircon, opaques.	Felsic gneiss
73281088	Orthoclase mesoperthite, oligoclase antiperthite, quartz, garnet, biotite, opaques.	Felsic gneiss
73281089	Oligoclase, quartz, K-feldspar (exsolved grains only), garnet, biotite, chlorite (secondary), muscovite (secondary); cut by pegmatite vein containing oligoclase, K-feldspar, quartz, garnet and biotite.	Felsic gneiss cut by pegmatite
73281324	Andesine, quartz, orthoclase, biotite, chlorite + calcite (after ?clinopyroxene), muscovite (secondary), apatite, opaques.	Felsic gneiss
73281325	Labradorite, quartz, orthoclase, biotite, clinopyroxene (much altered to chlorite + actinolite + calcite), hornblende, apatite, opaques.	Felsic gneiss
73281326	Andesine, quartz, biotite (slightly chloritised), apatite, zircon, opaques.	Felsic gneiss
73281327	Microcline, quartz, garnet, biotite, plagioclase, opaques.	Leucogneiss
73281328	Microcline, albite, quartz, garnet, biotite, chlorite (secondary), muscovite (secondary), sphene.	Leucogneiss
73281329	Andesine, quartz, K-feldspar, garnet, biotite, (some replacing garnet), apatite, zircon, opaques.	Felsic gneiss

Sample	Assemblage	Classification
73281330	Andesine antiperthite, quartz, hornblende (green), biotite, apatite, opaques.	Felsic gneiss
73281331	Andesine (An35), orthoclase, quartz, garnet, biotite, muscovite (secondary), apatite, opaques.	Felsic gneiss
73281332	Orthoclase, quartz, albite, biotite (partly) chloritised), muscovite.	Leucogneiss
73281336	Diopside, ?epidote, opaques.	Calc-silicate (from moraine).

'DALTON HILLS'

73281333	Oligoclase (saussuritised), microcline, quartz, biotite (partly chloritised), apatite, opaques.	Felsic gneiss
73281334	Microcline, oligoclase (saussuritised), quartz, biotite (mostly chloritised), garnet.	Felsic gneiss
73281335	Andesine, quartz, hornblende (green), biotite, ?K-feldspar.	Felsic gneiss

MAWSON ESCARPMENT H

73281654	Oligoclase, microcline, quartz, diopside, hornblende, scapolite. From near contact.	Granite
73281655	Andesine (An36), scapolite, calcite, ?phlogopite, quartz.	Plagioclase-rich gneiss.
73281656	Calcite, scapolite, actinolite, garnet.	Marble
73281658	Plagioclase (partly sericitised), hornblende (olive green), biotite, quartz.	Amphibolite
73281659	Labradorite, quartz, garnet, biotite.	Felsic gneiss

MAWSON ESCARPMENT I

73282144	Plagioclase, diopside (some alteration to hornblende), hornblende, calcite, quartz, sphene, opaques.	Calc-silicate gneiss
73282145	Labradorite, diopside, hornblende, calcite, quartz, sphene, opaques.	Calc-silicate gneiss
73282146	Plagioclase, diopside, garnet, calcite, scapolite, sphene.	Calc-silicate gneiss
73282147	Andensine, hornblende (green), quartz, colourless amphibole (secondary), opaques.	Amphibolite
73282148	Plagioclase, diopside (rimmed by blue-green hornblende), garnet, calcite, epidote, sphene.	Calc-silicate gneiss
73282149	Plagioclase, diopside, garnet, scapolite, calcite, epidote (secondary), hornblende, sphene, opaques.	Calc-silicate gneiss

MAWSON ESCARPMENT J

73281351	Orthoclase perthite, oligoclase, quartz, biotite (slightly chloritised), zircon.	Biotite granite

Sample	Assemblage	Classification
73281352	Labradorite, quartz, biotite, apatite, opaques.	Felsic gneiss
73281353	Labradorite (altered), cummingtonite, garnet, biotite, pale amphibole (after hornblende), quartz, chlorite, muscovite, ilmenite.	Mafic gneiss (retrogressed)
73281354	Labradorite, quartz, garnet, biotite.	Felsic gneiss
73281355	Labradorite, hornblende (pale olive green), actinolite, biotite, quartz, white mica, opaques.	Mafic gneiss (retrogressed)
73281356	Labradorite, quartz, diopside, biotite, opaques.	Calc-silicate gneiss
73281357	Bytownite, diopside (some alteration to a actinolite), scapolite, hornblende, calcite, quartz, K-feldspar, sphene, opaques.	Calc-silicate gneiss
73281358	Bytownite, diopside, scapolite, ?clinozoisite, tremolite (secondary), calcite (secondary), K-feldspar, sphene.	Calc-silicate gneiss
73281359	Andesine, quartz, biotite, apatite, zircon, opaques.	Felsic gneiss
73281360	Andesine, quartz, biotite, apatite, zircon, ?allanite, opaques.	Felsic gneiss
73281361	Microcline perthite, quartz, plagioclase, biotite.	Leucogneiss (pegmatitic)

MAWSON ESCARPMENT K

Sample	Assemblage	Classification
65280250	Microcline perthite, quartz, albite, biotite (partly chloritised), muscovite, epidote, zircon, opaques.	Granite gneiss
65280251	Oligoclase, quartz, orthoclase, biotite, garnet, apatite, zircon, ?allanite, opaques.	Felsic gneiss
73281362	Oligoclase-andesine, microcline perthite, quartz, biotite (partly chloritised), muscovite (secondary).	Pegmatitic gneiss
73281363	Oligoclase, quartz, garnet, hypersthene (partly altered), biotite.	Felsic gneiss
73281364	Plagioclase, garnet, biotite, sillimanite, K-feldspar (exsolved).	Pelitic gneiss
73281365	Oligoclase, perthite, quartz, garnet, biotite (some altered to garnet + K-feldspar), zircon, opaques, sillimanite (in hand specimen).	Felsic gneiss (aluminous)
73281366	Orthoclase perthite, quartz, plagioclase, biotite.	Felsic gneiss
73281367	Quartz, andesine, orthoclase, biotite, garnet, muscovite.	Felsic gneiss (quartz-rich)
73281368	Quartz, andesine, orthoclase/microcline, biotite, opaques.	Felsic gneiss (quartz-rich)
73281441	Bytownite,quartz, diopside, hornblende (secondary).	Calc-silicate gneiss

Sample	Assemblage	Classification
73281442	Andesine-labradorite, quartz, hornblende (green), biotite.	Felsic gneiss
73281557	Oligoclase, microcline, quartz, biotite, muscovite (secondary), apatite, zircon, ?allanite, opaques.	Felsic gneiss
73281558	Andesine, quartz, hornblende (pale olive brown), biotite (partly chloritised), opaques.	Felsic gneiss
73281559	Microcline, quartz, oligoclase, biotite (mostly chloritised), apatite, zircon, opaques.	Felsic gneiss
73281560	Plagioclase (sericitised), microcline, quartz, biotite (partly chloritised), apatite, zircon.	Granite
73281561	Labradorite, hornblende (green), clinopyroxene, biotite, quartz, opaques.	Amphibolite
73281562	Labradorite, hornblende (green), cummingtonite, hypersthene, biotite, quartz, opagues.	Mafic granulite (retrogressed)
73281563	Diopside, scapolite, hornblende, carbonate (secondary), sphene.	Calc-silicate gneiss
73281564	Labradorite, hornblende (brown), hypersthene (in intergrowths with labradorite and ilmenite).	Mafic granulite
73281565	Plagioclase (altered), clinopyroxene (altered to amphibole, chlorite, etc), biotite (secondary), opaques.	Metadolerite
73281566	Labradorite, hornblende (brown), hypersthene, biotite, opaques.	Mafic granulite
73281567	Calcic plagioclase, clinopyroxene, hypersthene, hornblende (brown), biotite, opaques.	Mafic granulite
73281568	Labradorite (An52), clinopyroxene, hypersthene, hornblende (brown), biotite, quartz (in plagioclase), spinel.	Mafic granulite
73281569	Labradorite (An60), clinopyroxene, hypersthene, hornblende (brown), biotite, ilmenite.	Mafic granulite
73281570	Calcic plagioclase, clinopyroxene, hypersthene, hornblende (brown), biotite, opaques.	Mafic granulite
73281571	Andesine-labradorite, quartz, garnet, biotite, chlorite (secondary), sericite, zircon, opaques.	Felsic gneiss
73281572	Andesine (partly sericitised), quartz, biotite, garnet, chlorite + muscovite (after biotite), K-feldspar, zircon.	Felsic gneiss
73281573	Quartz, plagioclase (sercitised), K-feldspar (sericitised), biotite, muscovite, chlorite (secondary), garnet (in hand specimen).	Felsic gneiss (quartz-rich)
73281574	Andesine (altered), quartz, garnet, biotite, chlorite (secondary), opaques.	Felsic gneiss
73281575	Plagioclase (sericitised), quartz, garnet, chlorite (after biotite), cordierite (altered to pinite), muscovite, opaques.	Pelitic gneiss (retrogressed)
73281576	Plagioclase (sericitised), quartz, garnet, chlorite (after biotite), cordierite (altered to pinite), muscovite.	Pelitic gneiss (retrogressed)

Sample	Assemblage	Classification
73281577	Plagioclase (sericitised), quartz, garnet, sillimanite, biotite (partly chloritised), cordierite (altered to pinite), opaques.	Pelitic gneiss (retrogressed)
73281578	Plagioclase (sericitised), quartz, garnet (mostly altered to chlorite), epidote, sphene.	Calc-silicate gneiss (retrogressed)
73281579	Labradorite, quartz, diopside, hornblende, calcite, chlorite (secondary), opaques.	Calc-silicate gneiss
73281580	Calcic plagioclase, clinopyroxene, hypersthene, hornblende (secondary, or enclosed in pyroxene), biotite, quartz, spinel.	Mafic granulite
73281581	Plagioclase (altered), quartz, garnet, chlorite + carbonate (after ?diopside), sphene.	Calc-silicate gneiss (retrogressed)
73281582	Plagioclase, quartz, diopside (some alteration to chlorite), garnet.	Calc-silicate gneiss
73281583	Plagioclase, quartz, diopside, garnet, hornblende, biotite, muscovite (secondary), chlorite (secondary), calcite (secondary), opaques.	Calc-silicate gneiss
73281584	Microcline, oligoclase-andesine, quartz, biotite (slightly chloritised), muscovite (secondary), carbonate, opaques.	Granite
73281585	Andesine-labradorite (slightly sericitised), quartz, clinopyroxene, hornblende, carbonate, opaques.	Felsic gneiss
73281871	Andesine, hornblende (olive green), clinopyroxene, quartz, opaques.	Mafic gneiss

N.B. Samples 73281441, 1442, 1584, 1585, and 1871 are from the vicinity of the Barkell Platform trigonometrical station.

MAWSON ESCARPMENT L

Sample	Assemblage	Classification
73281427	Labradorite, hornblende (green), clinopyroxene, biotite.	Mafic gneiss
73281428	Labradorite, orthoclase/microcline, biotite, quartz, apatite, zircon, ?allanite, opaques.	Feldspar-rich gneiss
73281435	Oligoclase, quartz, K-feldspar, biotite, apatite, ?allanite.	Felsic gneiss
73281436A	Andesine, hornblende (olive), biotite, quartz.	Amphibolite
73281436B	Andesine, quartz, ?cordierite (porphyroblast), biotite.	Pelitic gneiss
73281437	K-feldspar, albite, quartz, biotite, (slightly chloritised), muscovite.	Felsic gneiss
73281438	Labradorite, cummingtonite, quartz, biotite, opaques.	Felsic gneiss
73281439	Microcline, sodic plagioclase (sericitised), quartz, biotite (altered), opaques.	Granite
73281440	Albite, microcline, quartz, garnet, biotite, tourmaline.	Pegmatite
73281865	Hypersthene, andesine (An47), opaques, hornblende (secondary), biotite, quartz, apatite.	Ultramafic gneiss (pegmatitic)
73281866	Hypersthene (poikiloblastic), cummingtonite, hornblende (pale green), biotite, quartz.	Orthopyroxenite

Sample	Assemblage	Classification
73281867	Labradorite, hornblende (olive green), clinopyroxene, quartz, opaques.	Amphibolite
73281868	Labradorite (An53), hornblende (pale green), biotite, quartz.	Amphibolite
73281869	Bytownite (An72), hornblende (olive green), clinopyroxene, quartz, opaques.	Amphibolite
73281870	Andesine (An45), hornblende (green), biotite, quartz, magnetite.	Amphibolite

