# The Geology of the Nashornet – Viddalskollen Area, western Dronning Maud Land

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Geological investigation of the Nashornet-Viddalskollen area formed part of a detailed mapping programme carried out by the 12th South African National Antarctic Expedition during the summer of 1971 - 72.

A 390 m thick succession of feldspathic graywacke, siltstone and intraformational conglomerates, intruded by a 150 m thick differentiated mafic still of unknown age, is exposed. Metamorphic effects are limited to low-grade alterations as indicated by the development of chlorite and epidote. Minor occurrences of slate and phyllite were observed at the bottom contact of the sill. The sediments were derived from a granitic source area located to the west. The sequence has been divided on a lithological basis into two conformable members, both of which are correlated with the Pyramiden Formation on account of striking lithological and mineralogical similarities. Bedding planes dip 18° - 20°SE in the north and 22° - 25°ESE in the south. The predominant structural trends are N-S and NE-SW.

The differentiated sill has an olivine gabbroic basal part, a quartz-gabbroic to dioritic to syeno-granitic middle part and a gabbroic upper part.

*Geologiese ondersoek van die Nashornet-Viddalskollengebied het deel uitgemaak van 'n detailkarteringsprogram wat gedurende die somer van 1971 - 72 deur die 12de Suid-Afrikaanse Nasionale Antarktiese Ekspedisie uitgevoer is.*

*'n Opeenvolging van veldspatiese grouwak, sliksteen en intraformasionele konglomeraat van 390 m dik, binnegedring deur 'n gedifferensieerde mafiese plaat van onbekende ouderdom, 150 m dik, is blootgestel. Metamorfe effekte is beperk tot laegraadse veranderings, soos aangedui deur die ontwikkeling van chloriet en epidoot. Geringe voorkomste van leisteen en filliet is aan die onderste kontak van die intrusie waargeneem. Die sedimente het hul oorsprong in 'n granitiese brongebied in die weste. Die opeenvolging is op grond van litologiese oorwegings in twee konkordante lede verdeel. Albei word met die formasie Pyramiden gekorreleer op grond van treffende litologiese en mineralogiese ooreenkomste. Laagvlakke hel 18° - 20° SO in die noorde en 22° - 25°OSO in die suide. Die oorheersende strukturele rigtings is N-S en NO-SW.*

*Die gedifferensieerde plaat bestaan uit 'n olivien-gabbroïese basale deel, 'n kwarts-gabbroïese tot dioritiese tot siëno-granitiese middelste deel en 'n gabbroïese boonste deel.*

## Introduction

Detailed geological mapping was carried out in the Nashornet-Viddalskollen area by the 12th South African National Antarctic Expedition during November 1971. As base maps, 1:25 000 enlargements of the 1:250 000 map (Sheet G6) published by Norsk Polarinstitutt (1961) were used (Figs. 2a and 3a). In order to add to the limited amount of detail that can be fitted onto plans of this scale, side-view sketches of each nunatak were compiled from colour photographs (Figs. 2b and 3b).

The area comprises four nunataks (Nashornkalvane twins, Nashornet and Viddalskollen) which are situated on a north-east trending ridge at the confluence of the Viddalen and Jutulstraumen (Fig. 1). These nunataks are separated from the rest of the Ahlmannryggen by the 20 to 30 km wide north-east flowing Viddalen. Only 50 km to the east are the HU Sverdrupfjella consisting of Precambrian gneisses and schists of amphibolite facies.

The area was first visited by geologists of the Norwegian-British-Swedish Antarctic Expedition (*Roots*, 1953 and 1969) and subsequently by Russian expeditions (*Ravich & Soloviev*, 1966). No detailed information has, however, been published, nor have any maps been compiled of the individual nunataks.

The findings of previous investigators can be summarized briefly as follows:

### A. EF Roots

No attempt was made to assign the sediments to any of the established formations of the Ahlmannrygg Group and they are indicated on his map as "undifferentiated clastic rocks" belonging to the Ahlmannrygg Group. All the sedimentary rocks of the northern Ahlmannryggen were classified under this heading.

### B. MG Ravich & DS Soloviev

"In our opinion, the oldest formations exposed in the present-day erosional section include the sheets of greenstone rocks in the north-east of the region (Mount Utkinen and others) and *the grayish-greenish siltstones and argillites of Mount 'Widdalskollen' containing early Riphean Algae* of the Rifenites group and remains of Laminarites . . ." (author's italics). They further imply that these rocks are overlain by the Tindeklypa Formation (defined by *Neethling*, 1967) which in turn is overlain by sedimentary rocks of the Ahlmannrygg Group.

