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THE GEOLOGY OF DRONNING LOUISE LAND N. E. GREENLAND

BY

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WITH 9 FIGURES IN THE TEXT AND 1 PLATE

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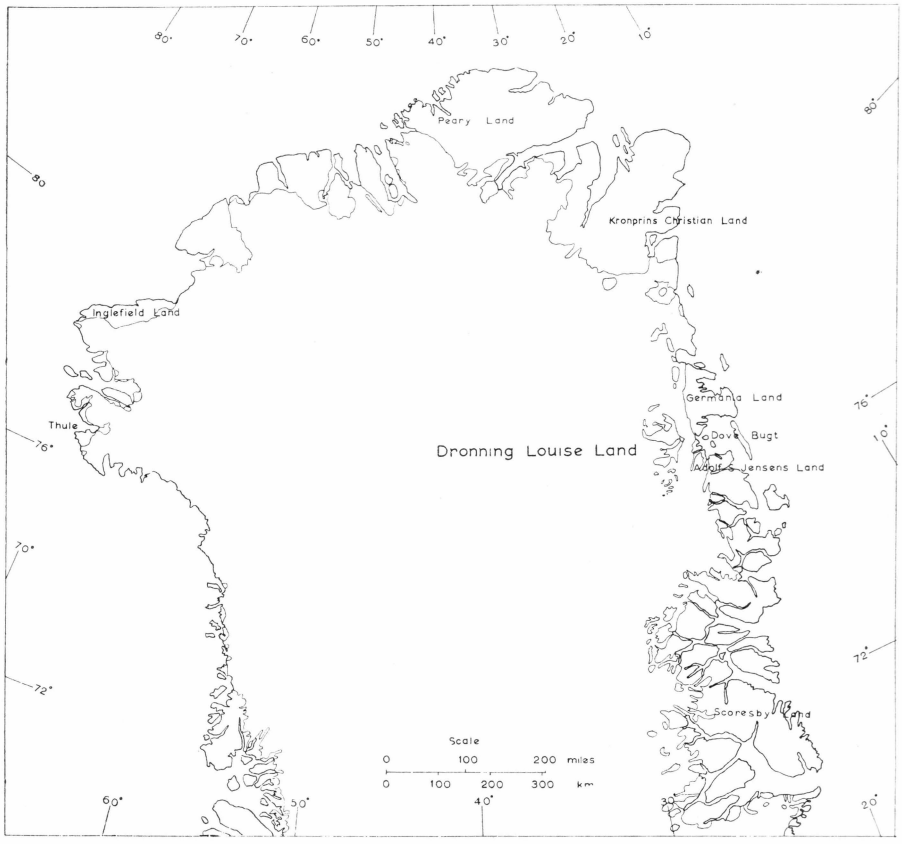


Fig. 1. Location of Dronning Louise Land, North-east Greenland.

1. INTRODUCTION

The purpose of this paper is to furnish an outline of the geology of Dronning Louise Land. Various aspects of the work will be treated in greater detail in subsequent reports.

The field studies on which this account is largely based were carried out in the period from September 1952 to July 1954. During the first year, the author worked with Mr. P. J. WYLLIE, and attention was concentrated on traverses of the Budolfi Isström, Borgjökel, and Admiralty Gletscher, together with work in the neighbourhood of Britannia Sö. In the second year WYLLIE, assisted mainly by Lt. ANGUS ERSKINE, R. N., extended the reconnaissance southwards to the southern nunataks of Dronning Louise Land, and northwards to Ymer Nunatak. The ground covered in the first year was consolidated by an extra traverse and visits to specific localities. A visit was also paid to Sælsöen in Germania Land. The author carried out the petrographic determinations which form a background to parts of this account, and is responsible for all opinions expressed herein.

The geological sketch-map is based on the most recent topographical sketch supplied by the Danish Geodetic Institute.

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2. POSITION AND TOPOGRAPHY

Dronning Louise Land is situated near the east coast of Greenland, and comprises the land masses and nunataks between latitudes 75 degrees north and 77 degrees 30 minutes north, and longitudes 23 degrees west and 27 degrees west. Thus it lies about midway between the intensively studied Fjord region of East Greenland, and the less well known Peary and Kronprins Christian Lands. It is separated by about 20 miles of ice (L. Bistrup Bræ and Storströmmen) from Dove Bugt and the neighbouring coastal regions of Germania Land and Adolf S. Jensen Land.

The main mass of Dronning Louise Land is some 70 miles long from north to south and up to 35 miles across. Southwards, the amount of ice-free land diminishes and is cut up into small nunataks before the Inland Ice proper is reached. To the west, the last land is a line of four or five widely-spaced nunataks running north to south approximately along 27 degrees west longitude, parallel to the mountain wall of the major land mass. The northern approach to Dronning Louise Land is guarded by Ymer Nunatak.

The relief of Dronning Louise Land is moulded from one or more morphological surfaces, now considerably dissected by the various agents of erosion. The degree of dissection varies, but is generally greater in the west, with the formation of a N.N.E. to S.S.W. trending mountain range.

This single or composite surface is most marked in the area extending from the north side of the Borgjökel to the land areas south of A. B. Drachmann Gletscher. The land surface rises here from almost sea-level near the snout of the Borgjökel to approximately 1.000 metres on the mid-meridian (25 degrees west) of Dronning Louise Land, taking the form of gently rolling hills interrupted only by glacial trenches and deep river gorges.

Westward from the central meridian, the surface appears to rise rather rapidly to about 1300 metres, a state of affairs which is most obvious in the region north and south of the middle Budolfi Isström. The highest peaks on the west side of Dronning Louise Land, which reach

some 2,700 metres in height, are formed from the rising morphological surface. With the increasing height the range of relief becomes greater, and in the south-west the dissection results in chunky mountain masses and nunataks, and finally alpine peaks. Northward from Revaltoppe, alpine peaks are rare, and the mountains take the form of rolling fells with a considerable relief-range.

The land is trenched by four eastward flowing glaciers which originate in the Inland Ice—from north to south the Admiralty Gletscher, Borgjökel, Budolfi Isström, and A. B. Drachmann Gletscher. In addition, a glacier flows eastward from the ice-shed in the ice-bay between Revaltoppen and the nunataks centred on Kaldbakur. The Budolfi Isström and A. B. Drachmann Gletscher join the northward-flowing L. Bistrup Bræ to the east of Dronning Louise Land, but the other three glaciers terminate within the land area.