MAWSON ESCARPMENT M

Sample	Assemblage	Classification
73320007	Andesine (An38), hypersthene, clinopyroxene, hornblende (brown), biotite, opaques. Veins of hypersthene - clinopyroxene - andesine (An44) pegmatite.	Mafic granulite
73281660	Labradorite, hornblende (brown), hypersthene, clinopyroxene, biotite, opaques.	Mafic granulite
73281661	Labradorite, hornblende, hypersthene, clinopyroxene, biotite, opaques.	Mafic granulite
73281662	Labradorite, hornblende, hypersthene, clinopyroxene, biotite, opaques.	Mafic granulite
73281663	Labradorite, hornblende, hypersthene, clinopyroxene, biotite, opaques (associated with pyroxene).	Mafic granulite
73281664	Andesine, orthoclase, quartz, biotite, hornblende, apatite, zircon, ?allanites.	Felsic gneiss
73281665	Antiperthite, garnet, biotite, K-feldspar (exsolved), apatite, zircon.	Feldspar-rich gneiss
73281666	K-feldspar, quartz, biotite, rutile, zircon.	Felsic gneiss (K-rich)
73281667	Labradorite, hornblende, hypersthene, clinopyroxene, opaques.	Mafic granulite
73281668	Plagioclase, hornblende, hypersthene, clinopyroxene, quartz, opaques.	Mafic granulite
73281669	Labradorite, hornblende (brown, some alteration), hypersthene, clinopyroxene, opaques.	Mafic granulite
73281670	Andesine-labradorite, hypersthene, clinopyroxene, hornblende (olive brown), opaques.	Mafic granulite
73281671	Andesine (An47), hypersthene, hornblende (brown), biotite, opaques.	Mafic granulite
73281672A	Plagioclase, hypersthene, hornblende (brown), opaques. Cut by hypersthene (poikilitic) - plagioclase (An71) - opaques pegmatite.	Mafic granulite
73281672B	Hornblende (brown), plagioclase, hypersthene, garnet, biotite, opaques.	Mafic granulite
73281673	Bytownite, hypersthene, clinopyroxene, hornblende (brown), biotite, opaques.	Mafic granulite
73281674	K-feldspar, quartz, sodic plagioclase, biotite, apatite, zircon, opaques.	Felsic gneiss (K-rich)
73281675	Plagioclase, K-feldspar, quartz, garnet, biotite, muscovite (secondary), opaques.	Felsic gneiss
73281676	Plagioclase, quartz, garnet, clinopyroxene, hornblende (possibly replacing garnet + clinopyroxene).	Felsic gneiss

Sample	Assemblage	Classification
73281677	Oligoclase, quartz, garnet, biotite, ?K-feldspar, opaques.	Felsic gneiss
73281678	Cordierite, anthophyllite (pink), hypersthene, bytownite (An75), biotite, quartz, ilmenite.	Pelitic gneiss
73281679	Andesine, hornblende (brown), opaques.	Amphibolite
73281680	Andesine (An47), hornblende (brown), hypersthene, clinopyroxene, biotite, opaques.	Mafic granulite
73281681	Quartz, chlorite (some after biotite), opaques.	Quartz-chlorite rock
73281682	Labradorite, hornblende, hypersthene, clinopyroxene, biotite.	Mafic granulite
73281683	Diopside, scapolite, hornblende (green).	Calc-silicate gneiss
73281858	Plagioclase, microcline, quartz, garnet, chlorite (after biotite).	Leucogneiss
73281859	Albite, microcline, quartz, garnet, biotite (partly chloritised), zircon.	Leucogneiss
73281860	Labradorite, hornblende (brown), clinopyroxene, opaques.	Amphibolite
73281861	Labradorite, hypersthene, clinopyroxene, hornblende (pale brown, ?secondary), biotite, quartz.	Mafic granulite
73281862	Plagioclase, quartz, garnet, biotite, apatite, zircon, opaques.	Felsic gneiss
73281863	Andesine, garnet, biotite, K-feldspar (exsolved).	Feldspar-rich gneiss
73281864	Labradorite, quartz, garnet, biotite, chlorite, (secondary), carbonate (secondary).	Felsic gneiss

SS40-42/6 MOUNT MENZIES

Sample	Assemblage	Classification
'ENGLAND NUNATAK'		
73281260	Chlorite, calcite, sphene, magnetite	Altered mafic rock
73281261	Chlorite (2 varieties), calcite, magnetite	Altered mafic rock
73281262	Actinolite, chlorite, magnetite	Altered mafic rock
GOODSPEED NUNATAK A		
73281119	Quartz, white mica, chlorite, opaques	Metaconglomerate
73281120	Quartz, white mica, biotite (mostly chloritised), opaques	Metaconglomerate
73281121	Quartz, biotite, white mica, carbonate, opaques	Mica schist
73281122	Quartz, biotite, white mica, apatite, opaques	Mica schist
GOODSPEED NUNATAK B		
73281123	Quartz, epidote, actinolite, carbonate, microcline, chlorite	Calc-silicate schist
73281124	Quartz, biotite (partly chloritised), white mica, chlorite, epidote, sodic plagioclase, K feldspar, opaques	Calc-silicate mica schist
73281125	Quartz, actinolite, epidote, chlorite (secondary), K feldspar, sphene	Calc-silicate schist
GOODSPEED NUNATAK C		
73281126	Quartz, biotite (rather altered), white mica, opaques	Mica schist
73281127	Quartz, biotite, white mica, opaques	Mica schist
73281128	Quartz, biotite (partly chloritised), white mica, chlorite, epidote, carbonate, K feldspar, opaques	Calc-silicate mica schist
73281129	Quartz, epidote, carbonate, biotite, K feldspar, chlorite, opaques	Calc-silicate schist
73281130	Carbonate, quartz, epidote, biotite (slightly altered), white mica, sphene	Marble lens in schist
GOODSPEED NUNATAK D		
73281131	Quartz, biotite, epidote, chlorite (secondary), plagioclase, K feldspar, opaques	Mica schist (psammitic)
73281132	Quartz, epidote, actinolite, biotite, chlorite, microcline, sphene, opaques	Calc-silicate mica schist
73281133	Quartz, epidote, actinolite, biotite, microcline (poikiloblastic), opaques	Calc-silicate schist
GOODSPEED NUNATAK J		
73281005	Quartz, white mica, opaques	Mica schist
GOODSPEED NUNATAK K		
73281003	Quartz, white mica, K feldspar, opaques	Mica schist
73281004	Quartz, white mica, chlorite, K feldspar, opaques, tourmaline	Mica schist
73281006	Quartz, biotite, garnet, staurolite, K feldspar, white mica, chlorite	Pelitic schist (from moraine)

Sample	Assemblage	Classification
GOODSPEED NUNATAK L		
73281001	Quartz, biotite (slightly altered), white mica, carbonate, microcline, plagioclase, opaques	Breccia
73281002	Quartz, carbonate, microcline, biotite, white mica, tourmaline, epidote, opaques	Impure quartzite
MOUNT BAYLISS		
R11352	Calcite, epidote, biotite, muscovite, magnetite	Marble
R11353	Microcline, quartz, plagioclase, biotite (partly chloritised)	Foliated granite
R11354	Ferrohastingsite, epidote, biotite (green), quartz, K feldspar, calcite, chlorite, sphene, magnetite	Calc-silicate
R11364	Quartz, biotite, muscovite, opaques	Impure quartzite
R11365	Ferrohastingsite, epidote, biotite, microcline, calcite, sphene, magnetite	Calc-silicate
R11366	Actinolite, chlorite, biotite, carbonate, quartz	Amphibolite
R11367	Actinolite, chlorite, biotite, quartz, plagioclase, opaques	Amphibolite
R11368	Actinolite, quartz, plagioclase, apatite, opaques	Amphibolite
R11369	Actinolite, biotite, quartz, plagioclase, opaques, tourmaline	Amphibolite
R11370	Alkali feldspar, magnophorite, arfvedsonite, phlogopite (dark red-brown), leucite (replaced by K feldspar, etc.), quartz, anatase, zircon, carbonate, ilmenite	Magnophorite basalt
R11371	Microcline, quartz, plagioclase biotite, chlorite, fluorite, allanite, sphene, zircon	Foliated granite
73281541	Microcline, quartz, oligoclase (sericitised), biotite (slightly chloritised), sphene, epidote, ?allanite, rutile, opaques	Augen gneiss (foliated granite)
73281542	Microcline (porphyroclastic), quartz, plagioclase (sericitised), biotite (largely chloritised), ferrohastingsite, sphene, epidote, ?allanite	Augen gneiss (foliated granite)
73281543	Microcline, quartz, plagioclase (sericitised), biotite (partly chloritised), sphene, epidote, opaques	Augen gneiss (foliated granite)
73281544	Oligoclase, hornblende (green), quartz, sphene, opaques. Slightly discordant.	Amphibolite
73281545	Alkali feldspar, magnophorite, arfvedsonite, phlogopite + biotite (dark red-brown), calcite, apatite, anatase, zircon, ilmenite	Magnophorite basalt dyke
MOUNT MATHER		
73281028	Plagioclase, biotite (partly chloritised), epidote, garnet, quartz	Mafic gneiss(retrogressed)
73281029	Plagioclase, biotite (greenish brown), garnet (relict), epidote, quartz, zircon	Mafic gneiss(retrogressed)
73281030	Andesine (An35), biotite (greenish brown), epidote, quartz, sphene	Mafic gneiss (retrogressed)

Sample	Assemblage	Classification
73281031	Quartz, actinolite, chlorite (after biotite), garnet, carbonate, epidote	Calcareous quartzite
73281032	Quartz, carbonate, epidote, garnet	Calcareous quartzite
73281033	Actinolite, plagioclase, quartz, biotite, opaques	Amphibolite
73281034	Hornblende, plagioclase, epidote, quartz, biotite, sphene	Amphibolite
73281035	Quartz, kyanite, white mica (?pyrophyllite), opaques	Quartzite
73281036	Quartz, kyanite, staurolite, white mica, opaques	Quartzite
73281037	Quartz, kyanite, white mica, opaques	Quartzite
73281038	Quartz, kyanite, white mica, staurolite, tourmaline, diopside	Quartzite
73281039A	Sodic plagioclase, microcline, quartz, biotite, muscovite (secondary), clinozoisite, ?allanite	Granite
73281039B	Microcline, quartz, plagioclase (sericitised), biotite, muscovite (secondary), opaques, ?allanite	Granite
73281512	Quartz, kyanite, white mica	Quartzite
73281513	Quartz, kyanite, white mica	Quartzite
73281514	Quartz, kyanite, white mica	Quartzite
73281515	Quartz, kyanite, white mica	Quartzite
73281516	Quartz, biotite, chlorite, garnet (corroded)	Pelitic schist
73281517	Quartz, garnet, biotite, white mica, chlorite, plagioclase, rutile	Pelitic schist
73281518	Garnet, hornblende (green), carbonate, biotite, plagioclase, quartz, opaques	Garnet amphibolite

MOUNT MENZIES

For details of rocks collected before 1973, see Tingey and England (1973).