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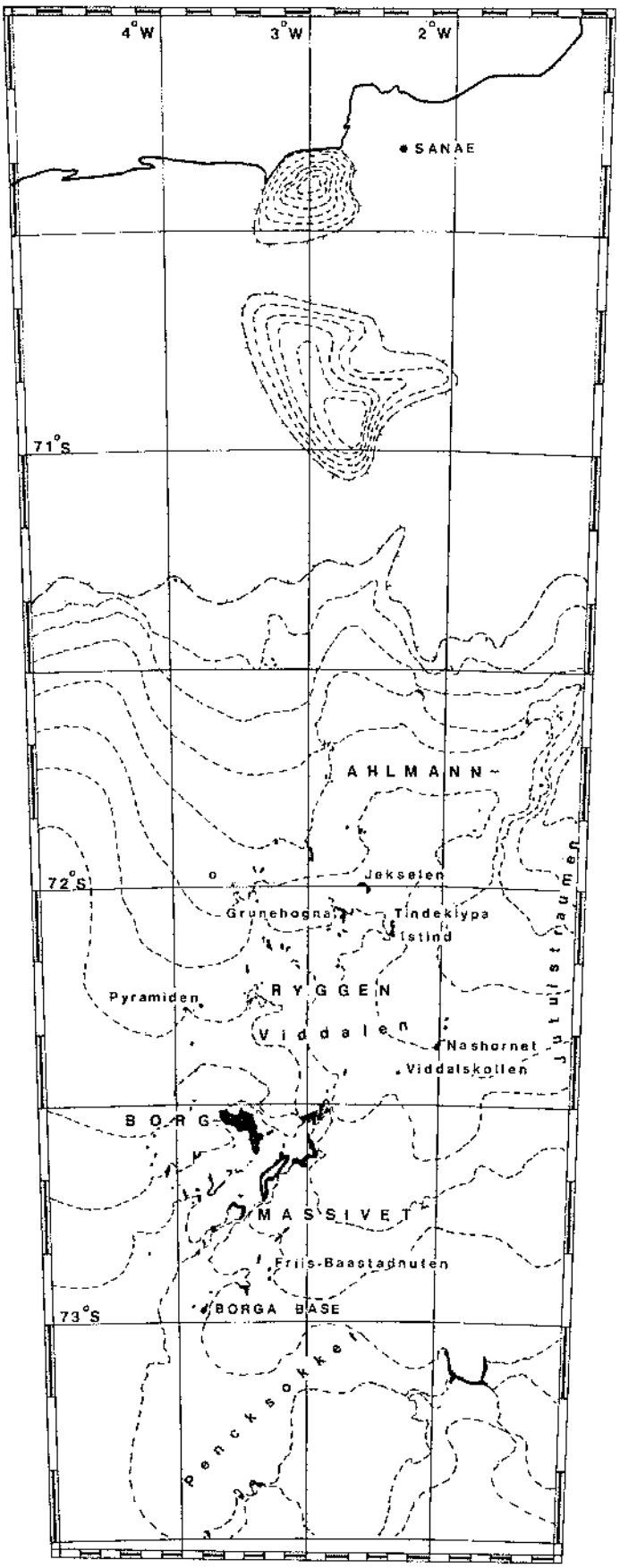



*Fig. 1. Locality map of area visited.*

C. DC Neethling (1970)

For some reason not mentioned in the text, Nashornet is indicated on his map as a type locality of the Trollkjellrygg Group which is a *volcanogenic* sequence.

From these divergent views, it is clear that there is a considerable amount of confusion about the age and correlation of the rocks in the Nashornet-Viddalskollen area. This can mostly be attributed to a lack of information about these isolated nunataks; it is hoped that the present investigation will cast light on some of the problematic relationships.

# The Sedimentary Sequence

The total exposed thickness of the sedimentary succession (disregarding the intrusive sill) is approximately 390 m. The sequence has been subdivided into two conformable members, *viz* a Lower Member and an Upper Member.

## Lower Member

LITHOLOGY

Rocks belonging to this member are best exposed at Nashornkalvane (peak 1016). This is the northernmost nunatak of the group and consists entirely of sediments (Fig. 2b). A succession of approximately 140 m of well-bedded, dark-brown weathered feldspathic graywacke and intercalated dark-green laminated siltstone is exposed. Individual beds vary in thickness from about 10 cm to 3 m and show very good lateral continuation. The following lithologically different types of graywackes were recognized: dark grey homogeneous; light grey homogeneous; dark grey with light grey spots and faint banding; and light grey with dark grey bands.

Light grey quartzite layers up to about 15 cm thick occur locally, but are not very persistent and pinch out laterally. Thin quartz veins and quartz joint fillings are abundant in the lower part of the succession. Only minor epidotization along joint planes was observed. Green copper carbonate staining is common throughout the succession, but is more conspicuous at the top of the nunatak. Small specks of disseminated chalcopyrite and pyrite occur in the graywacke, especially in the dark grey homogeneous type.

The scarcity of sedimentary structures and the complete absence of conglomerates are very characteristic of the Lower Member and also serve as the main criterion by which it can be distinguished from the Upper Member (Table 1). Ripple marks are very rare and only two examples were observed *in situ*. These are oscillation ripples and so symmetrical that the palaeocurrent direction can only be guessed:

(a) Strike of ripples: 62°
Palaeocurrent direction: NW to SE

(b) Strike of ripples: 07°
Palaeocurrent direction: W to E

Cross-bedding is also extremely rare and where present, it is so weakly developed that the determination of palaeocurrent directions is virtually impossible.