In the north, the Britannia Gletscher runs southward as an offshoot from Storströmmen into Britannia Sö, and together with the small glacier flowing south between Splinten and Juel-Brockdorff Bjerg, takes a smaller contribution from the Inland Ice.

At some points the Inland Ice is, as it were, banked up against the western mountains, and a number of glaciers rise from this local feature rather than from the main ice sheet. Examples are the glaciers to the north and south of Prinsessen. Apart from the Inland Ice, a number of small local icecaps are scattered on high ground, but none of these contribute large glaciers.

The solid geology of much of the lower ground is masked by extensive glacial and fluvioglacial deposits. On higher ground there is a cover of frost-shattered debris composed often of glacial material together with country rock not far from outcrop, and steep slopes may be partially mantled in scree. Except for occasional rock ribs projecting through this mantle, extensive outcrops are confined to the steep sides of glacial valleys. The cliffs overlooking the west to east running glaciers offer good though discontinuous cross-sections of the geology.

3. PREVIOUS WORK

Only two expeditions have hitherto set foot upon Dronning Louise Land. In March 1910 a party from the Danmark Expedition including ALFRED WEGENER as geologist crossed Storströmmen and spent a short time at Kap Bellevue. It is recorded that the party returned to its base with numerous geological specimens. Later in the same year, another small group under J. P. KOCH visited the extreme east end of Ymer Nunatak, but only glaciological work is mentioned in the accounts. (G. AMDRUP 1913, J. P. KOCH and A. WEGENER 1916).

During 1913, J. P. KOCH and A. WEGENER passed through part of Dronning Louise Land before setting out on their journey across the Greenland icecap. Their route lay along the lower Borgjökel, and thence through Farimagdal and up the Kursbræ to the nunatak Kaldbakur. Their observations deal chiefly with geomorphology and glaciology along the route, but notes were made on the solid geology of the western nunataks and several specimens collected from these.

To quote (KOCH and WEGENER 1930 p. 106):—

"Die beiden westlichsten Nunatakker, die wir trafen, wurden von uns nicht näher besucht. Dagegen betraten wir die Falkonerklippe. Ihr unterster Teil, den wir aber nicht aus der Nähe sahen, besteht aus braunen Sandsteinen anscheinend ähnlicher Art wie bei Kaldbakur. Die obere tafelförmige Teil, den wir über eine Schnee-wehe bestiegen, ist aus mächtigen Bänken eines aus der Ferne fast weissen, aus der Nähe meist schwach rosa gefärbten Kalkes (actually non-calciferous sandstone)[1]) aufgebaut, der hin und wieder dünne, prächtig violett und grün gefärbte Zwischenschichten aus Tonschiefer aufweist. Alles liegt in nahezu horizontaler Lage. Leider war keine Spur von Fossilien zu entdecken."

According to L. KOCH 1929, the specimens of slates examined by him show signs of pressure.

An unsuccessful attempt was made to ascend the nunatak Kaldbakur. It was observed to be composed of similar flat-lying brown sandstone to

[1]) L. KOCH 1929 p. 52 et seq.

that found at Falkonerklippe, together with dark intrusives. (Diabase according to L. Koch).

From the moraine on the south-east side of Kaldbakur samples of sandstone, quartz conglomerate and diabase were obtained. Ripple marks and false bedding were observed in morainic boulders. Viewed from a distance, the nunataks to the south of the route appeared to be made of sediments, while Revaltoppe and Sankt Vitus Bjerg were formed of gneiss. The Gefiontinder appeared to be built of gneiss penetrated by numerous dykes.

L. Koch ascribes the sediments to either the Thule Formation of North Greenland, or the Eleanore Bay Formation of East Greenland. (1929 p. 52).

4. STRATIGRAPHY

The rock groups occurring in Dronning Louise Land are tabulated on p. 37 and their distribution can be observed from the map.

Western Gneisses.

Budolfi Isström and South-west Dronning Louise Land.

The alpine ridges and steep cliffs overlooking the glaciers here offer good sections through the ground occupied by this rock group. In brief, the Western Gneisses may be described as a complex of granitic, augen, and flaser gneisses with subsidiary basic granulitic gneiss. Quartzites and schists of possibly sedimentary origin are rare.

Granitic gneisses are widespread and important, and may take the following forms:—

1) Coarse-grained non-foliate granite-like rocks. These are petrographically variable, ranging from granite to quartz-diorite in composition. The rocks occur either as apparently uniform masses with intrusive or gradational boundaries, or as bands of slightly different mineralogies, which, though distinctive from a distance, may be impossible to separate at close quarters from neighbouring rocks.

   Good examples of the more uniform granitic rocks outcrop at St. Andrews Klippe, where two granitic bodies can be seen. One is a biotite granite composed of perthitic microcline and quartz together with accessory plagioclase and biotite. Megascopically it is a grey rock, often foliated, and grading laterally into augen gneiss. The other is a hornblende adamellite (plagioclase, perthitic microcline, quartz, hornblende) of more uniform appearance but grading laterally into belts of crush with medium and fine grained augen gneisses.

   The margin of the adamellite cuts the granite, and there is a concentration of biotite and hornblende at the contact. Rocks similar to the adamellite occur at the nunatak Kamæleon a few miles to the W.N.W. and are probably part of the same body.

2) Foliated granite gneiss. As before, the composition of these rocks is variable.

Banded gneisses, with the bands marked by more or less biotite, occur as components of the complex, particularly in the region of the upper Budolfi Isström. In places the bands are strongly folded, and the biotite-bearing bands may splay out against those composed of quartz and feldspar.

At Kamæleon, there is a small outcrop of big-feldspar gneiss which differs from the other augen gneisses to be described in that it is porphyroblastic. It contains antiperthitic oligoclase and subsidiary hornblende, and thus in some ways provides a link between the foliate and non-foliate rocks in the complex.

3) Augen and flaser gneisses. On the Budolfi Isström, rocks of this type seem to be most widespread east of St. Andrews Klippe. From a distance they may be uniform in appearance and indistinguishable from the uniform granitic rocks previously mentioned, but at other points banding can be seen. In hand specimen they exhibit a distinct schistosity, and under the microscope show augen of microcline up two centimetres across, together with smaller plagioclase augen, both set in winding trails of quartz, epidote and micas.

4) Aplites. These are associated with the granite-like rocks. They are usually grey fine-grained rocks composed of quartz, plagioclase, microline, with small proportions of dark minerals, mainly chlorite. More than one generation can be recognized.