Sample	Assemblage	Classification
73281040	Quartz, garnet, biotite, chlorite, white mica	Quartzite
73281041	Quartz, garnet, biotite, white mica, opaques	Pelitic schist
73281042	Quartz, garnet, biotite, white mica, opaques	Pelitic schist
73281043	Actinolite, chlorite, white mica, carbonate, ?epidote, opaques	Sheared mafic dyke margin
73281044	Actinolite, carbonate, chlorite, white mica	Amphibolite
73281045	Hornblende, andesine, carbonate, quartz, sphene, rutile	Metadolerite dyke
73281046	Actinolite, ?andesine, quartz, clinozoisite, sphene, biotite, opaques	Amphibolite
73281047	Hornblende (blue-green), garnet, plagioclase, quartz, biotite, chlorite, opaques	
73281251	Actinolite, plagioclase, biotite, quartz, rutile, opaques	Amphibolite (Fe-poor)
73281252	Actinolite, plagioclase, biotite, quartz, ?clinozoisite	Amphibolite (Fe-poor)
73281253	Actinolite, plagioclase, biotite, epidote, quartz, rutile	Amphibolite
73281254	Actinolite, plagioclase, quartz, ilmenite	Amphibolite
73281255	Quartz, chloritoid, white mica, opaques	Quartzite
73281256	Quartz, chlorite, epidote, garnet, rutile, biotite, magnetite, ilmenite	Impure Quartzite

Sample	Assemblage	Classification
73281257	Quartz, white mica, chlorite (after ?biotite), kyanite (in hand specimen)	Quartzite
73281258	Quartz, kyanite, chlorite (some after biotite), white mica, rutile, opaques	Quartzite
73281259	Quartz, kyanite, chloritoid, white mica, rutile, tourmaline	Quartzite
73281519	Quartz, biotite, muscovite+chlorite (after biotite), carbonate	Quartzite
73281520	Quartz, biotite, chlorite, white mica, garnet, opaques	Mica schist
73281521	Quartz, chlorite (some after garnet), white mica, opaques	Mica schist (retrogressed)
73281522	Quartz, biotite, chlorite, garnet, epidote, white mica, opaques	Quartzite (retrogressed)
73281523	Quartz, biotite (some after garnet), chlorite (secondary), white mica, opaques	Mica schist (retrogressed)
73281525	Quartz, biotite (some after garnet), white mica, chlorite, ilmenite	Pelitic schist (retrogressed)
73281526	Quartz, garnet, biotite (some after garnet), white mica, chlorite, ilmenite	Pelitic schist
73281527	Quartz, garnet (euhedral, post deformational), biotite, chlorite	Pelitic schist
73281528	Quartz, epidote, carbonate, biotite (post deformational), chlorite, white mica, rutile	Calc-silicate schist
73281529	Quartz, epidote, carbonate, chlorite, white mica	Calc-silicate schist
73281530	Quartz, epidote, carbonate, biotite	Calc-silicate schist
73281531	Quartz, epidote, biotite (greenish brown), chlorite, actinolite, opaques	Calc-silicate schist
73281532	Quartz, garnet, hornblende (blue-green), chlorite, clinozoisite, sphene	Impure quartzite
73281533	Quartz, garnet, actinolitic hornblende, biotite, chlorite, oligoclase, opaques	Psammo-pelitic schist
73281534	Quartz, garnet, staurolite, kyanite, biotite, white mica	Pelitic schist (from moraine)
73281535	Quartz, garnet (corroded), biotite, white mica, chlorite, opaques	Pelitic schist
73281536	Quartz, carbonate, biotite (pale green, and brown)	Calcareous schist
73281537	Quartz, biotite, actinolite, chlorite, opaques	Quartzite
73281538	Quartz, K feldspar, actinolite, biotite	Arkosic quartzite
73281539	Quartz, actinolite, biotite	Quartzite
73281540	Hornblende (pale green), sodic plagioclase, sphene	Amphibolite
73281803	Quartz, actinolite, garnet, biotite, carbonate, opaques	Actinolite schist
73281804	Quartz, actinolite, garnet, biotite, opaques	Actinolite schist

Sample	Assemblage	Classification

MOUNT SCHERGER

For details of rocks collected before 1973, see Tingey and England (1973).

73281090	Quartz, biotite, white mica, opaques	Mica schist
73281091	Quartz, kyanite (partly altered to white mica), biotite, white mica (partly altered to fibrolite, possibly by contact metamorphism), chlorite	Pelitic schist
73281092	Quartz, plagioclase, white mica (partly altered to fibrolite, possibly by contact metamorphism), kyanite (altered), cordierite (altered), chlorite	Pegmatite
73281094	Albite, quartz, muscovite, biotite, zircon, opaques	Granite
73281096	Quartz, biotite, white mica, oligoclase, sillimanite (after biotite), ilmenite	Mica schist
73281097	Oligoclase (zoned), hornblende (green), biotite, clinopyroxene, quartz, sphene	Metadolerite
73281098	Oligoclase, hornblende (green), biotite, clinopyroxene, quartz, K feldspar, sphene	Metadolerite
73281099	Microcline, albite, quartz, biotite, muscovite	Pegmatite
73281100	Microcline, plagioclase (sericitised), quartz, biotite (altered), muscovite (secondary), apatite, zircon	Granite

SEAVERS NUNATAK

For details of rocks collected before 1973, see Tingey and England (1973).

73281115	Quartz, garnet, biotite, plagioclase (saussuritised), chlorite (secondary), white mica	Pelitic schist
73281116	Quartz, biotite, chlorite, white mica, oligoclase, garnet (relict), kyanite (relict), staurolite (relict), opaques	Pelitic schist
73281117	Quartz, staurolite, kyanite, biotite, white mica, chlorite, oligoclase, opaques	Pelitic schist
73281118	Quartz, staurolite, kyanite, garnet, biotite, white mica, chlorite (secondary), plagioclase (saussuritised)	Pelitic schist

SS40-42/7 CUMPSTON MASSIF

Sample	Assemblage	Classification
CUMPSTON MASSIF		
73281237	Microcline, albite (sericitised), quartz, biotite (partly chloritised), hornblende, epidote (secondary), muscovite (secondary), sphene	Granitic gneiss
73281238	Microcline, quartz, oligoclase, biotite, ferrohastingsite, epidote, sphene, apatite, magnetite	Granitic gneiss
73281239	Oligoclase-andesine, hornblende (green), biotite, quartz, sphene, opaques	Amphibolite
73281240	Microcline, quartz, albite (sericitised), biotite, apatite, zircon, ?allanite, opaques	Granitic gneiss
73281241	Quartz, biotite, white mica, chlorite, plagioclase, epidote, carbonate, sphene	Quartzite
73281242	Quartz, biotite, epidote, sphene, opaques	Quartzite
73281243	Quartz, staurolite, biotite, plagioclase (strongly zoned), chlorite (secondary), ilmenite, magnetite	Pelitic schist
73281244	Quartz, hornblende (blue-green), biotite (partly chloritised), garnet, plagioclase, microcline, ilmenite	Hornblende biotite schist
73281245	Quartz, staurolite, biotite, white mica, oligoclase (zoned), garnet, opaques (including graphite)	Pelitic schist
73281246	Quartz, staurolite, garnet, kyanite, cordierite, biotite, white mica, chlorite, plagioclase (altered), opaques	Pelitic schist (polymetamorphic)
73281247	Quartz, garnet (partly altered), biotite, chlorite, sodic plagioclase, opaques	Pelitic schist
73281248	Quartz, garnet (aggregates, replacing older garnet), biotite, chlorite (secondary), plagioclase, opaques	Pelitic schist
73281249	Quartz, garnet, biotite, chlorite, labradorite	Pelitic schist
73281250	Quartz, garnet (partly altered), biotite, chlorite, calcic plagioclase	Pelitic schist
73281470	Quartz, biotite, sericite, epidote, carbonate, sodic plagioclase, sphene	Impure quartzite
73281471	Quartz, garnet, biotite (partly altered to chlorite + white mica), white mica, chlorite, ?feldspar, rutile, tourmaline, opaques	Impure quartzite
73281473	Quartz, garnet, biotite, chlorite, white mica, tourmaline	Impure green quartzite
73281474	Actinolite, plagioclase, biotite, opaques	Amphibolite
73281475	Hornblende (blue-green), sodic plagioclase, biotite, quartz, sphene, apatite, carbonate, opaques	Amphibolite
73281476	Hornblende (green), plagioclase (strongly zoned), biotite, quartz, epidote, sphene	Amphibolite
73281479	Quartz, K feldspar, biotite (slightly altered), biotite, carbonate, white mica, sphene, opaques	Arkosic quartzite
73281480	Quartz, garnet (partly chloritised), biotite, chlorite, K feldspar, labradorite, opaques	Pelitic gneiss

Sample	Assemblage	Classification
73281926	Plagioclase, quartz, microcline, biotite, hornblende, chlorite (secondary), muscovite, carbonate, sphene, epidote, ?allanite, opaques	Foliated granodiorite
73281927	Hornblende (green), microcline, plagioclase, biotite, quartz, sphene, carbonate, muscovite, opaques	Metasomatised meta-dolerite
73281928	Hornblende, plagioclase, biotite, opaques	Sheared metadolerite
73281929	Hornblende (pale green), plagioclase, quartz, biotite, sphene	Metadolerite
73281930	Hornblende (green), plagioclase, biotite, epidote, sphene, opaques	Metadolerite
73281931	Hornblende (blue-green), epidote, sphene, carbonate, opaques	Sheared metadolerite
73281932	Quartz, epidote, hornblende (blue-green), plagioclase	Calc-silicate gneiss
73281933	Albite, microcline, quartz, biotite, ferrohastingsite, sphene, carbonate, opaques	Foliated granite
73281934	Plagioclase, microcline, quartz, biotite, ferrohastingsite, sphene	Foliated granite
73281935	Plagioclase, microcline, quartz, biotite, ferrohastingsite, sphene	Foliated granite
73281936	Plagioclase, microcline, quartz, biotite (partly chloritised), muscovite, sphene, ?allanite, opaques	Felsic gneiss
73281937	Epidote, quartz, hornblende, biotite, chlorite, sphene	Calc-silicate gneiss
73281938	Epidote, quartz, hornblende, biotite, sphene	Calc-silicate gneiss

KEYSER RIDGE

73281266	Quartz, chlorite, white mica, albite	Mica schist
73281267	Quartz, biotite, white mica, garnet, plagioclase	Mica schist (quartz-rich)
73281268	Hornblende (pale green), plagioclase (partly recrystallised labradorite), biotite, sphene, quartz, opaques	Amphibolite
73281269	Quartz, epidote, biotite, carbonate	Calc-silicate schist
73281271	Quartz, diopside, albite, clinozoisite (in albite), hornblende (secondary, green), sphene	Calc-silicate gneiss
73281272	Quartz, staurolite, garnet, biotite, white mica, chlorite, ?kyanite	Pelitic schist (from moraine)
73281273	Quartz, staurolite, garnet, biotite, white mica, ?kyanite, opaques	Pelitic schist (from moraine)
73281274	Quartz, staurolite, garnet, biotite, chloritoid, white mica, chlorite, opaques	Pelitic schist (from moraine)
73281275	Quartz, staurolite, garnet, biotite, chloritoid, white mica, chlorite	Pelitic schist (from moraine)
73281276	Quartz, staurolite, biotite, chloritoid, white mica, ?kyanite, opaques	Pelitic schist (from moraine)
73281547	Quartz, biotite, garnet, white mica, opaques	Pelitic schist
73281548	Quartz, garnet (partly altered to chlorite), white mica, chlorite, opaques	Pelitic schist

Sample	Assemblage	Classification
73281549	Quartz, garnet, cummingtonite	Garnet-cummingtonite schist
73281550	Quartz, garnet, white mica, opaques	Quartzite
73281701	Hornblende (brown-green), plagioclase (zoned), biotite, quartz, opaques	Amphibolite
73281702	Hornblende (blue-green), sodic plagioclase, quartz, biotite, sphene, opaques	Amphibolite
73281703	Plagioclase, quartz, hornblende (green-brown), biotite, ?K feldspar, epidote, opaques	Felsic gneiss
73281704	Anthophyllite, chlorite, phlogopite, white mica, ?cummingtonite, opaques.	Altered ultramafic (from moraine)
73281705	Andesine, biotite, hornblende (green), quartz, epidote	Mafic gneiss
73281706	Sodic plagioclase, quartz, biotite, garnet, chlorite, carbonate, epidote, apatite, tourmaline	Felsic gneiss
73281707	Oligoclase-andesine, quartz, biotite, muscovite, opaques	Felsic gneiss
73281708	Oligoclase, microcline, quartz, biotite (greenish, partly chloritised), garnet, muscovite	Pegmatitic gneiss
73281709	Oligoclase, microcline, quartz, biotite	Felsic gneiss
73281710	Oligoclase, microcline, quartz, biotite, sphene, chlorite (secondary), zircon, ?allanite, opaques	Felsic gneiss
73281711	Enstatite, olivine, tremolite, phlogopite, magnetite	Altered lherzolite (from moraine)
73281712	Clinopyroxene, actinolite, biotite, opaques	Altered ultramafic (from moraine)
73281713	Cummingtonite, phlogopite, opaques, zircon.	Altered ultramafic (from moraine)

MOUNT BIRD

73281050	Chlorite, carbonate, white mica, quartz, opaques	Mafic gneiss (retrogressed)
73281201	Labradorite, hornblende (green), garnet, cummingtonite, biotite, quartz	Garnet amphibolite
73281202	Quartz, chloritoid, white mica, sillimanite (relict), tourmaline	Pelitic gneiss (retrogressed)
73281203	Chlorite, carbonate, quartz, biotite (relict)	Mafic gneiss (retrogressed)
73281204	Chlorite, carbonate, plagioclase, quartz, garnet (relict), biotite (relict), opaques	Mafic gneiss (retrogressed)
73281205	Quartz, chloritoid, white mica, garnet (relict), sillimanite (relict), rutile	Pelitic gneiss (retrogressed)
73281206	Quartz, chloritoid, white mica, chlorite, sillimanite (relict), tourmaline	Pelitic gneiss (retrogressed)
73281207	Chlorite, carbonate, quartz, epidote, labradorite (relict), garnet (relict)	Mafic gneiss (retrogressed)
73281208	Quartz, chloritoid, chlorite, white mica, garnet (relict), sillimanite (relict)	Pelitic gneiss (retrogressed)
73281286	Labradorite, hornblende (green), biotite (slightly chloritised), quartz, ilmenite, sphene (round ilmenite)	Amphibolite

Sample	Assemblage	Classification
73281287	Hornblende (blue-green), plagioclase (saussuritised), quartz, opaques	Amphibolite (retrogressed)
73281288	Quartz, chlorite, white mica, biotite	Pelitic gneiss (retrogressed)
73281289	Quartz, oligoclase, biotite (partly chloritised), white mica, opaques	Pelitic gneiss (retrogressed)
73281290	Quartz, oligoclase, K feldspar, biotite, chlorite (secondary, some after garnet), white mica (secondary), haematite, opaques	Pelitic gneiss (retrogressed)
73281291	Quartz, oligoclase, K feldspar, biotite, chlorite (secondary, some after garnet), white mica (secondary), haematite, opaques	Pelitic gneiss (retrogressed)
73281292	Andesine, carbonate, biotite, white mica, clinozoisite, quartz, hornblende (green)	Amphibolite (retrogressed)

MOUNT DUMMETT

For details of rocks collected before 1973, see Tingey and England (1973).