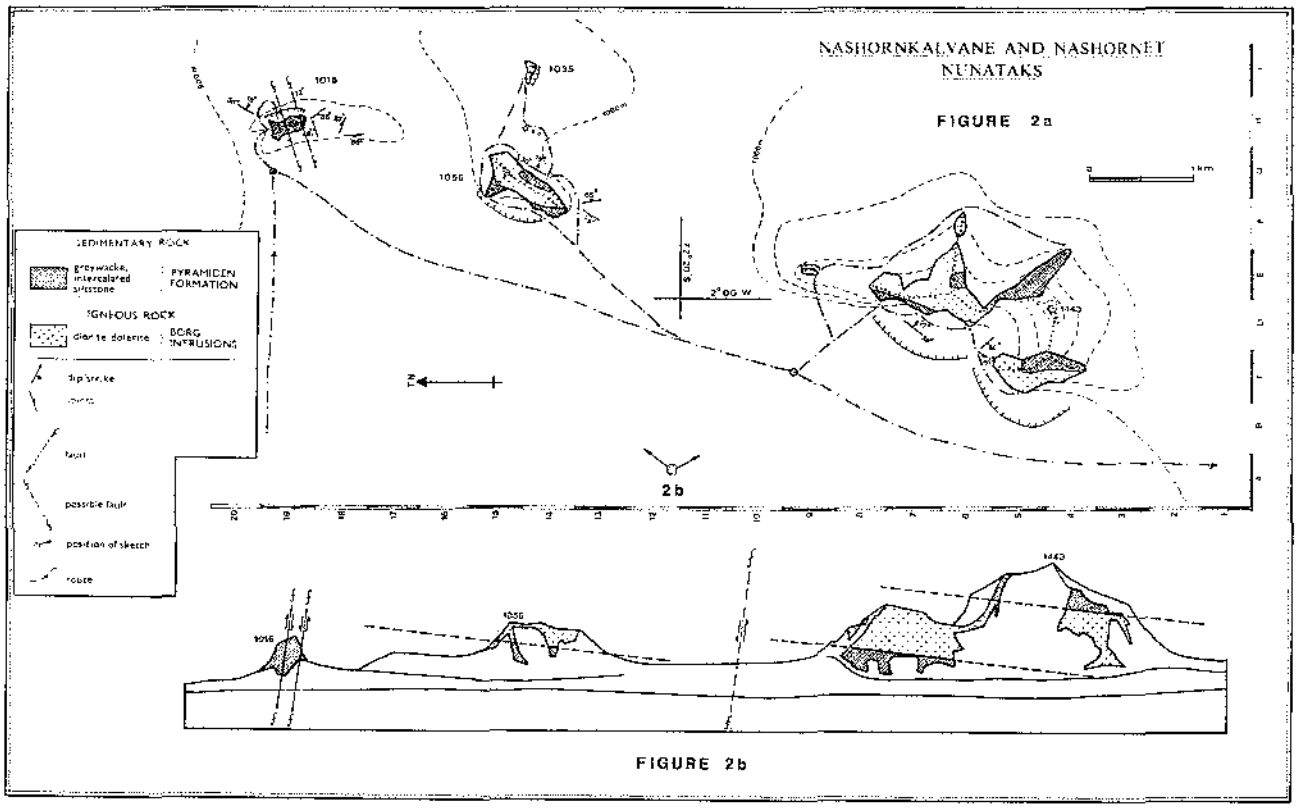



*Fig. 2. (a) Geological map and (b) side view of Nashornet.*

METAMORPHISM ON INTRUSIVE CONTACTS

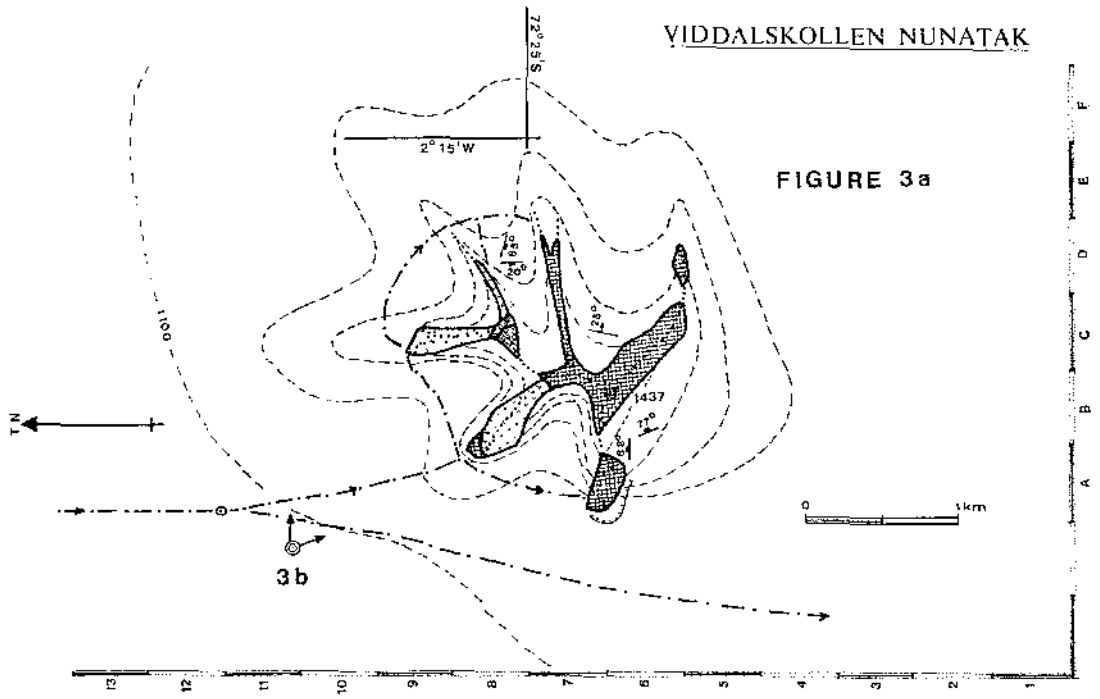
Where the Lower Member occurs in contact with the lower part of the sill, as at Nashornkalvane (peak 1056) and Nashornet (Fig. 2b), a definite zone of metamorphism was observed. For a distance of about 2 m from the contact, the siltstones have been changed into black slate and locally into dark-green phyllite. The latter has a silky lustre and often exhibits undulating schistosity. Well-developed pyrite crystals up to 2 mm long occur in the phyllite. Quartz veins, up to 30 cm thick, are abundant in this zone and usually occur along bedding planes in the slate. Well-developed cleavage is common, but no signs of metamorphism are noticeable in the graywackes, even where they occur in direct contact with the sill.