5) Pegmatites in small quantity occur as veins or blebs in most of the rocks of the complex, but become more important where there are outcrops of basic granulitic gneiss. In most cases the pegmatites are composed almost entirely of grey feldspar and quartz, but sometimes a little calcite may occur in drusy cavities.

Basic granulitic gneiss as mentioned above is a widespread but subsidiary component of the complex. It generally shows sharp boundaries against surrounding rocks, but contacts may also be gradational. There seem to be two types of occurrence. In the first, the basic gneiss is seen as flat bands or lenticles alternating with granitic rocks. In the second, very thick bands of the dark gneiss are cut by irregularly anastomosing veins of white granite or pegmatite, these pegmatites being sometimes zoned. From a distance, the thick dark bands may simulate basic intrusions, and can often be seen to be subparallel to the foliation of the neighbouring gneiss. (Fig. 2).

The granulitic gneiss is coarse to fine grained. The dark minerals are commonly hornblende and biotite, but augite is more important in

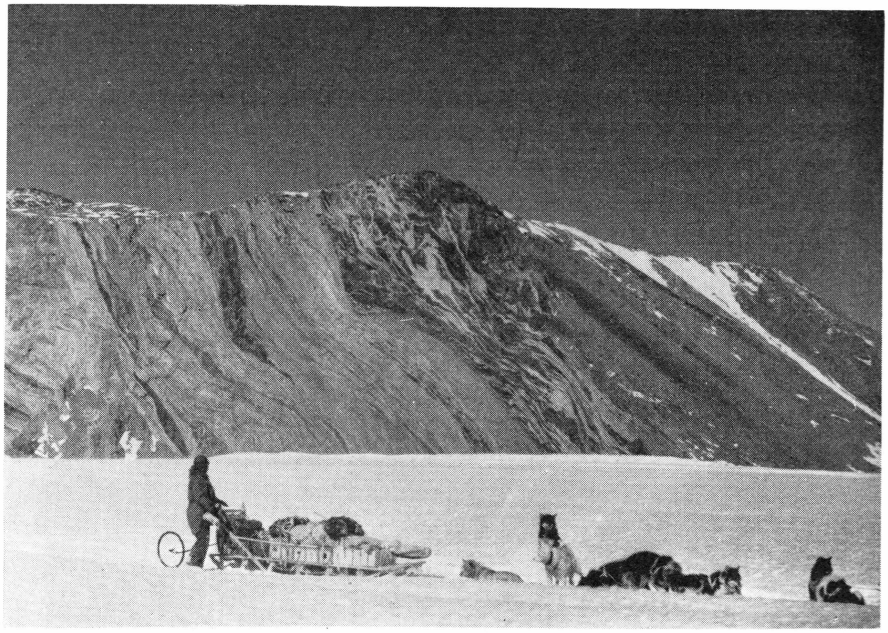


Fig. 2. Basic granulitic gneiss cut by irregularly anastomosing veins of granite and pegmatite. Budolfi Isström.

the west. The feldspar is mainly labradorite, but microcline also occurs. The structure may be schistose, foliate, or massive. A specimen of basic gneiss obtained about midway between Durham Klippe and St. Andrews Klippe showed epidotised feldspar, and tremolite in addition to brown hornblende.

Schists are not of great importance. At St. Andrews Klippe a banded series 200 metres thick separates two masses of hornblende-adamellite, which grade into it by way of augen gneiss. The schist series is made up chiefly of chloritic schists with small eyes of bluish quartz and pearly feldspar. Some parts are richer in biotite or magnetite, and there are some blebs of pegmatite containing calcite. Though at close quarters the schists appear parallel-banded, at a greater distance lenticular forms can be seen in cross-section.

Quartzites were observed only at one point, this being at the west end of Dickens Bjerg where the gneisses emerge from below the unconformity of the Trekant Series. Here bands of reddish-stained quartzites from three to thirty centimetres in thickness are interbedded with gneiss or light granitic rock.

Glacier on the south side of Dronningestolen.

The rock types to be found here are similar to those further south. In the west, at the head of the glacier, the complex is formed mainly of unfoliated grey rocks of granitic aspect. Further east these are replaced, on the whole, by banded granitic gneisses in which bands which are entirely quartzo-felspathic alternate with those containing subsidiary amounts of chlorite and biotite. Gradations occur into chloritic augen gneisses. In places these banded granitic gneisses show structures resembling lensing and plastic folding.

The region of the Borgjökel.

As in the region of the Budolfi Isström, the granitic gneisses may be considered in relation to the presence or absence of marked foliate structures. No outcrops of basic gneiss were discovered here.

1) Rocks of granitic aspect were noted at Cloos Klippe and on the north shore of Eigil Sö. At Cloos Klippe, a hornblende-bearing granodiorite shows intrusive contacts against a biotite-adamellite, but both rock types seem to grade laterally into augen gneiss and are intersected by a few crush zones. Each of the two massive rocks contains its own suite of aplite veins, and sometimes "xenoliths" of biotite-rich material may be observed.

2) Flaser and augen gneisses are probably the most important members of the complex in this region. At Eigil Sö, there is an apparent gradation from massive granite-like augen gneiss with a high proportion of big feldspars at the west end of the lake to flaser or augen gneiss with a variable concentration of big feldspars at the east end. Flaser gneiss, sometimes with big feldspars, also outcrops in force on the east side of Kilen and at Cloos Klippe.

   In composition, these gneisses are adamellitic, with variations towards granitic, or granodioritic.

3) Banded granitic gneisses, similar to those described from the areas further south can also be found, though they are probably of lesser importance than the other gneisses.

4) Pegmatites are almost universally distributed through the rocks mentioned above, usually in very subsidiary amounts. In places they seem to bear some relation to the foliation, the veins showing a tendency to parallelism with this. At other outcrops ptygmatic folding may be shown, or the pegmatite may occur as blebs of more random orientation.

Admiralty Gletscher.

The complex as a whole is very similar to the foregoing, but a little material derived from sediment occurs at Regnbueklippe.

Granitic gneisses of foliate or non-foliate character build most of the cliffs overlooking the glacier.

1) Unfoliated granitoid gneisses outcrop mainly in the upper reaches of the glacier and become more sparingly distributed eastwards. The mode of occurrence differs little from that described from elsewhere. For instance, at Thomson Klippe, just west of Newton Klippe, rocks varying from granite to adamellite in composition can be seen veining massive more biotite-rich material (possibly related to granulitic basic gneiss). The granitic rock also forms more uniform discrete masses, and grades into coarse augen gneiss.