Sample	Assemblage	Classification
73281386	Quartz, biotite, white mica, epidote, opaques	Mica schist
73281387	Epidote, biotite, actinolite, microcline, quartz	Calc-silicate schist
73281388	Diopside, tremolite, epidote, carbonate, microcline, plagioclase	Calc-silicate schist
73281389	Diopside, tremolite, biotite, microcline, epidote, plagioclase	Calc-silicate schist
73281390	Epidote, actinolite, diopside, biotite, microcline	Calc-silicate schist
73281393	Diopside, epidote, carbonate, microcline, sphene	Calc-silicate
73281394	Actinolite, epidote, quartz, microcline, plagioclase, sphene	Calc-silicate
73281395	Forsterite (serpentinised), carbonate, tremolite, ?brucite	Ultramafic (from moraine)
73281396	Quartz, epidote, biotite, microcline, carbonate, white mica, opaques	Calc-silicate mica schist
73281397	Quartz, biotite, epidote, opaques	Mica schist
73281398	Quartz, epidote, carbonate, plagioclase, actinolite	Calc-silicate
73281604	Albite, quartz, microcline, muscovite, garnet	Aplite
73281605	Quartz, epidote, hornblende (blue-green), biotite, opaques	Calc-silicate schist
73281606	Quartz, epidote, hornblende (blue-green), biotite, opaques	Impure quartzite
73281607	Quartz, biotite, white mica, tourmaline, opaques	Mica schist
73281608A	Microcline perthite, albite, quartz	Pegmatite
73281608B	Quartz, kyanite, sillimanite (fibrolite, after kyanite), muscovite, ?beryl	Pegmatite
73281609	K feldspar, albite (sericitised), quartz, biotite, muscovite	Granite
73281610	Quartz, biotite, chlorite, white mica, fibrolite, tourmaline, opaques. (Probably contact metamorphosed).	Mica schist

Sample	Assemblage	Classification
73281611	Quartz, epidote, actinolite, microcline, carbonate, saussurite, opaques	Calc-silicate quartzite
73281612	Quartz, biotite, carbonate, epidote, white mica, opaques	Calc-silicate schist
73281693	Quartz, biotite, epidote, microcline, white mica, sphene, opaques	Calc-silicate schist
73281694	Quartz, biotite, white mica, opaques	Mica schist
73281695	Albite, K feldspar, quartz, muscovite	Pegmatite
73281696	Epidote, actinolite, biotite, chlorite, K feldspar, plagioclase, carbonate, sphene	Calc-silicate schist
73281697A	Epidote, actinolite, quartz, K feldspar, biotite	Calc-silicate schist
73281697B	Quartz, epidote, biotite, chlorite, K feldspar, sphene, opaques	Calc-silicate schist
73281698	Quartz, biotite, chlorite, white mica, opaques	Quartzite

MOUNT McCAULEY

Sample	Assemblage	Classification
R8843	Quartz, biotite, white mica, carbonate, microcline	Quartzite
R8844	Quartz, albite, microcline, white mica	Quartzite
73281048A	Microcline, quartz, ferrohastingsite, biotite, oligoclase, sphene, ?allanite, opaques	Felsic gneiss
73281048B	K feldspar, quartz, calcic labradorite, biotite, muscovite	Felsic gneiss
73281049A	Quartz, white mica	Quartzite
73281049B	Quartz, andesine, biotite, white mica	Impure quartzite
73281263	Microcline, quartz, oligoclase antiperthite, ferrohastingsite, biotite, sphene, apatite, ?allanite	Foliated granite
73281264	Plagioclase, hornblende (green), biotite, quartz, sphene	Amphibolite
73281265	Garnet, carbonate, actinolite, quartz	Calc-silicate (from moraine)
73281337	Oligoclase, microcline, quartz, muscovite, biotite, opaques	Granite
73281338	Quartz, biotite, white mica, microcline	Psammitic schist
73281339	Quartz, biotite, white mica	Psammitic schist
73281340	Microcline, albite, quartz, garnet, muscovite, biotite	Leucogranite
73281341	Quartz, garnet, white mica, plagioclase	Pelitic schist
73281342	Quartz, biotite, white mica, sillimanite, plagioclase	Pelitic schist
73281343	Quartz, biotite, white mica, sillimanite (fibrolite), oligoclase, rutile	Pelitic schist
73281344	Quartz, biotite, white mica, sillimanite, oligoclase, rutile	Pelitic schist
73281345	Quartz, biotite, white mica, sillimanite, plagioclase	Pelitic schist
73281346	Quartz, biotite, white mica, oligoclase	Pelitic schist
73281347	Quartz, biotite, kyanite (relict), staurolite, cordierite, sillimanite, white mica, oligoclase (kyanite + staurolite + biotite $\rightarrow$ cordierite + sillimanite)	Pelitic schist (polymetamorphic)

Sample	Assemblage	Classification
73281348	Quartz, biotite, white mica, oligoclase (albite core, andesine rim)	Pelitic schist
73281349	Hornblende (pale fawnish green), labradorite, biotite, ilmenite	Amphibolite
73281350	Hornblende (pale fawnish green), plagioclase (zoned), quartz, opaques	Amphibolite
73281501	Andesine, hornblende (green), garnet, biotite, quartz, apatite, opaques	Garnet amphibolite
73281502	Hornblende (green), epidote, diopside, garnet, quartz, carbonate, plagioclase (saussuritised), sphene	Calc-silicate
73281503	Actinolite, epidote, labradorite, quartz, rutile, sphene	Calc-silicate
73281504	Actinolite, epidote, carbonate, microcline, quartz, sphene	Calc-silicate
73281505	Actinolite, epidote, diopside, quartz, biotite, white mica, K feldspar, fibrolite (secondary), opaques	Calc-silicate schist
73281506	Oligoclase, quartz, kyanite, biotite, white mica (secondary)	Pegmatitic segregation
73281507	Hornblende (green), plagioclase (zoned), sphene, apatite, opaques	Amphibolite
73281508	Quartz, plagioclase (zoned), biotite, actinolite	Mica schist
73281509	Cummingtonite, andesine-labradorite, garnet, quartz, biotite, hornblende, opaques	Cummingtonite schist
73281510	Quartz, biotite, white mica, fibrolite, oligoclase	Pelitic schist
73281511	Quartz, biotite, white mica, fibrolite, plagioclase	Pelitic schist
73281546	Actinolite, plagioclase (saussuritised), K feldspar, chlorite, sphene	Actinolite schist

MOUNT NEWTON

For details of rocks collected before 1973, see Tingey and England (1973).

73281456A	Plagioclase, microcline, quartz, hornblende, biotite, sphene, epidote, zircon, apatite, ?allanite	Felsic gneiss
73281456B	Hornblende, biotite, epidote, quartz, plagioclase, sphene, carbonate, opaques	Calc-silicate gneiss
73281456C	Plagioclase, microcline, quartz, biotite	Felsic gneiss
73281457B	Sodic plagioclase, microcline, quartz, biotite, clinozoisite, carbonate	Cataclastic felsic gneiss
73281458	Quartz, kyanite, staurolite, garnet, biotite, albite, cordierite (altered)	Pelitic schist (from moraine)
73281459	K feldspar, quartz, sillimanite, biotite, white mica (after sillimanite)	Altered pegmatite
73281460	Labradorite, hornblende (brown), hypersthene, garnet, biotite, quartz (inclusions in garnet)	Mafic granulite
73281461	Quartz, garnet, biotite (secondary), white mica (secondary), opaques	Cataclastic gneiss
73281462	Oligoclase, quartz, garnet, biotite, chlorite (after garnet), zircon, opaques	Felsic gneiss

Sample	Assemblage	Classification
73281463	Oligoclase (sericitised), quartz, garnet, biotite, chlorite (after garnet), zircon, opaques	Felsic gneiss (retrogressed)
73281748	Labradorite, augite, pigeonite, hornblende (secondary), biotite (secondary), quartz, opaques	Quartz tholeiite dyke
73281749	Garnet, sillimanite, opaques	Pelitic gneiss
73281750	Garnet, sillimanite, quartz, opaques	Pelitic gneiss
73281901	Quartz, sillimanite, garnet, cordierite, K feldspar	Pelitic gneiss
73281902	Plagioclase, orthoclase, quartz, biotite, sericite, zircon, opaques	Felsic gneiss
73281903	Plagioclase, microcline perthite, quartz, biotite, garnet	Felsic gneiss
73281904	Plagioclase, clinopyroxene, hypersthene (altered), hornblende (brown, some secondary), biotite, quartz, opaques	Mafic granulite
73281905	Plagioclase, orthoclase, quartz, garnet, biotite (partly chloritised), epidote, opaques	Granite
73281906	Quartz, K feldspar, garnet, sillimanite	Pelitic gneiss
73281907	Quartz, K feldspar, garnet, sillimanite, biotite, cordierite (altered), opaques	Pelitic gneiss
73281908	Garnet, biotite, sillimanite, cordierite (altered), quartz, chloritoid (after sillimanite), chlorite (secondary), sericite, opaques	Pelitic gneiss
73281909	Hornblende (greenish-brown), andesine, cummingtonite, biotite, quartz, opaques	Amphibolite

MOUNT RUBIN

For details of rocks collected before 1973, see Tingey and England (1973).

Sample	Assemblage	Classification
73281209	Quartz, carbonate, biotite, white mica, opaques	Calcareous quartzite
73281210	Quartz, carbonate, biotite (green), plagioclase, epidote, opaques	Calcareous quartzite
73281211	Quartz, carbonate, biotite (greenish-brown), white mica, opaques	Calcareous quartzite
73281212	Quartz, carbonate, biotite (brownish-green), white mica, opaques	Phyllite
73281293	Quartz, carbonate, albite, K feldspar, white mica, rutile, opaques	Calcareous quartzite
73281294	Quartz, carbonate, biotite, plagioclase, white mica, opaques	Calcareous quartzite
73281295	Quartz, carbonate, chlorite, white mica, K feldspar, opaques	Calcareous sandstone
73281296	Quartz, carbonate, biotite, chlorite, white mica, K feldspar, plagioclase, opaques	Calcareous quartzite
73281555	Quartz, carbonate, biotite, white mica	Calcareous quartzite
73281556	Quartz, carbonate, biotite, white mica, opaques	Slatey quartzite
73281626	Quartz, carbonate, biotite, albite, microcline, epidote, opaques	Calcareous quartzite

Sample	Assemblage	Classification
73281627	Quartz, white mica, opaques	Phyllite
73281732	Quartz, carbonate, biotite, white mica, sodic plagioclase, opaques	Calcareous quartzite
73281733	Quartz, carbonate, biotite, white mica, opaques	Calcareous quartzite
73281853	Quartz, carbonate, biotite, white mica, opaques	Phyllite
73281854	Quartz, carbonate, biotite, white mica, epidote, opaques	Psammo-pelite
73281855	Quartz, biotite, white mica, chlorite, carbonate, plagioclase, opaques	Impure quartzite
73281856	Quartz, white mica, chlorite, microcline, plagioclase, rutile, opaques	Impure quartzite
73281857	Riebeckite, magnetite, quartz, carbonate, apatite	Ironstone (from moraine)

MOUNT RUKER

For details of rocks collected before 1973, see Tingey and England (1973).