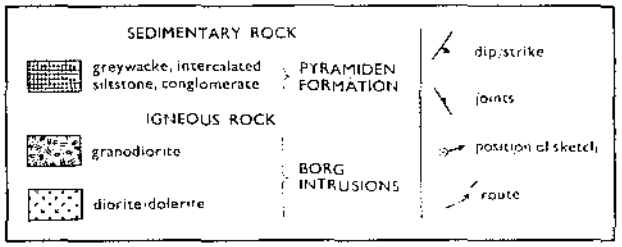
The extremely localized occurrence of the phyllites, together with the relatively undisturbed

**Table 1**

Lithological Subdivision of the Nashornet-Viddalskollen sedimentary sequence

| | Upper Member | Lower Member |
|---|---|---|
| Locality | On top of sill at Nashornet and Viddalskollen | Nashornkalvane and below sill at Nashornet and Viddalskollen |
| Distinctive lithological characteristics | 1. Conglomerates are abundant.<br>2. Mud-cracks are present.<br>3. Flow ripples are rare but do occur.<br>4. Cross-bedding well developed in in upper 80 m.<br>5. Laminated siltstone is rare and black shale occurs only low down in the succession.<br>6. No sulphides are present. | 1. No conglomerates of any kind.<br>2. No mud-cracks.<br>3. Only oscillation ripples.<br>4. Cross-bedding rare and poorly developed.<br>5. Intercalated laminated siltstone abundant.<br>6. Disseminated chalcopyrite and pyrite are present. |
| Conditions at time of deposition | High-energy conditions. Shallow water environment. | Low-energy conditions. Deeper water environment. |
| Approximate thickness (m) | 250 | 140 |



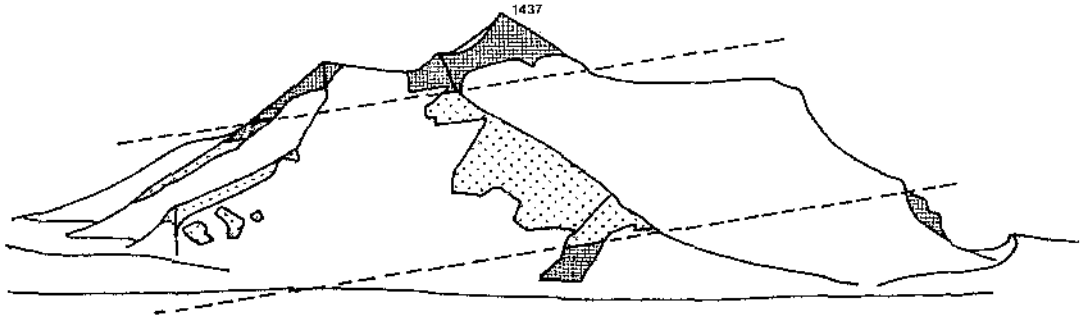




FIGURE 3b

*Fig. 3. (a) Geological map and (b) side view of Viddalskollen.*

nature of the sedimentary succession as a whole, is indicative of metamorphism caused by the combined effects of temperature and pressure during the intrusion of the sill, rather than of regional dynamothermal metamorphism.

### Upper Member

This member is exposed both at the southern side of Nashornet (Fig. 2b) and at Viddalskollen (Fig. 3b). The exposure is better at the latter locality where an approximately 250 m thick succession was investigated. The following sequence was established from the base up to the summit of peak 1437.