2) Augen and flaser gneisses form the greater part of the rock away from the head of the glacier, and banded gneisses with hornblende and biotite occur at some points, notably the west part of Thomson Klippe.

Schists sometimes occur as bands in the granite-like rocks, the bands sometimes being flanked by augen gneiss, and cut by granite, quartz and pegmatite veins. At Regnbueklippe, some thicker bands of muscovite- and chlorite-schist are associated with quartzite. Biotite is the commonest mineral in the schist bands occurring within granitoid rocks.

Quartzite in a bed of the order of 20 metres thick occurs at Regnbueklippe in a synclinal fold. Trails of quartzite hang from the base of the fold, parallel to the schistosity of the surrounding rocks.

Pegmatites and aplites occur especially in the granite-like rocks of the upper Admiralty Gletscher, but pegmatites also may be found in granitic gneisses with planar structures.

North-west Dronning Louise Land.

Where the sedimentary cover is absent, the basement is formed of similar material to that described in preceeding sections. Granite gneisses, sometimes banded, and even-grained granitic rocks outcrop on the sides of the small glacier rising and flowing north-east to the south of Prinsessen. At one point here, flat lenticles of biotite-rich rock are interleaved with the gneiss, recalling one of the modes of occurrence of the basic granulitic gneiss of the Budolfi area. Augen gneiss of granitic

composition is fairly common, particularly on the sheared flanks of folds in the sedimentary cover.

At Ymer Nunatak, there are sparse outcrops of mylonite gneiss, quartzite, and quartz schist, probably all belonging to this group.

Eastern Schists and Gneisses.

In contrast to the Western Gneisses, this rock group is mainly of obviously sedimentary origin. It can be traced from the land north of Britannia Sö across the lower Borgjökel and Budolfi Isström to the nunataks on the south side of A. B. Drachmann Gletscher. The boundary with the western granites and gneisses is not clear: this problem will be commented on briefly in a subsequent section.

Budolfi Isström and South Dronning Louise Land.

The best exposed section in these rocks is at Durham Klippe (fig. 3) on the north side of the glacier, where the outcrops of easterly dipping beds are not interrupted by many scree-filled gullies and valleys. The thickness of beds here is of the order of 3,000 metres, without allowance for bedding slip, or thickening and thinning of beds during metamorphism.

Semipelitic schists are quantitatively the most important. In these, quartz, biotite and epidote are the chief minerals, and there is sometimes green hornblende, muscovite, and calcite in addition. Pyrite, magnetite and garnet are frequent accessories. Other schists may be felspathic, or rarely pelitic. The pelitic schists are composed of biotite and muscovite, or biotite and hornblende. All the schists are found as bands varying from a few centimetres to many metres in thickness.

Gneisses may be formed by increase in feldspar content of some of the schists. Other varieties include grey augen gneiss resembling that in the Western Gneisses, white felspathic gneiss and gneissose pegmatite composed of oligoclase-andesine, quartz, muscovite, hornblende and epidote, with accessory garnet. The grey augen gneiss may also be garnet-bearing. The gneissose pegmatite is interbedded with, and perhaps intrusive into, the schists.

Quartzite and quartz-muscovite schists, usually thin, occur in places among the other beds. At the west end of Durham Klippe, about 50 metres of quartzite overlies the grey augen gneiss of the Western Gneisses, but is separated by a thrust from the schists above.

Limestone is not common, only two thin bands being discovered in this region.

South of the Budolfi Isström, the gross lithology of the paraschists seems to remain much the same. Eastwards, there seems to be an increase in proportion of light coloured gneiss.

In the Budolfi Isström area, the easterly dip seen at Durham Klippe is followed eastwards by a number of complex folds trending N.N.W.—S.S.E.

Glacier on the south side of Dronningestolen.

Similar rocks to those found at Durham Klippe outcrop from Monumentet eastwards.

Lower Borgjökel to Trefork Sö.

Rocks belonging to the Eastern Schists and Gneisses outcrop east of the north-south limb of the Borgjökel, and from Rosmule eastwards. Like the series further south, the main body of the rock is semipelitic schist, with sparse bands of quartzite, quartz schist, and limestone. The gneisses show some differences, however. At Rosmule, felspathic banded gneiss is associated with pale pink granitic veining, and big feldspars occur in some of the schists. Another difference from the Budolfi Isström is the occurrence of concordant and cross-cutting bands of amphibolite and metadolerite.

Further north, the country east of the north-south limb of the Borgjökel is built of similar schists with thin quartzite bands in places, and sometimes granitic veining forming rocks approaching migmatites.

Britannia Sö Area.

Semipelitic schists and gneisses again form the majority of the complex, east of a line from Söstersöer to west central Britannia Sö. Commonly, they are composed of quartz, biotite, and epidote, and may contain hornblende, microcline, or plagioclase. Some varieties have muscovite, chlorite and red garnet in their composition. The feldspars in some of these rocks are porphyroblastic.

Augen gneisses and granitic veining occur in the peninsula dividing the east and west arms of Britannia Sö, and also north-east of H. A. Jensen Bjerg. The semi-pelitic schists develop eyes of pinkish microcline, and increasing concentration of these give a granitic appearance to the rock. These variations can be observed both along and across the strike of the beds. In places, associated pegmatite veins show ptygmatic folding.

Gneissose Pegmatites, composed of white microcline, quartz, oligoclase and muscovite with a little garnet outcrop on the west side of Kap Bellevue. These rocks bear a marked field resemblance to the white gneisses or gneissose pegmatites found on the lower Budolfi.

Quartzite and quartz schist occur particularly in the western half of the Britannia Sö region, associated with a little quartz-magnetite rock and some limestone. The quartzite is white to buff in colour, and is often red-stained. In thin section, it can be seen to be completely recrystallised. Current bedding occurs in the thicker beds. Some quartzite also can be found among the semipelitic schists.

Limestone is of greater importance in the west Britannia Sö region than anywhere else in Dronning Louise Land. Two beds over 30 metres in thickness outcrop on the south-west shore of Britannia Sö. In section, these limestones can be seen to be made up of interlocking calcite, quartz in pockets or isolated grains, and a pale phlogopitic biotite.

Quartz-magnetite rock in lenses of the order of centimetres thick is associated particularly with some of the quartzites. One bed a few metres thick outcrops at the snout of Admiralty Gletscher.