73281277	Quartz, actinolite, chlorite, opaques	Black slate
73281278	Quartz, biotite, white mica, carbonate, sphene, opaques	Mica schist
73281279	Andesine, hornblende (pale green), sphene, ?quartz, clinozoisite	Metadolerite
73281281	Plagioclase, actinolite, biotite, chlorite, sphene, opaques	Metadolerite
73281282	Calcic plagioclase (relict igneous), actinolite, sphene, quartz, opaques	Metadolerite
73281283	Plagioclase (relict igneous), actinolite, biotite, opaques	Metadolerite
73281284	Quartz, biotite, chlorite, actinolite, plagioclase, carbonate, ilmenite	Black slate
73281285	Oligoclase (sericitised), microcline, quartz, biotite, epidote	Granite
73281399	Microcline perthite, albite (saussuritised), quartz, epidote, chlorite (secondary)	Granite
73281400	Microcline, albite (sericitised), quartz, biotite, muscovite (secondary), carbonate (secondary), ?allanite, apatite	Granite
73281551	Plagioclase (saussuritised), microcline, quartz, biotite, muscovite, epidote, ?allanite	Granite
73281552	Oligoclase, quartz, garnet, hornblende (green), biotite, chlorite, sphene	Mafic gneiss (from moraine)
73281553	Microcline perthite, plagioclase (sericitised), quartz, biotite (partly chloritised), carbonate (secondary), apatite, ?allanite	Foliated granite
73281554	Plagioclase (altered), quartz, chlorite (secondary), epidote	Altered aplite
73281619	Quartz, biotite (greenish-brown), chlorite, carbonate, sphene	Phyllite
73281620A	Plagioclase (relict igneous), actinolite, sphene, opaques	Metadolerite
73281620B	Plagioclase (relict igneous), actinolite, quartz, sphene, opaques	Metadolerite
73281621	Quartz, chlorite, carbonate, opaques	Chlorite schist
73281622		Mica schist

Sample	Assemblage	Classification
73281623	Plagioclase (relict igneous), actinolite, chlorite, sphene, opaques	Metadolerite
73281624	Microcline, albite (saussuritised), quartz, biotite, epidote	Granite
73281625	Quartz, biotite, white mica, chlorite, opaques	Mica schist
73281699	Opaques, garnet, quartz, biotite (brownish-green), carbonate	Ironstone
73281700	Sodic plagioclase, actinolite, epidote, carbonate, chlorite, sphene, opaques (relict igneous texture)	Metadolerite
73281714	Opaques, quartz, riebeckite, carbonate	Ironstone
73281715	Opaques (inc. magnetite), quartz, riebeckite, carbonate	Ironstone
73281716	Opaques (inc. magnetite), quartz, riebeckite, carbonate, ?biotite	Ironstone
73281717	Opaques (inc. magnetite), quartz, riebeckite, carbonate	Ironstone
73281718	Opaques (inc. magnetite), quartz, carbonate	Ironstone
73281719	Opaques (inc. magnetite), quartz, riebeckite, carbonate	Ironstone
73281720	Opaques, quartz, riebeckite, carbonate	Ironstone
73281721	Quartz, carbonate, opaques	Calcareous quartzite
73281722	Plagioclase (sericitised), microcline perthite, quartz, biotite (altered), carbonate (secondary), muscovite (secondary), opaques	Granite
73281723	Plagioclase (altered), microcline, quartz, biotite (partly chloritised), muscovite (secondary), epidote, ?allanite	Granite
73281724	Sodic plagioclase (sericitised), orthoclase + microcline, quartz, biotite (partly chloritised), muscovite (secondary), epidote, ?allanite	Granite
73281725	Plagioclase, K feldspar, quartz, sericite, chlorite, sphene, ?allanite, opaques	Altered granite
73281726	Quartz, clay (?kaolin), sericite, chlorite	Altered granite
73281727	Carbonate, epidote, chlorite, biotite, sphene, quartz, opaques	Metadolerite
73281728	Sodic plagioclase, quartz, sericite, chlorite, sphene, rutile	Altered granite
73281729	Carbonate, biotite (green), quartz	Calcareous schist
73281730	Plagioclase (sericitised), microcline, quartz, biotite, chlorite (secondary), muscovite (secondary), epidote, ?allanite	Granite
73281731	Quartz, clay (?kaolin), sericite, sphene	Altered granite
73281851	Actinolite, plagioclase, epidote, sphene	Metadolerite
73281852A	Plagioclase (saussuritised), microcline, quartz, biotite, epidote, apatite, ?allanite	Granite
73281852B	Quartz, white mica	Quartzite
73281998	Opaques (including magnetite and pyrite), quartz, carbonate	Ironstone
73281999	Opaques (including magnetite and pyrite), quartz, carbonate, biotite	Ironstone
73282000A	Quartz, carbonate, biotite, chlorite	Calcareous schist

Sample	Assemblage	Classification
MOUNT RYMILL		
R8838	Quartz, biotite, epidote, sphene	Quartzite
R8847	Calcite	Marble
R8866	Quartzite, biotite, white mica, orthoclase (clastic), microcline, chlorite, opaques	Quartzite
73281076	Plagioclase (sericitised), microcline, quartz, ferrohastingsite, biotite, sphene, ?allanite, opaques	Foliated granite
73281077	Plagioclase (igneous), actinolite, rutile, opaques (strongly olivine-normative)	Metabasic dyke
73281078	Plagioclase, hornblende (blue-green), quartz, biotite, sphene	Metadolerite dyke
73281079	Quartz, kyanite, staurolite, biotite (partly chloritised), plagioclase, white mica, rutile, opaques	Pelitic schist (from moraine)
73281080	Quartz, kyanite staurolite, biotite (partly chloritised), white mica, plagioclase (zoned), opaques	Pelitic schist (from moraine)
73281081	Quartz, kyanite, staurolite, biotite, albite, chlorite, white mica, rutile, ilmenite	Pelitic schist from moraine)
73281304	Hornblende (blue-green), albite, apatite, opaques, ?quartz	Amphibolite
73281305	Hornblende (pale green), albite, chlorite, quartz, opaques	Hornblende schist
73281306	Quartz, biotite, white mica, chlorite, opaques	Micaceous quartzite
73281307	Hornblende (blue-green), oligoclase, chlorite, quartz, opaques	Amphibolite
73281308	Quartz, chlorite, ?albite, sphene, opaques	Pelitic schist
73281309	Quartz	Quartzite
73281310	Hornblende (green), plagioclase, quartz, opaques	Amphibolite
73281311	Quartz, biotite (partly chloritised), chlorite, white mica, K feldspar, opaques	Psammitic schist
73281312A	Quartz, biotite (partly chloritised), magnetite, limonite	Quartzite
73281313	Plagioclase (igneous), hornblende (pale blue-green), biotite, quartz, sphene, opaques	Metadolerite
73281314	Microcline perthite, albite, quartz, biotite, sphene	Granite
73281315	Quartz, staurolite, biotite, chlorite, white mica, opaques	Pelitic schist (from moraine)
MOUNT SEDDON		
R8839	Quartz, carbonate, biotite, white mica, chlorite, K feldspar, opaques	Calcareous quartzite
R8840	Quartz, white mica, biotite, microcline, sodic plagioclase, opaques	Psammo-pelite
65280259	Labradorite, hornblende (blue-green), biotite, chlorite, quartz, epidote, sphene, apatite, zircon, opaques	Amphibolite
73281016	Quartz, actinolite, biotite, chlorite, carbonate, epidote, sphene, opaques	Metagreywacke
73281017	Quartz, actinolite, chlorite, white mica, sphene, epidote, opaques (inc. pyrite)	Psammitic schist

Sample	Assemblage	Classification
73281082	Quartz, chlorite, white mica, epidote, plagioclase, opaques	Black slate (quartz-rich)
73281083	Quartz, epidote, chlorite, rutile	Quartzite
73281084	Quartz, white mica, chlorite, epidote, plagioclase, K feldspar, magnetite, rutile	Quartzite
73281085	Quartz, white mica, epidote, opaques	Quartz vein
73281316	Quartz, biotite, chlorite, white mica, K feldspar, plagioclase, opaques, carbonate (in hand specimen)	Psammitic schist
73281317	Quartz, carbonate, biotite, chlorite, white mica, K feldspar, plagioclase, opaques	Calcareous schist
73281318	Quartz, carbonate, chlorite, plagioclase	Vein
73281319	Quartz, carbonate, biotite, chlorite, white mica, feldspar, opaques	Calcareous schist

MOUNT STINEAR

For details of rocks collected before 1973, see Tingey and England (1973)

Sample	Assemblage	Classification
73281377	Andesine, quartz, biotite, epidote, zircon, opaques	Felsic gneiss
73281378	Microcline, quartz, ferrohastingsite, biotite, plagioclase, sphene, ?allanite, opaques	Felsic gneiss
73281379	Andesine, quartz, hornblende (green), biotite, sphene, magnetite	Felsic gneiss
73281380	Microcline, albite, quartz, biotite, muscovite, garnet, opaques	Granite
73281381	Quartz, epidote, hornblende (green), oligoclase	Calc-silicate gneiss
73281382	Plagioclase (zoned), microcline, quartz, hornblende (green), biotite, sphene, ?allanite, opaques	Foliated granite
73281383	Plagioclase (zoned), microcline, quartz, hornblende (green), biotite, sphene, epidote, ?allanite, opaques	Foliated granite
73281443	Quartz, cummingtonite, biotite, K feldspar, garnet, chlorite (secondary), opaques	Metaconglomerate
73281444	Quartz, K feldspar, biotite, garnet, white mica, plagioclase, opaques	Psammo-pelitic schist
73281445	Quartz, K feldspar, biotite, white mica, plagioclase	Quartzite
73281446	Quartz, garnet, biotite, white mica, opaques	Psammitic schist
73281447	Quartz, garnet (partly altered, some secondary), staurolite (after garnet), biotite, chlorite, white mica	Psammitic schist
73281448	Quartz, garnet, biotite, white mica	Psammitic schist
73281449	Clinozoisite, carbonate, biotite	Calc-silicate
73281450	Quartz, white mica, magnetite	Quartzite
73281586	Quartz, ?cummingtonite, chlorite (secondary), biotite, zircon, opaques	Quartzite
73281587A	Quartz, staurolite, biotite (partly chloritised), white mica, opaques	Pelitic schist
73281587B	Diopside, scapolite, oligoclase-andesine, quartz, epidote, hornblende, sphene, ?allanite, opaques	Calc-silicate gneiss

Sample	Assemblage	Classification
73281588	Quartz, garnet, biotite, chlorite, cummingtonite, hornblende, plagioclase, opaques.	Pelitic schist
73281589	Quartz, garnet, chlorite, hornblende (blue-green), biotite (relict), opaques	Pelitic schist
73281590	Quartz, oligoclase, hornblende (green), biotite, opaques	Psammo-pelitic schist
73281591	Quartz, cummingtonite, chlorite, opaques	Psammitic schist
73281592	Quartz, garnet, hornblende (blue-green), plagioclase, epidote, chlorite, opaques	Calc-silicate schist
73281601	Quartz, biotite, white mica, albite-oligoclase, epidote, opaques	Quartzite
73281602	Albite-oligoclase, K feldspar, quartz, biotite	Felsic gneiss
73281603	Quartz, kyanite, white mica	Quartzite
73281628	Quartz, biotite, white mica	Metaconglomerate
73281629	Quartz, staurolite, garnet, biotite, white mica, albite	Pelitic schist
73281630	Microcline, quartz, biotite, ferro-hastingsite, epidote, apatite, ?allanite, opaques	Felsic gneiss
73281631	K feldspar, quartz, ferrohastingsite, biotite, sphene, carbonate, epidote, ?allanite	Felsic gneiss
73281632	Hornblende (green), albite, biotite, quartz, opaques	Metadolerite
73281633	Microcline, quartz, plagioclase (sericitised), ferrohastingsite, biotite, sphene, ?allanite, opaques	Foliated granite
73281634	Microcline, quartz, ferrohastingsite, biotite, sphene, ?allanite	Foliated granite
73281635A	Bytownite, hornblende (green), biotite	Mafic gneiss
73281635B	Quartz, chlorite, white mica, K feldspar (sericitised)	Quartzite
73281638	Quartz, biotite, chlorite, K feldspar, plagioclase, opaques	Impure quartzite
73281639	Quartz, biotite (mostly chloritised), K feldspar	Mica schist
73281640	Quartz, staurolite, sillimanite (after kyanite), biotite, white mica, albite, magnetite, ?cordierite	Pelitic schist
73281641	Plagioclase, hornblende (green), quartz, opaques	Amphibolite
73281642	Plagioclase, hornblende (green), quartz, sphene, opaques	Metadolerite
73281643	Quartz, staurolite (largely altered to white mica, etc.), white mica, chlorite, albite, rutile, opaques	Pelitic schist (retrogressed)
73281644	Quartz, garnet, biotite, chlorite, sodic plagioclase	Metaconglomerate
73281688	Quartz, garnet, biotite, sodic plagioclase, magnetite	Psammitic schist
73281689	Quartz, kyanite, staurolite, biotite, chlorite, K feldspar, plagioclase, rutile	Pelitic schist
73281690	Oligoclase, hornblende (blue-green), sphene, epidote, biotite, K feldspar, opaques	Amphibolite
73281691	Microcline, quartz, plagioclase, biotite (partly chloritised), sphene, opaques	Granite
73281872	Quartz, hornblende (green), cummingtonite, biotite, garnet, oligoclase, opaques	Psammitic schist
73281997	Quartz, staurolite, biotite (partly chloritised), white mica	Pelitic schist