1. Dark grey graywacke and shale with intraformational mud-fragment conglomerates. Epidotization of the pebbles is common. Circular structures resembling "Rifenites" were found in this unit. Attitude of beds: 24°ESE/18°. 2 m

2. Dark grey graywacke with flat green chert pebbles up to 6 cm long. 2 m

3. Dark grey graywacke and intraformational mud-fragment conglomerate beds up to 15 cm thick. 2 m

4. Dark homogeneous graywacke with occasional flat chert and black slate pebbles. 50 m

5. Alternating dark homogeneous and banded graywacke with intercalated siltstone. The banded graywacke is often epidotized and quartz-epidote veins are common. Closed joints (strike 17°) crossed by an open joint system (strike 142°) often occur on exposed bedding planes. Polygons up to 15 cm in diameter bounded by mud-cracks are abundant. Flow ripples are rare. Ripples strike 344°; palaeocurrent direction west to east. 100 m

6. Coarse-grained epidotized graywacke containing conglomerate beds about 10 cm thick. The pebbles are black slate and white-vein quartz, fairly well rounded and up to 2 cm in diameter. 2 m

7. Dark grey graywacke with occasional inclusions of mudstone fragments. 10 m

8. Thin mud-fragment conglomerate beds in dark grey graywacke. Cross-bedding units up to 1 m thick are conspicuous. 40 m

9. The same as 6. 1 m

10. Dark-grey epidotized banded graywacke with occasional inclusions of flat mudstone fragments. Cross-bedding is abundant. Attitude of beds: 25°ESE/14°. 40 m

249 m

The main difference between this sequence and the Lower Member is the relative abundance of sedimentary structures and the presence of conglomerates.

## Petrology and Classification

According to Pettijohn's classification (1957), the arenaceous sediments of the Lower and Upper Members fall within the feldspathic graywacke field (Fig. 4).

Apart from the quartz, feldspar and matrix, there is also a small percentage of rock fragments. The relative sizes of the small triangles in the QFM diagram give an indication of the percentage of rock fragments in each sample. Sorting is poor and maximum grain sizes range from 0,1 mm for rock fragments to 0,2 mm for quartz and feldspar. The feldspar is mostly untwinned albite, but a few clasts with albite twinning were observed. All have more or less the same composition ($An_2$–$An_{10}$).

Apart from chlorite, which forms most of the matrix, the following accessories were observed: calcite, augite, actinolite, muscovite, epidote, chert and pyrite (in rocks of the Lower Member). The flaky chlorite crystals often penetrate the quartz grains. All the quartz and feldspar grains are angular.

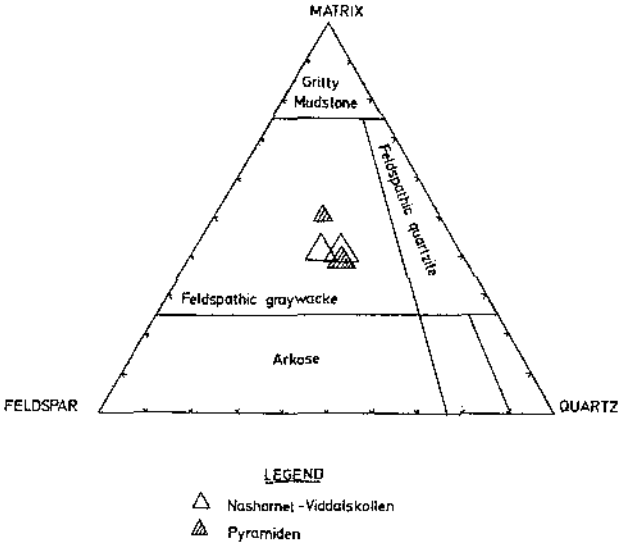



*Fig. 4. Triangular diagram (after Pettijohn) showing volumetric composition of Nasharnet - Viddalskollen arenites in relation to that of arenites from Pyramiden. Relative sizes of small triangles indicate the amount of lithic fragments present in each case.*

## Depositional Conditions

Deposition in the area may have started with filling of a deep basin under low-energy conditions. The presence of sulphides in the Lower Member is indicative of reducing conditions in deep water. The basin gradually filled up and in the later stages periodical drying out and subsequent flooding took place. The Upper Member was deposited under these conditions of increased energy.

The sediments most probably originated from a granitic provenance located to the west. This can be deduced from the high percentage of angular quartz and albite ($An_2$–$An_{10}$) grains and the palaeocurrent direction which is predominantly from the west.

## Regional Correlation

The sedimentary succession is correlated with the Pyramiden Formation on account of striking lithological and mineralogical similarities. Comparisons have been made from hand specimens, personal investigation of the Pyramiden Formation at the type locality, lithological descriptions by previous geologists (*Pollak*, 1966; *Neethling, Kingsley & Aucamp*, 1968) and from thin section studies.

LITHOLOGY

Distinctive lithological features common to the Nashornet-Viddalskollen sediments and the Pyramiden Formation are:

(a) The rock types are mainly feldspathic graywacke, siltstone and intercalated dark shaly layers.
(b) Scarcity of sedimentary structures.
(c) Presence of chalcopyrite and pyrite.
(d) Occurrence of monomict flat-pebble conglomerates with local epidotization of the pebbles.
(e) Presence of chert.
(f) Occurrence of light-coloured quartzite bands.