The interbedded quartzites, limestones, quartz-muscovite-schists, and quartz-magnetite rock are sufficiently distinctive in lithology and distribution to be separated off from the Eastern Schists and Gneisses, and termed the Britannia Sö Group. On the east side of the Britannia Gletscher, and also on the south shore of Britannia Sö, the Britannia Sö Group seems to underlie the Eastern Schists and Gneisses proper, though the evidence is not clear. No trace of this assemblage can be found further south, though there are strong resemblances to the quartzites and limestones found among the paraschists.

In the Britannia Sö region there are numerous intrusions of quartz-amphibolite showing intrusive or concordant relationships against the country rock (see under Minor Intrusions below).

Prins Axel Nunatak.

On the south-east side of the nunatak, beside the small lake, there are outcrops of red-stained quartzite and white and purple quartzite. Some of these rocks are false-bedded. In thin section, the rocks are seen to be blastopsammitic, and the purple bands are magnetite bearing. It is likely that the quartzites here are less-metamorphosed representatives of the Britannia Sö Group.

Suzanne Nunatak.

Here outcrops of red-stained quartzites, white and purple banded quartzites, and black limestones emerge from the ice and drift. Sections show the quartzites to be sheared or slightly recrystallised quartzitic sandstone. The occurrence of limestone and red-stained quartzite relates these beds to the Britannia Sö Group, but otherwise they also bear a remarkable resemblance to the Zebra Series (see below).

The Boundary between the Western Gneisses and the Eastern Schists and Gneisses.

The descriptions given above demonstrate the differences between the two rock groups: in the one case dominantly felspathic or granitic with few paraschists, in the other dominantly meta-sediment. However, drawing a precise boundary between them is difficult because of:—

a) possible transitions between the two groups;
b) the incompleteness of the sections;
c) presence of rock types probably common to both groups;
d) structures connected with metamorphism;
e) local faulting and folding; and
f) the reconnaissance nature of the mapping.

Thus the author has thought it advisable to include a third group of rocks on the geological map, whose true affinities are as yet undetermined.

At the snout of the Admiralty Gletscher, chloritic gneiss with feldspar augen overlies (inverted) quartzite and schists of the Britannia Sö Group. Augen gneisses with schists bands and amphibolite intrusions form the mountain sides facing north-west from here to Trefork Sö. On the east side of the glacier tongue running south into Trefork Sö, these gneisses can be seen to be overlain by a red band, probably quartzite.

The east wall of the Trefork Gletscher, between the Borgjökel and Trefork Sö, is formed of granitic gneiss with thick bands of hornblende-schist. These rocks bear greater resemblance to the Western Gneisses than to the paraschists to the east.

On the west side of Kilen, a thin quartzite and limestone overlie granitic flaser gneiss with big feldspars, the sequence being much disturbed by intrusions of metadolerite. However, the big-feldspar gneisses continue in the cliffs northward around the apex of Kilen to the east side, and thus the significance of the quartzite and limestone remain in doubt.

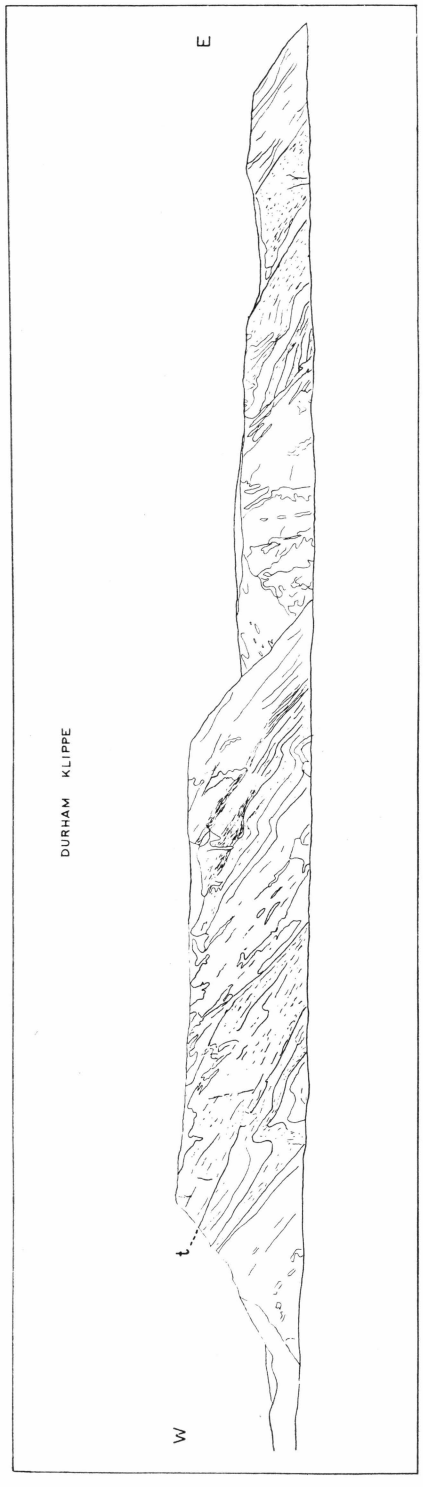


Fig. 3. Panorama of Durham Klippe on the north side of the Budolfi Isström. Beds below the thrust "t — —" are quartzites resting on augen gneiss. Length of panorama about six kilometres.

The next point of examination is the glacier south of Dronningestolen. At Monumentet, the rocks are paraschists as stated above, while the cliff on the west side of the small lake W.N.W. of Monumentet is formed of Western Gneisses. The boundary must therefore run southwards from here.

At the west side of Durham Klippe, quartzite overlies grey augengneiss. This is possibly the only good exposure of the boundary, if such exists, in Dronning Louise Land. However, as mentioned in the appropriate section above, the quartzite is separated from undoubted Eastern Schists and Gneisses by a thrust of unknown dimensions (fig. 3).

On the south side of the Budolfi Isström, the land mass is built of Eastern Schists and Gneisses, interrupted on the west side by a mushroom-shaped granitic gneiss, which shows both concordant and cross-cutting relationships to the schists.

Southwards from here, the dividing line runs south into the southernmost nunataks of Dronning Louise Land.

The Trekant Series.

Sediments belonging to this Series are found from Ymer Nunatak in the north down the west side of Dronning Louise Land as far as the southernmost nunataks. In the south, they are generally almost flat-lying, but there is strong folding from Revaltoppe northwards. The name of the Series is taken from the small nunatak Trekanten at the head of the Borgjökel.

The Type Succession at Trekanten.