SS40-42/8 MAWSON ESCARPMENT (SOUTH)

Sample	Assemblage	Classification
MAWSON ESCARPMENT A		
73281939	Tremolite/actinolite, epidote, sphene, chlorite, carbonate, quartz, opaques	Calc-silicate schist
73281940	Epidote, actinolite, sphene, carbonate, quartz, opaques	Calc-silicate schist
73281941	Actinolite, biotite, carbonate	Calc-silicate schist
73281942	Quartz, biotite, epidote, actinolite, sphene, carbonate, opaques	Calc-silicate schist
73281943	Quartz, biotite, white mica, zircon, opaques	Mica schist
73281945	Carbonate, tremolite, talc, quartz, pyrite	Impure marble
73281946	Carbonate, tremolite, quartz, white mica, pyrite	Impure marble
73281947	Carbonate, tremolite, quartz, talc, pyrite	Impure marble
73281948	Quartz, biotite, chlorite, garnet, hornblende (blue-green)	Mica schist
73281949	Quartz, garnet (some alteration), staurolite, biotite, chlorite, white mica, opaques	Pelitic schist
73281950	Quartz, garnet (partly altered), biotite, chlorite, white mica, opaques	Pelitic schist (retrogressed)
73282101	Quartz, garnet (skeletal), biotite (partly chloritised), chlorite, white mica	Pelitic schist
73282102	Quartz, biotite, carbonate, K feldspar, opaques	Mica schist
73282103	Quartz, staurolite, biotite (partly chloritised), garnet (partly altered, some secondary), white mica, opaques	Pelitic schist
73282104	Plagioclase, hornblende, biotite, quartz, apatite, opaques	Metadolerite dyke
73282105	Oligoclase (zoned, altered), biotite, hornblende, quartz, microcline, opaques	Granophyre from dyke
73282106	Plagioclase (altered), hornblende (blue-green), epidote, quartz, opaques	Metadolerite dyke
73282107	Plagioclase, hornblende/actinolite (blue-green), biotite, apatite, opaques	Metadolerite dyke
73282108	Plagioclase, hornblende/actinolite (blue-green), biotite, quartz, opaques	Metadolerite dyke
73282109	Plagioclase, hornblende/actinolite (blue-green), biotite, quartz, apatite, opaques	Metadolerite dyke
73282110	Oligoclase, microcline, quartz, hornblende, biotite, sphene, ?allanite, opaques	Felsic gneiss
73282111	Microcline, quartz, oligoclase, ferrohastingsite, biotite, sphene, ?allanite, chlorite, opaques	Felsic gneiss
73282112	Microcline, quartz, oligoclase, ferrohastingsite, biotite, carbonate, sphene, ?allanite, opaques	Felsic gneiss
73282113	Microcline, albite-oligoclase, quartz, ferrohastingsite, biotite, sphene, muscovite, opaques	Felsic gneiss
73282114	Andesine, quartz, biotite, hornblende, chlorite, muscovite, opaques	Felsic gneiss
73282115	Quartz, staurolite, kyanite, garnet, white mica, opaques	Psammo-pelitic schist

Sample	Assemblage	Classification
73282116	Quartz, staurolite, kyanite, garnet, white mica, plagioclase (altered), chlorite (secondary), tourmaline	Psammo-pelitic schist
73282117	Quartz, staurolite, kyanite, biotite, white mica, oligoclase, ilmenite	Psammo-pelitic schist
73282118	Quartz, staurolite, kyanite, white mica, oligoclase (zoned)	Psammo-pelitic schist
73282119	Quartz, epidote, carbonate, opaques	Calcareous quartzite
73282120	Oligoclase, microcline, quartz, ferro-hastingsite, biotite, sphene, ?allanite, opaques	Foliated granite
73282121	Plagioclase, microcline, quartz, biotite, chlorite (secondary), sphene, apatite, epidote, ?allanite	Felsic gneiss

MAWSON ESCARPMENT B

For details of rocks collected before 1973, see Tingey and England (1973).

Sample	Assemblage	Classification
73281401	Actinolite, clinopyroxene, carbonate	Amphibolite (4th generation dyke)
73281402	Hornblende (green), labradorite (igneous), scapolite, quartz, sphene, opaques	Metadolerite (3rd generation dyke)
73281403	Quartz, white mica, tourmaline	Quartzite
73281404	Actinolite (colourless), plagioclase, biotite, quartz, opaques	Metadolerite (1st generation dyke)
73281405	Quartz, oligoclase, cordierite, cummingtonite, biotite, chlorite, opaques	Pelitic gneiss
73281406	Quartz, plagioclase, kyanite, sillimanite(?) (secondary), biotite, chlorite, white mica, opaques	Pelitic schist
73281407	Quartz, andesine (An42), anthophyllite, biotite, tourmaline, opaques	Pelitic schist
73281408	Hornblende (pale green), plagioclase (relict igneous), cummingtonite, biotite, opaques	Metadolerite (2nd generation dyke)
73281409	Sodic plagioclase, K feldspar, quartz, hornblende (dark green), biotite, garnet, apatite, zircon, ?allanite, opaques	Felsic gneiss
73281410	Albite, quartz, hornblende (green), biotite, apatite, sphene	Felsic gneiss
73281411	Oligoclase, quartz, microcline, biotite (partly chloritised), hornblende, epidote, apatite, sphene, ?allanite	Foliated granodiorite
73281412	Labradorite, microcline, quartz, biotite, opaques	Felsic gneiss
73281413	Oligoclase, microcline, quartz, biotite, sphene, ?allanite, opaques	Felsic gneiss
73281414	Oligoclase, quartz, ferrohastingsite, biotite, garnet, carbonate, apatite, ?allanite, opaques	Felsic gneiss
73281415	Quartz, oligoclase, garnet, biotite, cummingtonite, chlorite (after ?cordierite), opaques	Pelitic gneiss
73281416	Labradorite, quartz, garnet, cordierite, anthophyllite, biotite, chlorite	Pelitic gneiss
73281417	Quartz, garnet, biotite, white mica, tourmaline, opaques	Pelitic gneiss

Sample	Assemblage	Classification
MAWSON ESCARPMENT C		
73281421	Sodic plagioclase, microcline, quartz, ferrohastingsite, biotite, sphene, ?allanite, opaques	Felsic gneiss
73281422	Labradorite (relict igneous), hornblende (green), quartz, scapolite, opaques	Metadolerite dyke
73281423	Quartz, andesine, garnet (partly altered), epidote, chlorite, white mica, opaques	Felsic gneiss (retrogressed)
73281424	Quartz, plagioclase (altered), garnet, fibrolite (secondary), chlorite, white mica, opaques	Pelitic gneiss (retrogressed)
73281425	Labradorite, hornblende (green), quartz, biotite, opaques	Metadolerite
73281426	Albite, quartz, biotite, muscovite	Altered pegmatite
MAWSON ESCARPMENT D		
73281481	Andesine, microcline, quartz, garnet, biotite, sillimanite, muscovite	Felsic gneiss
73281482	Andesine, quartz, biotite, apatite, zircon, opaques	Felsic gneiss
73281483	Plagioclase, hornblende (pale green), biotite, quartz	Metadolerite
73281484	Andesine, microcline, hornblende (green), quartz, epidote, sphene, opaques	Feldspar-rich gneiss
73281485	Andesine, microcline (altered), hornblende (green), quartz, epidote, sphene, ?allanite, opaques	Mafic gneiss
73281487	Labradorite, hornblende (pale green), biotite, quartz, opaques	Metadolerite dyke
MAWSON ESCARPMENT E		
73281488	Quartz, plagioclase, garnet, cummingtonite, biotite, chlorite (secondary), opaques	Pelitic gneiss
73281489	Andesine, quartz, biotite	Felsic gneiss
73281490	Plagioclase, hornblende (olive green), biotite, quartz, carbonate	Mafic gneiss
73281491	Quartz, cordierite, anthophyllite, biotite (slightly chloritised), opaques	Pelitic gneiss
73281492	Sodic plagioclase, K feldspar, quartz, ferrohastingsite, sphene, opaques	Felsic gneiss
MAWSON ESCARPMENT F		
73281495	Sodic plagioclase, microcline, quartz, biotite (partly chloritised), muscovite (secondary), sphene, opaques	Granite
73281496	Carbonate, forsterite (partly serpentinised), phlogopite	Marble
73281497A	Diopside, hornblende (brown), scapolite, sphene	Calc-silicate gneiss
73281499	Sodic plagioclase, quartz, biotite, K feldspar (exsolved)	Granodiorite
73281500	Actinolite, plagioclase (altered), leucoxene	Mafic gneiss
73281651	Labradorite, hornblende (olive green), quartz, opaques	Amphibolite
73281652	Garnet, cordierite, biotite, K feldspar, sillimanite, quartz, ilmenite	Pelitic gneiss

Sample	Assemblage	Classification
73281653	Hornblende (green-brown), diopside, plagioclase, biotite, opaques	Calc-silicate gneiss

MAWSON ESCARPMENT G

For details of rocks collected before 1973, see Tingey and England (1973).

73281429	Diopside, actinolite, bytownite, clinozoisite, carbonate, biotite, ?prehnite	Calc-silicate gneiss
73281430	Carbonate, diopside, forsterite (some alteration to antigorite), talc	Marble
73281431	Labradorite, quartz, garnet, biotite	Felsic gneiss
73281432	Quartz, andesine, K feldspar, garnet, cordierite, sillimanite (after ?staurolite), biotite	Pelitic gneiss
73281433	Bytownite, carbonate, ?talc	Calc-silicate gneiss
73282122	Oligoclase (sericitised), microcline, quartz, biotite, muscovite (secondary), zircon, opaques	Granite
73282123	Plagioclase, microcline, quartz, biotite, muscovite, zircon	Granite
73282124	Microcline, plagioclase, quartz, biotite, muscovite, zircon	Granite
73282125	Plagioclase (sericitised), microcline, quartz, biotite, muscovite, chlorite (secondary), zircon, opaques	Granite
73282126	Plagioclase (sericitised), microcline, quartz, biotite, muscovite	Granite
73282127	Quartz, plagioclase, staurolite, garnet, biotite, cordierite (after staurolite), sillimanite (after staurolite), white mica (secondary), opaques. Contact metamorphosed.	Pelitic gneiss
73282128	Quartz, plagioclase, staurolite, garnet, biotite, cordierite (after staurolite), opaques. Contact metamorphosed.	Pelitic gneiss
73282129	Quartz, plagioclase, staurolite, garnet, biotite, cordierite (after staurolite), sillimanite (after staurolite and ?kyanite). Contact metamorphosed.	Pelitic gneiss
73282130	Plagioclase (sericitised), microcline, quartz, biotite	Granite
73282131	Plagioclase, microcline, quartz, biotite (slightly chloritised), zircon, opaques	Granite
73282132	Plagioclase (sericitised), microcline, quartz, biotite (partly chloritised), zircon, opaques	Granite
73282133	Oligoclase, hornblende (green), biotite, quartz, sphene, opaques	Amphibolite
73282134	Plagioclase (altered), hornblende, biotite, quartz, opaques	Metadolerite
73282135	Plagioclase (sericitised), quartz, hornblende (green), biotite (partly chloritised), ?allanite	Felsic gneiss
73282136	Plagioclase, quartz, garnet, biotite, muscovite, apatite, opaques	Felsic gneiss
73282137	Andesine, quartz, garnet, biotite, apatite, zircon, opaques	Felsic gneiss

Sample	Assemblage	Classification
73282138	Oligoclase-andesine, quartz, biotite, garnet, muscovite, apatite, zircon, opaques	Felsic gneiss
73282139	Plagioclase, microcline, quartz, biotite, muscovite, chlorite, opaques	Leucogneiss
73282140	Hypersthene, hornblende (pale olive brown), biotite (red-brown), andesine	Mafic granulite
73282141	Andesine, hypersthene, hornblende (green-brown), cummingtonite, biotite, quartz, garnet, apatite, opaques	Mafic granulite
73282142	Hypersthene, hornblende, garnet, plagioclase, clinopyroxene, ?cummingtonite, quartz, carbonate, opaques	Mafic granulite
73282143	Quartz, garnet, biotite, cordierite (altered)	Pelitic gneiss

Sample	Assemblage	Classification
MOUNT MAGUIRE		

For details of rocks collected before 1973, see Tingey and England (1973).