PETROLOGY

The common features are:

(a) Arenaceous rocks from both localities (Pyramiden and Nashornet) fall within the feldspathic graywacke field (Fig. 4).
(b) The Ca content of the plagioclase grains is virtually the same ($An_{4-10}$ for Pyramiden rocks and $An_{2-10}$ for Nashornet rocks).
(c) Chlorite is the most abundant ferromagnesian mineral and occurs as flaky crystals in the matrix.
(d) Both contain the same accessories: calcite, augite, actinolite, muscovite, epidote and chert.
(e) Rocks from both localities have been subjected to greenschist facies metamorphism (Barrovian type facies series according to *Winkler*, 1967). They most probably belong to the quartz-albite-muscovite-chlorite subfacies.
(f) Maximum grain sizes in the graywackes are on the average 0,2 mm for the feldspar grains and 0,3 mm for the quartz and chert grains (Pyramiden); and 0,1 mm for chert and 0,2 mm for quartz and feldspar (Nashornet).
(g) Poor sorting and rounding of the grains are characteristic.
(h) The material for both successions was derived from a granitic source. Actual pebbles of granite were observed in rocks of the Pyramiden Formation.

Modal analyses were done on four representative arenaceous samples from Nashornet and Pyramiden (Table 2). On each thin section, 1 000 counts were made, using a Swift point-counter. The area covered on each section was approximately 100 $mm^2$. The data were plotted on a QFM diagram for comparison (Fig. 4). As can be seen from the relative sizes of the small triangles, the rocks from Pyramiden contain a few per cent more rock fragments than those from Nashornet.

# The Mafic Sill

## Lithology and Petrology

A differentiated mafic sill, approximately 150 m thick, cuts concordantly through the sedimentary succession and is exposed at the three southernmost nunataks. The lower and upper contacts are exposed at Nashornet and Viddalskollen nunataks (Figs. 2b and 3b).

In general, the rock is medium-grained, except for a 2 to 3 m thick fine-grained chill zone along the bottom contact. Rotated xenoliths up to 15 cm long of sedimentary rock were observed near the base of the sill at Nashornet. Green copper carbonate staining and specks of chalcopyrite are quite abundant locally.

The lower 10-15 m of the sill is ultramafic and contains up to about 36 modal per cent olivine. The latter usually occurs as oval to roundish crystals poikilitically enclosed in large plates of diallage. The cracks in the olivine are filled with serpentine. Other minerals in this zone are brown hornblende, plagioclase, epidote and chlorite. Unfortunately the plagioclase in all the thin sections investigated is saussuritized to such a degree that determination of the anorthite content is impossible.

About 30 m from the base of the sill, olivine disappears completely and, except for the presence of small quantities of quartz, the other mineral components are the same. The hornblende is of the green pleochroic variety.

The rock becomes highly siliceous at about 30 m from the top of the sill where about 38 modal per cent quartz was detected. Most of this quartz occurs as granophyric intergrowths with alkali feldspar. The only ferromagnesian minerals are hornblende and diopside which constitute about eight per cent of the total composition.

The upper 15-20 m of the sill is more mafic than the zone just below and consists of hornblende

**Table 2**

Volumetric composition of arenaceous rocks from Nashornet and Pyramiden

| Locality | Nashornet | | Pyramiden | |
|---|---|---|---|---|
| Sample | $(N)^{H19}/_{G2}$ | $(N)^{D7}/_{G14}$ | $(P)^{J14}/_{G1}$ | $(P)^{J14}/_{G3}$ |
| Quartz | 22,5 | 31,3 | 28,9 | 24,5 |
| Feldspar | 24,7 | 29,2 | 23,3 | 28,1 |
| Matrix | 49,3 | 37,4 | 37,9 | 38,8 |
| Rock fragments | 3,2 | 1,6 | 8,8 | 8,0 |
| Opaque | 0,3 | 0,5 | 1,1 | 0,6 |
| I.C. | 126 | 129 | 109 | 114 |

needles in a matrix of epidote, chlorite, muscovite, quartz and altered feldspar. In hand specimen this rock closely resembles the middle part of the Jekselen sill (*Bredell & Paterson*, 1972). The needle-like crystals in the latter case are, however, augite-pigeonite and not hornblende.

## Composition, Correlation and Age

Model analyses were carried out on 5 samples taken at approximately 30 m intervals from bottom to top of the sill (Table 3). On each thin section, 1 000 counts were made over an area of approximately 100 mm² using a Swift automatic point-counter. In spite of the limited number of samples investigated, the differentiation trend of the sill as a whole is clearly illustrated when the results are plotted on a mafic minerals-feldspar-quartz triangle (Fig. 5).

The composition of the sill varies from olivine-gabbroic in the basal part to gabbroic at the top. The middle part varies in composition from quartz-gabbroic to dioritic to syeno-granitic. There is therefore a significant difference in composition between this sill and the Borg Intrusions which are doleritic to quartz-doleritic and dioritic in composition (*Neethling*, 1970). If the differentiated sill from Jekselen (Borg Intrusions) is compared with the Nashornet-Viddalskollen sill on the triangle in Fig. 5, it can be seen that the Jekselen sill contains less than 50% mafic minerals, while 4 out of the 5 samples from the Nashornet sill have a mafic mineral content of more than 50%. Three samples from sills in the rest of the Ahlmannryggen (Grunehogna and Ovenuten) were analysed for their mafic mineral-feldspar-quartz content and it was found that they also contain more than more than 50% mafic minerals.