The Trekant series here is folded and slightly sheared. The thicknesses given are approximate, having been judged by eye, and further liable to error owing to the folding, incipient metamorphism, and faulting along the lines of quartz-dolerite dykes.

metres	
330	Grey, pink and yellowish quartzite. Ripple-marking and current-bedding.
	Pink, grey and green quartzite. Channelling, slump-structures, pebbles of quartzite & mudstone.
3	Mudstones and grey-green quartzite. Alternating red mudstone and quartzite with ripple-marks.
17	Conglomerate group. Egg-shaped pebbles of quartz, quartzite, gneiss. Matrix of, and lenses of, quartzitic sandstone.
70	Massive grey quartzite with green and purple tints, fine to to medium grained. Current-bedding and ripple-marks.

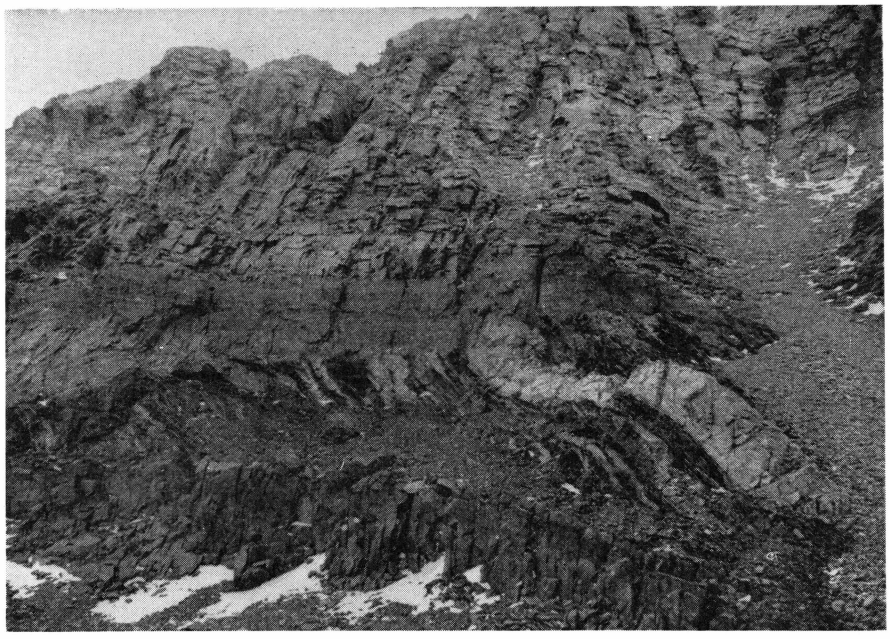


Fig. 4. Unconformity of Trekant Series on Western Gneisses, Helgoland. A quartz-dolerite dyke can be seen in the gneiss below the unconformity. Height of cliff about 70 metres.

3	Red and purple breccias. Two breccia bands. Fragments of gneiss and reddish quartzite.
0—70	Red Quartzite. Cross-bedding in bright red & pale bands. Pale patches and vertical lines (joints).
0—7	Basal Breccias. Fragments of gneiss, purple shale, feldspar and quartz. Matrix of quartzitic sandstone.
510	

A typical quartzite or quartzitic sandstone is made up as follows:—

Quartz, clastic, 0.2—0.4 mm subangular or subrounded 60—80 %
Microcline, clastic 0.2—0.4 mm subangular < 10 %
Groundmass. Sericite mesh and fine-grained quartz & a little hematite.

The larger quartz and microcline grains usually show some evidence of replacement by the groundmass. Secondary silica growths on quartz grains are common, and hematite often forms skins around the quartz grains also.



Fig. 5. Beds of the Trekant Series, at Newton Klippe. Conglomerate lower foreground. Quartzitic sandstone and shale with mudcracks above.

The Succession at Helgoland.

Helgoland lies about 40 km south of Trekanten, and the succession here illustrates the general uniformity of the Series.

metres

70 White and purple grits and quartzites of Zebra Series. — Apparently conformable on —

230 Rose-red quartzitic sandstone with rare red & green mudstone. Current-bedding with gritty bands in the foresets. Ripple-marks. Suncracks in the mudstones.

33 Dark grey to purple fine-grained quartzitic sandstone. Current-bedding. A few thin bands of mudstone. Gritty patches. Feldspar fragments in some bands.

2—7 Basal breccia with fragments of underlying gneiss.

Distribution.

South of the Budolfi Isström, quartzitic sandstones of the Trekant Series cap many of the tabular nunataks at the head of A. B. Drachmann Gletscher. Here the Zebra Series, which gives such a characteristic

appearance to the nunataks Falkonerklippe and Helgoland, is absent. The topmost beds are patchily coloured deep red and pink, and contain some larger quartz fragments.

At Kaldbakur, basal conglomerate and multicoloured quartzites rest on gneiss. The greater part of the nunatak is formed of reddish quartzitic sandstone, as mentioned by KOCH and WEGENER. The Trekant Series also outcrops on some of the Revaltoppe, and forms most of the mountain masses between the upper reaches of the Borgjökel and the Admiralty Gletscher. The mountains running S.S.W. from Splinten are formed in a complex syncline of Trekant Series overlain by folded Zebra Series. Similar rocks outcrop from Juel-Brockdorff Bjerg to Prinsessen. The westernmost nunataks of Ymer Nunatak are built of Trekant Series, though here again it is possible that some Zebra rocks are present.

From the Revaltoppe northwards, the Trekant Series in the mountains of west Dronning Louise Land is strongly folded and subject to slight metamorphism. The flat-lying beds found at Helgoland seem to continue in the line of nunataks running parallel to the west margin of Dronning Louise Land.

The Zebra Series.

The Type Succession.

The name of the Series is taken from Zebra Klippe, the northern cliff of Juel-Brockdorff Bjerg. Here rocks of the Series dip westwards the Inland Ice.

metres

67 Beds of white and purple grit and dark to light yellow-brown quartzite. Interbedded thin brown, green and purple-black mudstones up to 20 cm thick. A little current-bedding and some ripple-marks.

33 Massive beds of white grit with some interbeds as above.

— — Slight angular unconformity — —

Grey-brown quartzites of the Trekant Series.

The grits show considerable variation in grain size, with quartz grains up to a centimetre across. No feldspar is present among the clastic grains. The cement in the dark grits is mainly hematite: in the light, quartz and sericite, but the proportion of cement to clastics is very small in both rocks.

Distribution.

Rocks of the Zebra Series are very sparingly distributed in Dronning Louise Land.