73281213	Hornblende (blue-green), plagioclase, biotite, carbonate, ?quartz, opaques	Amphibolite
73281214	Carbonate, chlorite, albite, quartz, opaques	Calcareous schist
73281215	Quartz, garnet, biotite, hornblende (blue-green), carbonate	Pelitic schist
73281216	Hornblende (blue-green), biotite, quartz, carbonate, actinolite, K feldspar, chlorite, epidote, opaques	Calcareous schist
73281217	Quartz, garnet, biotite, hornblende (green), cummingtonite, opaques	Pelitic schist
73281218	Hornblende (green), albite, biotite, quartz, carbonate, opaques	Amphibolite
73281219	Quartz, garnet, biotite, white mica, opaques (inc. ?graphite)	Pelitic schist
73281220	Garnet, hornblende (altered), chlorite, carbonate, white mica, ?plagioclase	Pelitic schist (retrogressed)

WILSON BLUFF

For details of rocks collected before 1973, see Tingey and England (1973).

SS40-42/11 WILSON BLUFF

Sample	Assemblage	Classification
BLAKE NUNATAKS		
73281297	Oligoclase, quartz, biotite, muscovite	Leucogneiss
73281298	Oligoclase, microcline, quartz, biotite, muscovite	Leucogneiss
73281299	Sodic plagioclase, quartz, garnet, biotite, muscovite	Felsic gneiss
73281300E	Hornblende (green), sodic plagioclase, biotite, quartz, sphene, opaques	Amphibolite
73281451	Labradorite, quartz, biotite, apatite, ?allanite, opaques	Felsic gneiss
73281452	Hornblende (green), andesine, biotite, quartz, opaques	Amphibolite
73281453	Oligoclase, quartz, biotite, apatite, ?allanite	Felsic gneiss
73281454	Andesine, quartz, hornblende (green), biotite, sphene, zircon	Felsic gneiss
73281455	Hornblende (pale green), plagioclase, biotite, quartz, sphene	Amphibolite
73281456C	Sodic plagioclase, microcline, quartz, biotite, sphene	Felsic gneiss
73281457A	Plagioclase, perthite, quartz, hornblende (green), biotite, garnet, clinopyroxene, epidote, ?allanite, opaques	Felsic gneiss
73281734	Carbonate, quartz	Marble
73281735	Hornblende (blue-green), oligoclase, biotite, quartz, opaques	Amphibolite
73281736	Quartz, garnet, biotite, epidote, carbonate, white mica, hornblende, chlorite	Pelitic schist (calcareous)
73281737	Quartz, garnet, biotite, plagioclase, chlorite (secondary), carbonate, opaques	Pelitic schist
73281738	Hornblende (blue-green), sodic plagioclase, biotite, quartz, ilmenite	Amphibolite
73281739	Quartz, cummingtonite, phlogopite, chlorite, rutile	Mica schist
73281740	Quartz, biotite, white mica, epidote, zircon, opaques	Mica schist
73281741	Quartz, garnet, staurolite, kyanite, biotite, chlorite, opaques	Psammo-pelitic schist
73281742	Quartz, garnet, staurolite, kyanite, biotite, ilmenite, ?graphite	Pelitic schist
73281743	Quartz, biotite, white mica, oligoclase (saussuritised), K feldspar, chlorite, opaques	Mica schist
73281744	Quartz, garnet, biotite, white mica, chlorite, opaques	Pelitic schist
73281745	Actinolite, plagioclase, carbonate, biotite, quartz, chlorite, opaques	Calcareous schist
73281746	Actinolite, carbonate, biotite, chlorite, quartz, plagioclase, opaques	Calcareous schist
73281747	Quartz, garnet, staurolite, kyanite, biotite, white mica, opaques	Pelitic schist

SS40-42/12 MOUNT TWIGG

Sample	Assemblage	Classification
MOUNT BORLAND		
73281221	Quartz, microcline, white mica, opaques	Quartzite
73281222A	Andesine, hornblende, quartz, sphene opaques	Amphibolite
73281222B	Hornblende, sodic plagioclase, cummingtonite, biotite, opaques	Amphibolite
73281223	Andesine, ?tremolite, biotite, quartz, sphene, opaques	Calc-silicate gneiss
73281224	Andesine, garnet, diopside, hornblende (brownish-green), quartz, sphene	Calc-silicate gneiss
73281225	Andesine, diopside, hornblende (brownish-green), quartz, sphene	Calc-silicate gneiss
73281226	Andesine, hornblende (brownish-green), biotite, quartz, chlorite (secondary), sphene, opaques	Amphibolite
73281227	Quartz, garnet, biotite, albite	Quartzite
73281228	Andesine, hornblende (green), garnet, biotite, quartz, opaques	Garnet amphibolite
73281229	Oligoclase, microcline, quartz, biotite, hornblende (greenish-brown), sphene, zircon, ?allanite, opaques	Felsic gneiss
73281230	Quartz, sillimanite (relict), K feldspar, white mica, biotite (altered)	Quartzite
73281231	Quartz, sillimanite, biotite (altered), muscovite (secondary), plagioclase, opaques	Pelitic gneiss
73281232	Calcic plagioclase, diopside, epidote, quartz, hornblende	Calc-silicate gneiss
73281233	Quartz, K feldspar (sericitised), sillimanite, biotite (altered), white mica (secondary), opaques	Pelitic gneiss
73281234	Hornblende (green), plagioclase, biotite (partly altered), quartz, epidote, chlorite, magnetite	Amphibolite
73281235	Quartz, microcline, sodic plagioclase, white mica, biotite, magnetite	Psammo-pelitic gneiss
73281236	Quartz, orthoclase, oligoclase, sillimanite, biotite (partly altered), muscovite (secondary)	Pelitic gneiss
MOUNT TWIGG		
73281464	Albite, quartz, biotite	Leucogneiss
73281465	Plagioclase, hornblende (pale brownish-green), clinopyroxene, biotite, quartz	Amphibolite
73281466	Andesine, quartz, garnet, biotite, opaques	Felsic gneiss
73281468A	Plagioclase, K feldspar, quartz, hornblende, biotite, clinopyroxene, epidote, opaques	Felsic gneiss
73281468B	Albite, K feldspar, quartz, muscovite	Pegmatite
73281469	Hornblende (olive green), plagioclase, garnet, quartz, biotite, opaques	Garnet amphibolite
73281910	Quartz, biotite, white mica, chlorite, opaques	Pelitic gneiss
73281911	Quartz, oligoclase, K feldspar, biotite, white mica, garnet, zircon	Pelitic gneiss

Sample	Assemblage	Classification
73281912	Quartz, plagioclase, sillimanite, biotite, white mica	Pelitic gneiss
73281913	Quartz, plagioclase, sillimanite, biotite (slightly chloritised), white mica	Pelitic gneiss
73281914	Plagioclase, hornblende (green), garnet, quartz, biotite, opaques	Garnet amphibolite
73281915	Quartz, garnet, biotite, chlorite, carbonate, white mica	Impure quartzite
73281916	Plagioclase, K feldspar, quartz, biotite (largely chloritised), garnet, muscovite (secondary), carbonate, opaques	Pegmatite
73281917	Oligoclase, microcline, quartz, biotite, muscovite, apatite	Felsic gneiss
73281918	Plagioclase, microcline, quartz, biotite, muscovite	Felsic gneiss
73281919	Plagioclase, microcline, quartz, biotite, garnet, zircon, opaques	Pegmatitic gneiss
73281920	Oligoclase, microcline, quartz, biotite, muscovite, chlorite (secondary)	Felsic gneiss
73281921	Plagioclase, hornblende (green), quartz, biotite, garnet, opaques	Amphibolite
73281922	Plagioclase, hornblende (green), clinopyroxene, biotite, quartz, sphene, garnet, opaques	Amphibolite ?dyke
73281923	Plagioclase, clinopyroxene, biotite	Calc-silicate gneiss
73281924	Oligoclase, microcline, quartz, hornblende (green), ?allanite	Felsic gneiss
73281925	Plagioclase, microcline, quartz, hornblende, biotite, chlorite (secondary), carbonate	Leucogneiss

APPENDIX II

Rb-Sr geochronological results from the Prince Charles Mountains.

This appendix summarises data obtained by Dr P.A. Arriens; dates marked * are mica ages calculated by R.N. England (BMR).

SHEET AREA	LOCALITY	SPECIMEN NUMBER RSES	ROCK TYPE	METHOD	* INITIAL RATIO ($^{87}Sr/^{86}Sr$)	AGE	REMARKS
Goodspeed Nunataks	Binders Nunatak	73/865-868	Pegmatite	Muscovite	0.85	874*	
		866	"	"	0.85	871*	
		877	"	Biotite		498*	
		878	"	Biotite		489*	
	Goodspeed Nunataks	73/808	"	Muscovite	0.71	457*	
Mount Cresswell	Bosse Nunatak	73/743	Gneiss	Biotite		513*	
	Ely Nunatak	73/744-52	Gneiss				
		753	Pegmatite				No analyses
		754	Pegmatite				
	Machin Nunatak	73/1058	Pegmatite	Muscovite			
		1058	"	Biotite		500*	
		1059	"	"		489*	
		1060	"	Muscovite			
		1060	"	Biotite		530*	
		1061	Pegmatite granite	Biotite		500*	
		1061	" "	K-feldspar			
		1062	" "	Biotite		527*	
	Mount Cresswell	73/1057	Pegmatite	Muscovite		500*(approx)	
	Mount Johns	73/1035-1056	Gneiss	Total Rock	0.7060 ± .0012	891 ± 70	Model 3
	Shaw Massif	73/756-758	Biotite gneiss	Total Rock			No isochron
		765	Pegmatite	Biotite		496*	

* $^{87}Sr/^{86}Sr$

SHEET AREA	LOCALITY	SPECIMEN NUMBER RSES	ROCK TYPE	METHOD	* INITIAL RATIO ($^{87}Sr/^{86}Sr$)	AGE	REMARKS
Mawson Escarpment (North)	Clemence Massif	73/777-85	Biotite gneiss	Total Rock	0.7104 ± .0077	834 ± 304	
		786	Biotite pegmatite	Biotite		507*	
	'Dalton Hills'	73/790-97	Gneiss	Total Rock	0.7042 ± .0026	945 ± 97	
	Mawson Escarpment H1	73/986	Marble				No work
	H2	987	Pegmatite	Muscovite		408*	
	Mawson Escarpment L1 *	73/988	"	Biotite		459*	
		988A	"	Potash Feldspar			
	L2	73/989-93	Gneiss	Total Rock			No isochron
	L6	73/994-95	Pegmatite				No analyses
	M4	73/996-1003	Leucogneiss	Total Rock			No isochron
		1004-1013	Leucogneiss and calc-silicate				
		1012	Pegmatite	Biotite		481*	
		1013	Pegmatite	"		477*	
Mount Menzies	Mount Bayliss	73/826-44	Granite gneiss	Total Rock	0.7076 ± .0153	2809 ± 411	Model 2
	Mount Mather	73/1024-26	Granite dyke	Total Rock	0.7125 ± .0106	1796 ± 2064	Model 2
	Mount Scherger	73/806	Pegmatite dyke	Muscovite	0.73 (assumed)	530* (approx.)	

* L.1, L.2 etc. refers to subareas of the Mawson Escarpment; see text and Plate 1.