Although no definite conclusions can be drawn from this preliminary study there does seem to be a significant mineralogical difference between the Jekselen sill and the sills further south in the Ahlmannryggen (including Nashornet and Viddalskollen). The age of the sill at Jekselen was determined as 1 700 ± 130 m.y. (*Allsopp & Neethling*, 1970), but until recently no absolute ages have been obtained from mafic sills from the southern Ahlmannryggen and Borgmassivet. There is a strong possibility that these undated sills differ in age from the Jekselen sill. A late Precambrian age of 1 030 ± 70 m.y. (the age of the Jorgen Intrusions - *Allsopp & Neethling*, 1970) has been proposed by *Bredell & Paterson* (1972). Four new $^{40}Ar/^{39}Ar$ datings from the Ahlmannryggen were received in March 1973 (Geological Dating Services, geochronological report No. FMK 1112). The results from these spectra differ from the Rb/Sr ages but they support the abovementioned proposal. A minimum age of 1 339 ± 55 m.y. was obtained from intrusives at Jekselen, while minimum ages of 832 ± 2 m.y. and 924 ± 4 m.y. were obtained from sills at Grunehogna and Ytstenut respectively. The latter age is considered by the analysts to be very close to the age of intrusion. The Nashornet-Viddalskollen sill is also provisionally included in this younger intrusive episode.

**Table 3**

Volumetric composition of samples from the Nashornet – Viddalskollen sill in comparison with sills at Jekselen, Grunehogna and Ovenuten

| Locality | Nashornet-Viddalskollen | | | | | Jekselen | | | | | Grune-hogna | Ovenuten |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample | (V)$^{D9}/_{G1}$ | (N)$^{F14}/_{a1}$ | (N)$^{114}/_{G12}$ | (V)$^{D8}/_{a1}$ | (N)$^{G15}/_{G10}$ | (J)$^{H4}/_{G1}$ | (J)$^{H5}/_{G4}$ | (J)$^{13}/_{G7}$ | (J)$^{G4}/_{G45}$ | (J)$^{B18}/_{G29}$ | (J)$^{13}/_{\alpha 2c}$ | (G)$^{F11}/_{G24}$ | (O)$^{D10}/_{G2}$ |
| Olivine | 35,7 | — | — | — | — | — | — | — | — | — | — | — | — |
| Clinopyroxene | 35,4 | 34,4 | 20,4 | 1,0 | 6,7 | 8,1 | 16,8 | 26,2 | 32,1 | 34,4 | 20,6 | 49,5 | 55,6 |
| Orthopyroxene | — | — | — | — | — | 2,1 | 3,5 | — | — | — | — | — | — |
| Amphibole | 6,2 | 27,0 | 17,5 | 6,8 | 40,6 | 1,3 | 5,8 | — | — | — | — | — | — |
| Plagioclase | 17,4 | 7,6 | 26,4 | 14,1 | 18,6 | 12,5 | 7,6 | 21,0 | 23,4 | 35,4 | 46,7 | 37,5 | 39,4 |
| Alkali feldspar | — | — | — | 26,2 | 6,1 | 33,6 | 9,7 | 10,3 | 4,4 | — | — | — | — |
| Quartz | — | 16,0 | 12,2 | 37,8 | 13,5 | 27,2 | 16,7 | 16,0 | 12,2 | 4,4 | 9,1 | 10,3 | 8,8 |
| Opaque | 2,8 | 1,0 | 7,2 | 0,6 | — | 3,3 | 5,3 | — | 5,7 | 1,7 | — | — | — |
| Matrix | 2,5 | 14,0 | 16,3 | 13,5 | 14,5 | 11,7 | 34,7 | 26,6 | 22,4 | 24,2 | 23,8 | 2,7 | — |
| I.C. | 74 | 97 | 103 | 119 | 117 | 75 | 100 | 112 | 102 | 82 | 96 | — | — |

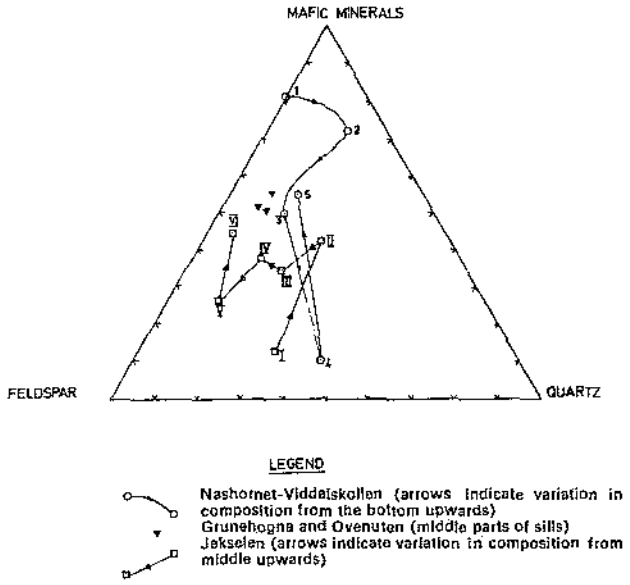



*Fig. 5. Triangular diagram (after Pettijohn) showing differentiation of the Nashornet - Viddalskollen sill and its volumetric composition in relation to sills in other parts of the Ahlmannryggen.*