At Prins Axel Nunatak, patches of the Zebra Series rest unconformably on Trekant quartzites. Both series are strongly folded. The mountains running S.S.W. from Splinten have already been mentioned. Outliers of Zebra rocks appear in the mountains south of Zebra Klippe, to Prinsessen, and again on cliffs overlooking the upper Admiralty Gletscher. Two of the outliers on the north side of the Admiralty Gletscher rest directly on granitic gneiss.

No further outliers of Zebra Series occur between the upper Borgjökel and the Kaldbakur area, where patches of rocks showing the distinctive lithology form cappings to the Trekant Series on some of the nunataks. South of the Budolfi Isström, there is only one small remnant, this being on Dickens Bjerg.

Minor Intrusions.

Western Dronning Louise Land.

1) Cleaved dykes of dioritic affinities.

Intrusions of this type outcrop from Ymer Nunatak in the north to at least as far south as Eigil Sö. They cut the Western Gneisses as narrow black dykes, often trending N.N.E. Where least altered, for instance on the upper Admiralty Gletscher, they are composed of oligoclase and chloritised biotite, with some quartz and epidote. There are sometimes phenocrysts of altered oligoclase. Dykes of this type are truncated by the basal breccia of the Trekant Series at Trekanten, and cut by quartz dolerite intrusions elsewhere.

At Eigil Sö, dykes occur with feldspar phenocrysts in a schistose ground. These are probably part of the same dyke series but have undergone greater metamorphism.

2) Quartz-dolerite dykes and sills.

These are almost confined to the west half of Dronning Louise Land. They have been intruded into the Western Gneisses, the Trekant Series, and possibly the Zebra Series and Britannia Sö Group.

In form, the intrusions are very variable. Sills are associated with the sedimentary rocks, and dykes with fairly constant dip and strike can be shows to have been intruded along faults (in two cases), though it is not clear whether such faulting took place before or after the date of the intrusion. Most commonly, however, the dykes are highly irregular

in form. The thickness of individual intrusions may reach 100 metres. Many of the dykes and sills show columnar jointing.

The quartz-dolerite itself is dark green to black when fresh, and weathers red or green. The dykes are usually coarse-grained, sometimes porphyritic, with a fine-grained margin. In two examples, vaguely-defined pegmatitic patches are common, composed apparently of similar material to the remainder of the rock.

Where fresh and unaltered, the rock is composed of diopsidic augite, often accompanied by hornblende, set in a network of andesine-labradorite laths. Subsidiary iron ore, micropegmatite (orthoclase and quartz), and quartz occur, the latter occupying interstices between the feldspars.

At Zebra Klippe, one quartz-dolerite intrusion transgresses the boundary of another, and shows a fine-grained chilled margin against it. Elsewhere in Dronning Louise Land, more than one period of dyke intrusion can also be recognised.

Unaltered quartz-dolerite is confined to unfolded areas in south-west and west Dronning Louise Land. Eastwards, there seems to be increasing metamorphism. At Cloos Klippe for instance, the dyke margins are schistose, and while the interiors have retained their original texture, the pyroxene has been replaced by tremolitic hornblende, and the feldspars epidotised.

3) Ultrabasic Dykes.

At Regnbueklippe, there is a dyke of olivine-bearing serpentine, and similar rocks occur in the scree at other points in Dronning Louise Land. The relations of this dyke to a neighbouring quartz-dolerite intrusion are doubtful. However, the quartz-dolerite here shows slight metamorphism (pyroxene replaced by hornblende), and the retention of olivine in the serpentine suggests that it is post-metamorphic.

Eastern Dronning Louise Land.

1) Metadolerites and amphibolites of Kilen and lower Borg-jökel.

At Rosmule and Paradisklippe, there are concordant and discordant intrusions of amphibolite and metadolerite of the order of several metres to over 30 metres in thickness. The metadolerite is composed of a soda-lime feldspar (andesine-labradorite) and hornblende pseudomorphs after pyroxene. Corona structures are common, especially around iron ore (tremolite and biotite, with garnet bordering feldspar). The amphibolite is composed of hornblende and plagioclase with a little garnet.

At Kilen, there are several thick intrusions of metadolerite with margins of light green hornblende-quartz-schist. North-west of Paradisklippe, hornblende-biotite-schists are probably related to the amphibolites.

The relations of these rocks to metamorphosed quartz-dolerites is not clear, but they may be similar rocks in a higher metamorphic grade.

2) Quartz-amphibolites of the Britannia Sö Region.

These rocks are intrusive into the Britannia Sö Group, and also into the schists and gneisses to the east. The majority of these intrusions are narrow, and concordant relationships are more frequent than cross-cutting. They are usually medium or coarse grained and schistose, composed of green hornblende, and biotite, with a little chlorite. The light minerals are quartz and epidote; rarely a little feldspar.

The western limit of this type of intrusion seems to be the Britannia Gletscher, to the lower Admiralty Gletscher and the northern arm of Trefork Sö. They do not extend as far as the Borgjökel, and seem to be confined to north-east Dronning Louise Land.

3) Garnetiferous quartz-amphibolite.

Amphibolites of this type were only found in association with felspathised gneisses north-east of H. A. Jensen Bjerg. They are mineralogically similar to the quartz-amphibolites, but contain red garnet in addition.

4) Quartz-dolerite.

A dyke of this material occurs in contact with quartzites possibly of the Britannia Sö Group at Suzanne Nunatak, and another in a similar situation at the south-east side of Prins Axel Nunatak.

5. STRUCTURE

Sedimentary Rocks.

Folding.

Because of the patchy distribution of these rocks and the reconnaissance nature of the mapping, it is only in the north of Dronning Louise Land that information is available to elucidate major structures in these rocks.

The Splinten Syncline. A major syncline in the Trekant Series can be traced from Splinten S.S.W. to within a few miles of the Admiralty Gletscher. The axis appears to rise southwards. A synclinal patch of sediments on the north side of the Admiralty Gletscher on almost the same line may represent a down-warping of the same fold axis.

The Zebra Anticline. Rocks of the Trekant Series outcropping at Splinten reappear on the other side of the glacier (see map) in an anticlinal arch. Though not well defined at Zebra Klippe itself, this anticline is well seen in the mountains to the south, and the axis appears to rise southwards like that of the Splinten Syncline.

No other fold structures can be traced for any distance with certainty in the sediments. It is possible that a second syncline runs parallel to the west margin of Dronning Louise Land, adjacent to the Zebra Anticline, but the evidence is mainly concealed by ice.

On Prins Axel Nunatak, the Trekant Series is thrown into an anticline and possibly an asymmetrical syncline, over which lie unconformable patches of Zebra Series, apparently folded on the same lines. The structures here, however, do not seem to continue southward across the glacier. The situation at this nunatak is detailed below (p. 31).