SHEET AREA	LOCALITY	SPECIMEN NUMBER RSES	ROCK TYPE	METHOD	INITIAL RATIO ($^{87}Sr/^{86}Sr$)	AGE	REMARKS
Cumpston Massif	Cumpston Massif	73/920	Pelitic schist	Muscovite	0.705 (assumed)	940	
		73/925-27	Biotite schist	Total Rock			No isochron
		73/929	? Pegmatite	Biotite		630	
		73/930-31		Mineral separate			
	'Greenall Nunataks'	73/1030-32	Biotite gneiss	Total Rock			No isochron
		1033-34	Biotite gneiss				
	Keyser Ridge	73/904-06	Leucogneiss	Total Rock			No isochron
		907	Pegmatite	Muscovite		1995*	
		908	Pegmatite	Muscovite		1708*	
		909	Biotite schist				
	Mount Dummett	73/845-50	Leucogranite	Total Rock			No isochron
		851	Pegmatite	Muscovite			
		852	"	"		516*	
		853	"	"			
		854	"	"			No analyses
		855	"	"			
		73/856-61	Leucogranite	Total Rock			
		73/862	Pegmatite	Muscovite		510*	
		862	Pegmatite	Biotite		487*	
		863	? Pegmatite	Muscovite			
		864	? Pegmatite	Muscovite		507*	
	Mount McCauley	73/809-12	Leucogranite	Total Rock			No isochron
		813	Pegmatite				
		73/814	Pegmatite	Muscovite		292*	
		815	Pegmatite	Muscovite		503*	

SHEET AREA	LOCALITY	SPECIMEN NUMBER RSES	ROCK TYPE	METHOD	INITIAL RATIO ($^{87}Sr/^{86}Sr$)	AGE	REMARKS
Cumpston Massif (cont.)	Mount McCauley (cont.)	73/816	Pegmatite	Muscovite			
		816	"	Biotite		800*	
		817	"	"		431*	
		821	"	Muscovite		515*	
		822	"	Muscovite		430*	
		822	"	K-feldspar			
	Mount Newton	73/918	Pegmatite	Muscovite	0.7	2100*	
					0.8	2000*	
	Mount Ruker	73/879-883	Granite	Total Rock	0.8902 ± .0162	1442 ± 152	Model 1
		73/890-897	Leucogneiss	Total Rock			No isochron
		73/900	Pegmatite			600*	
		901	"				
		902	"				
		903	"				
	Mount Rymill	73/770-76	Granite	Total Rock	1.1139 ± .0621	1197 ±238	
	Mount Stinear	73/1014	Pegmatite	Muscovite		2580	
		73/1015-23	Biotite gneiss	Total Rock	0.875	1042	(Approximate)
Mawson Escarpment (South)	Mawson Escarpment B	73/932-40	Grey gneiss	Total Rock	0.7050 ± .0008	2822 ± 227	
	Mawson Escarpment C	73/941	Pegmatite	Biotite		456* (approx.)	
		941	Pegmatite	Potash Feldspar			
	Mawson Escarpment E	73/942-56	Leucogneiss	Total Rock	0.7210 ± .0091	2766 ± 92	Model 4
		73/961	Biotite crystals	Biotite			No age

SHEET AREA	LOCALITY	SPECIMEN NUMBER RSES	ROCK TYPE	METHOD	INITIAL RATIO ($^{87}Sr/^{86}Sr$)	AGE	REMARKS
Mawson Escarpment (South) (cont.)	Mawson Escarpment F	73/962-68	Grey granite	Total Rock	0.7363 ± .0026	569 ± 43	
		73/969	Pegmatite	Muscovite		486*	
		970	"	"		507*	
		971	"	Biotite		471*	
		73/972-975	Granite	Total Rock			No isochron
		73/977	Marble	Total Rock			No analyses
		978-80	Granite gneiss	Total Rock			No isochron
	Mawson Escarpment G	73/982	Pegmatite	Muscovite		504*	
		983	"	Biotite		477*	
		984	"	Muscovite		482*	
		985	Pegmatite granite				No analyses
Wilson Bluff	Wilson Bluff	73/910	? Pegmatite	Muscovite		512	
		911	Pegmatite	Muscovite			No analyses
		912	Pegmatite	Muscovite		561	
		912	Pegmatite	Potash Feldspar			No ages
		913	? Pegmatite	Biotite			
Mount Twigg	Mount Borland	73/917	Pegmatite	Muscovite		518	
		917	"	Biotite			

NORTHERN PRINCE CHARLES MOUNTAINS

SHEET AREA	LOCALITY	SPECIMEN NUMBER RSES **	ROCK TYPE	METHOD	INITIAL RATIO $^{87}Sr/^{86}Sr$	AGE (m.y.)	REMARKS
Crohn Massif	Bond Ridge	73/1071-76	Gneiss; pegmatite	Total Rock	0.709	1200 approx	Eyeball
	Crohn Massif	73/1108-10	Charnockite	Total Rock	0.7097 ± .0198	994 ± 650	Model 1
	Martin Massif	74/258-261		Total Rock	0.7086 ± .0024	1005 ± 87	Model 3
	Moore Pyramid	70/1144-62	Leucogneiss	Total Rock	0.7363 ± .0030	786 ± 37	Model 3
		73/1078	Pegmatite	Muscovite		491	
		1078A	"	Biotite		500	
	Mount Bechervaise	73/1111-17	Leucogneiss	Total Rock	0.7429 ± 0.0208	923 ± 179	Model 2
	Mount Gardner	73/1098-1107	Leucogneiss	Total Rock	0.7233 ± .0147	995 ± 69	Model 3
	Mount Wishart	73/1079	Mica ?Pegmatite	Biotite		660 approx	
		1080	"	"		520 "	
		1081	"	"			
		1082	"	Mica			
		1083-97	Leucogneiss/ Charnockite	Total Rock	A 0.7086 ± .0002	A 933 ± 25	Model 1
					B 0.7121 ± .0007	B 945 ± 36	Model 3
Beaver Lake	Fox Ridge	69/426-7	Gneiss				No isochron
	Jetty Peninsula	74/320-23	"			913* (approx)	
Fisher Massif	Fisher Massif	73/1063-67	Granodiorite	Total Rock	0.7047 ± .0052	1114 ± 303	Model 1

APPENDIX III

K-Ar age determinations by Australian Mineral Development Laboratories.

K-Ar determinations - Constants used

K^{40} = 0.0119 atom %; $\lambda_B = 4.72 \times 10^{-10}$/yr; $\lambda_e = 0.854 \times 10^{-10}$/yr

---

MOUNT MENZIES 1:250 000 Sheet area

Mount Bayliss.

Specimen 73281545 - Magnophorite concentrate (from alkali melasyenite dyke that intersects Archaean granite gneiss).

Analytical data	%K	3.77 3.78	% Atmospheric Ar^{40}: 0.9 2.0	Radiogenic $\frac{Ar^{40}}{K^{40}}$: 0.02701 0.02695

Age $\substack{414 \\ 413}$ ± 10 million years (AMDL Report AN 3011/75)

Specimen 73281545 - Riebeckite concentrate(from alkali melasyenite dyke that intersects Archaean granite gneiss).

Analytical data	%K	2.71 2.76	% Atmospheric Ar^{40}: 3.3	Radiogenic $\frac{Ar^{40}}{K^{40}}$: 0.028230

Age 430 ± 12 million years (AMDEL Report AN 3011/75)

CUMPSTON MASSIF 1:250 000 Sheet area

Mount Newton.

Specimen 73281748 - plagioclase concentrate (from a slightly altered quartz tholeiite dyke that intrudes metamorphic basement)

Analytical data	%K	0.541 0.537	% Atmospheric Ar^{40}: 1.5 1.3	Radiogenic $\frac{Ar^{40}}{K^{40}}$: 0.72230 0.73037

Age $\substack{3813 \\ 3831}$ ± 80 million years* (AMDEL Report AN 3480/75)

---

* Despite the agreement between these ages they are regarded as anomalously old, because of the presumed incorporation of extraneous Ar^{40} into the plagioclase crystals at the time of crystallisation.

Mount Ruker.

Specimen 72280856 - plagioclase concentrate (from a float specimen of tholeiitic dolerite, presumably derived from a dyke that intersects low grade metasediments).

Analytical	%K	0.251	% Atmospheric Ar^{40}: 0.8	Radiogenic $\frac{Ar^{40}}{K^{40}}$: 0.72813
data		0.254		

Age 3826 ± 80 million years* (AMDEL Report AN 3480/75)

<u>BEAVER LAKE 1:250 000 Sheet area</u>

Manning Massif

Specimen 73281594 - total rock (fine-grained porphyritic olivine leucitite lava flow overlying metamorphic basement).

Analytical	%K	4.64	% Atmospheric Ar^{40}: 9.7, 13.0	Radiogenic $\frac{Ar^{40}}{K^{40}}$: 0.003070, 0.002907
data		4.64		

Age $\begin{matrix}51.8\\49.1\end{matrix}$ ± 2.0 million years (AMDEL Report No. 3011/75)

East side of Fox Ridge, McLeod Massif, Beaver Lake 1:250 000 sheet area, Northern Prince Charles Mountains.

Specimen 69280225 - pyroxene concentrate (from alkali olivine basalt dyke that intrudes metamorphic basement).

Analytical	%K	0.472	% Atmospheric Ar^{40}: 7.9	Radiogenic $\frac{Ar^{40}}{K^{40}}$: 0.033764
data		0.467		

Age 504 ± 20 (AMDEL Report AN 3480/75)

---

*Despite the agreement between these ages they are regarded as anomalously old, because of the presumed incorporation of extraneous Ar^{40} into the plagioclase crystals at the time of crystallisation.

Taylor Platform, Beaver Lake 1:250 000 sheet area, northern Prince Charles Mountains.

Specimen 71280126 - plagioclase concentrate (from basaltic dyke of alkaline affinities that intrudes metamorphic basement).

Analytical data	%K	0.668, 0.670	% Atmospheric Ar^{40}: 51.2 Radiogenic $\frac{Ar^{40}}{K^{40}}$: 0.015373

Age 246 ± 6 million years (AMDEL Report AN 3480/75)

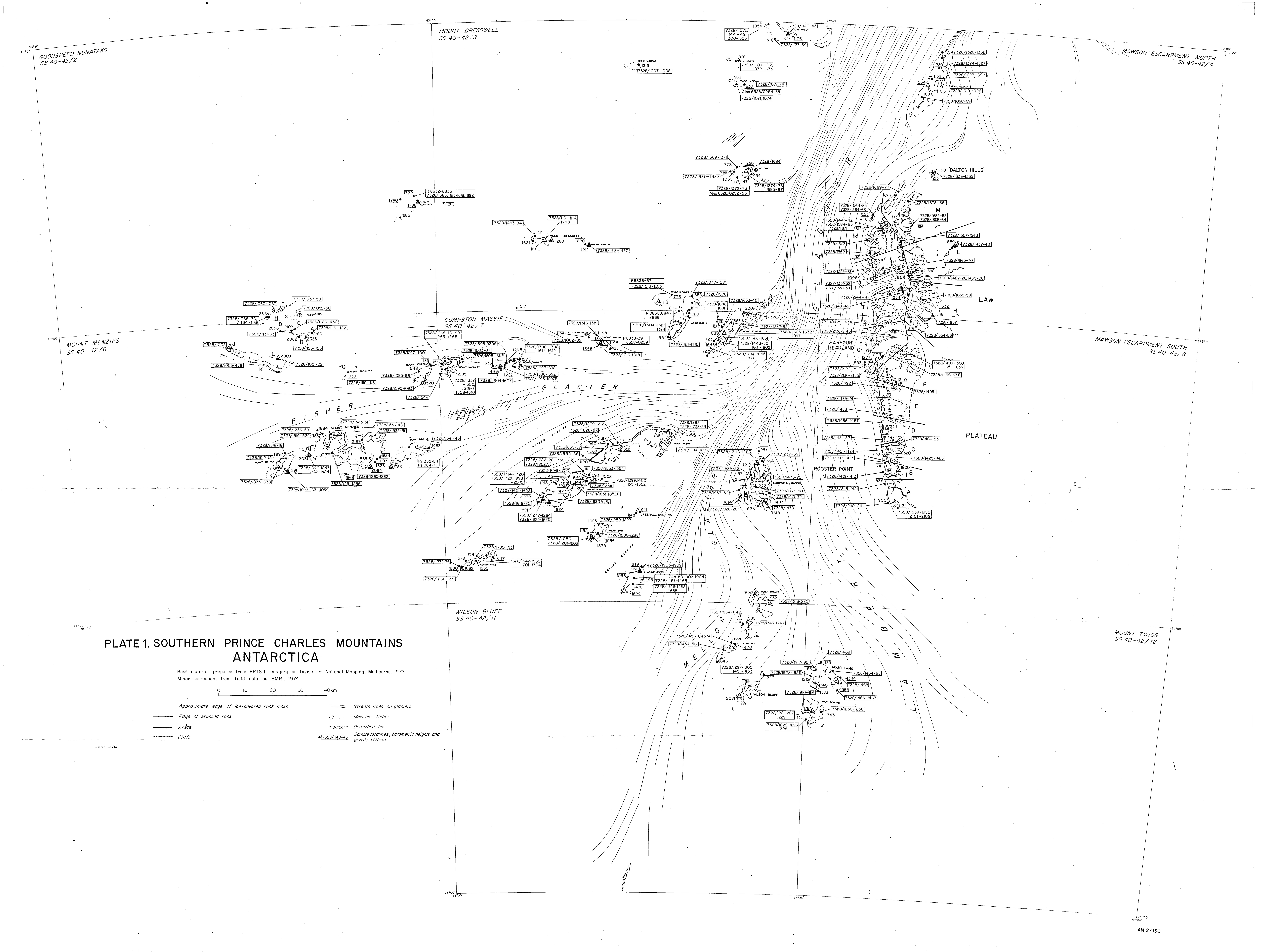


PLATE 1. SOUTHERN PRINCE CHARLES MOUNTAINS ANTARCTICA

Base material prepared from ERTS 1 Imagery by Division of National Mapping, Melbourne. 1973.
Minor corrections from field data by BMR, 1974.

0 10 20 30 40 km

PLATE 2. GEOLOGY OF THE SOUTHERN PRINCE CHARLES MOUNTAINS

AUSTRALIAN ANTARCTIC TERRITORY