## Structure

### Faults

No large-scale faulting was observed. The only faults found in outcrop were two parallel normal faults striking ENE-WSW which cut through the central and southern part of nunatak 1016 at Nashornkalvane (Fig. 2a and 2b). The fault planes dip 80°N and total displacement is only about 2 m. Slight monoclinal folding occurs on the downthrow side of the northernmost fault.

### Dip of Strata

The general dip of the sedimentary succession is between 18° and 25° ESE. A very slight change in the attitude of the beds was observed going from north to south along the nunatak range. In the northern part (Nashornkalvane) the shallowest dips were encountered (18°20°) and the direction of dip is more south-easterly (strike 30°-42°). Towards the south the dips get steeper and the strike changes to 14°-18°. The steepest dips (24°-25° ESE) were measured in the extreme south of the range at Viddalskollen. Local deformation along intrusive contacts causes dips to increase to as much as 45°.

### Joints

Joints are well-developed in the entire area both in sedimentary rock and in the mafic sill. A total of 65 joint measurements were taken and plotted on a rose diagram (Fig. 6). Although the number of measurements is limited, three prominent joint directions are revealed, *viz* approximately N-S, NE-SW, and E-W. The N-S trend seems to be the best developed and corresponds with the strike direction of the Jutulstraumen in this area. The NE-SW trend is displayed by the strike direction of the Viddalen. Both these glaciers are believed to follow lines of intense preglacial tectonic activity. These two trends also correspond with two of the three major structural trends recognized for the Ahlmannryggen (*Neethling*, 1970). The E-W direction appears to be more localized and coincides with the strike direction of the two parallel faults in the northern part of the area.

## Conclusions

The sedimentary succession in the area consists of 390 m of feldspathic graywacke and siltstone which were derived from a granitic source area located to the west. Deposition took place in a rapidly filled basin which resulted in the formation of a lower deep-water and a upper shallow-water member.

The succession as a whole is correlated with the Pyramiden Formation on account of striking lithological and mineralogical similarities. The position of the Pyramiden Formation within the Ahlmannrygg Group has not been established beyond doubt, but it is provisionally believed to be the lowest exposed formation of the Group (*Neethling*, 1970).

However, the above-mentioned correlation is contradicted by the presence of algal fossils of Riphean age (680-440 m.y.) as reported by Russian expeditions (*Ravich & Soloviev*, 1966). The age of the Ahlmannrygg Group as defined by Neethling, is older than 1 700 m.y., the age of the Borg Intrusions (*Allsopp & Neethling*, 1970).

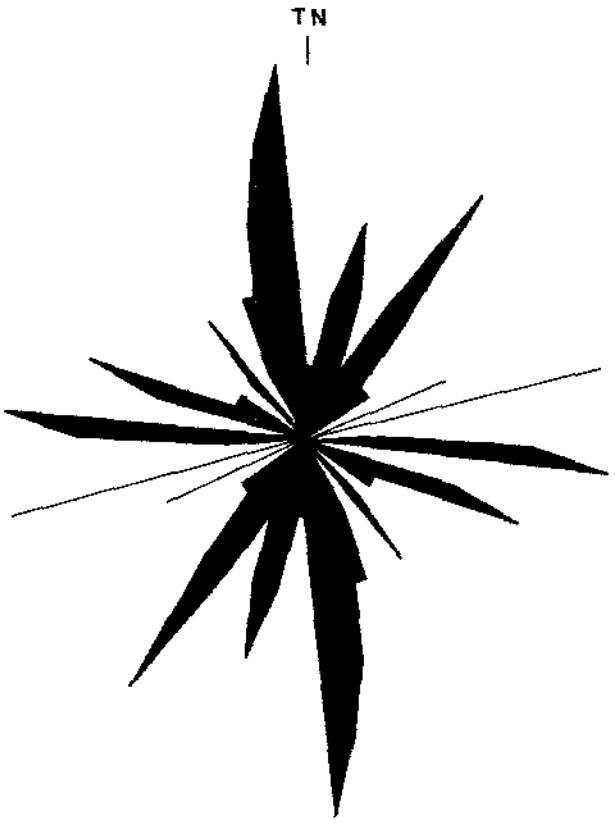



*Fig. 6. Rose diagram of joints.*

This controversy about the age of the sedimtary rocks will only be settled if absolute age determinations can be obtained from the differentiated mafic sill which is intrusive into the succession at Nashornet and Viddalskollen. Even then, the seemingly insurmountable problem of long-distance correlation between exposures at isolated nunataks and the absence of marker horizons and conclusive fossil evidence will still cause uncertainty about the stratigraphic column of this part of Dronning Maud Land.

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