The various patches of sediments to the north and south of the Admiralty Gletscher are often almost flat-lying, but with sharply-upturned apparently monoclinal limbs.

South of the Revaltoppe, the sediments are flat-lying or have a gentle westerly dip of up to 10 degrees, and this condition holds also for the strip of nunataks running through Poulsen Nunatakker parallel to the western margin of the main land mass. It appears therefore that the N.N.E—S.S.W. system of folding in north-west Dronning Louise

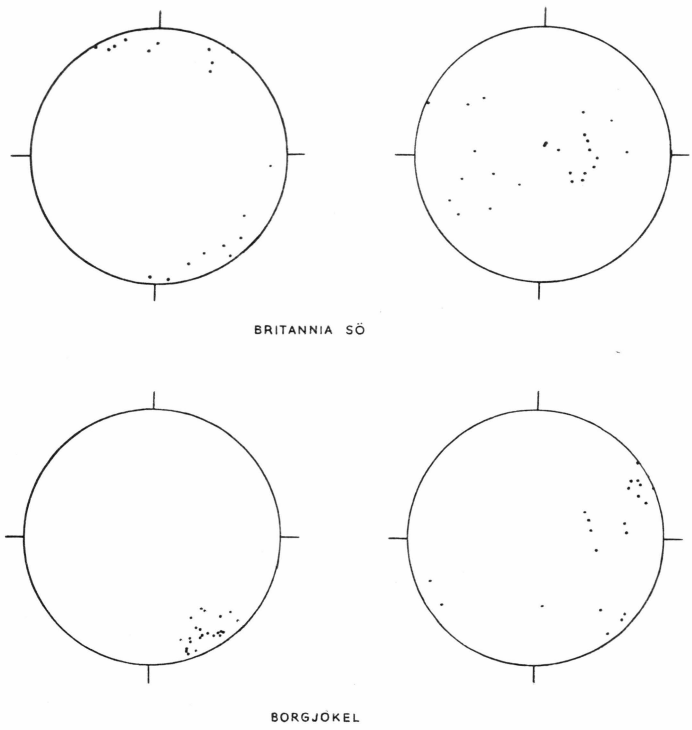


Fig. 6.

Fig. 6 & 7. Equal Area Projections of lineation and poles to the schistosity in Eastern Schists and Gneisses.
Lineations (left-hand side) plotted on the lower hemisphere. Poles to schistosity (right-hand side) plotted on the upper hemisphere.

Land must die out southwards and westwards at about the 26 degrees west meridian.

It is noticeable, particularly in north Dronning Louise Land, that the folding undergone by the quartzitic sandstones is of a type normally seen in weaker beds, and might in many cases be described as incompetent. At many points also in the north, the rocks are affected by fracture cleavage, and in the Splinten range, the sediments are considerably sheared with the formation of schists. At two points on the Admiralty Gletscher, basal conglomerates occur with strongly deformed but unbroken pebbles. These facts indicate that the beds in north Dronning Louise Land have probably undergone mild metamorphism, a state of affairs that is confirmed by petrographic examination.

Faulting seems to be of much less importance than folding. In the south-west of Dronning Louise Land, faulting was observed at only one place, at Dickens Bjerg, where there are two north-south striking faults

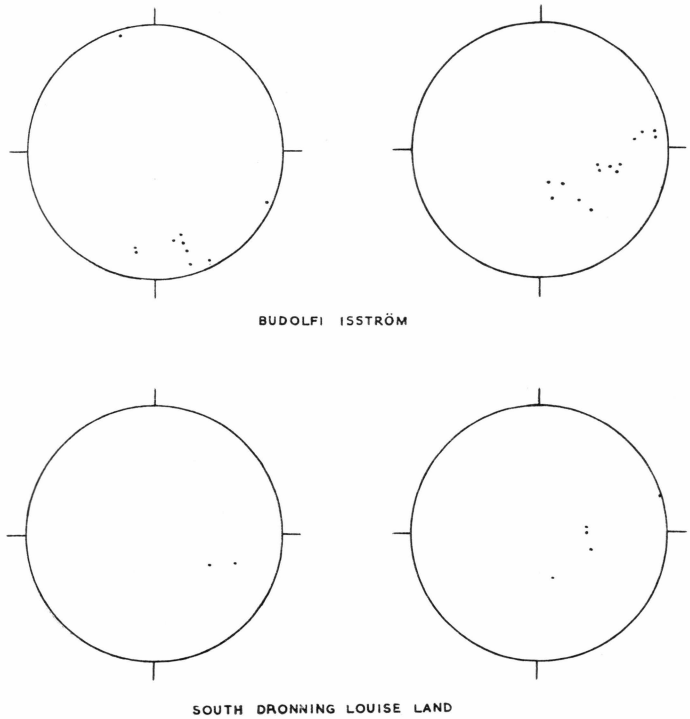


Fig. 7.

with throws of the order of 20 metres. At Trekanten and one or two other places, movement has taken place along the line of basic dykes.

Eastern Schists and Gneisses.

The accompanying equal-area projections (Figs 6 & 7) of lineation and schistosity show that, on the whole, linear structures in these rocks are at right angles to the great circle containing poles to the planar elements. Minor fold structures usually run parallel to the lineation. These facts suggest that the lineation is in the 'b' direction.

In the region south of the Borgjökel, a strong eastward dip of the schists and gneisses is succeeded to the east by a series of N.N.W.-trending anticlines and synclines, which may themselves be corrugated on the same lines. Boudinage structures occur parallel to the fold-axes in at least one instance. These major structures probably plunge 5—15 degrees southwards in conformity with the lineation. However, the simple picture of the structure here as gained from reconnaissance mapping is probably deceptive.

Around Britannia Sö, the situation is more complex. No large scale structures are revealed with certainty, but minor folding, sometimes

with inversion (as indicated by current bedding in the quartzites), is common. At two points, more than one set of lineations can be observed. Small scale folding with axial planes dipping east occurs in the promontory separating the two halves of Britannia Sö.

At Durham Klippe, a thrust of unknown dimensions occurs not far above the presumed Western Gneisses—Eastern Schists and Gneisses boundary. The quartzite and granitic gneiss below the thrust plane are folded into a large drag-anticline with axial plane dipping eastwards parallel to the thrust, which in its turn is parallel to the bedding of the overlying schists (fig. 3). The thrust plane itself is marked by a thin bed of flinty crush rock.

Further north, immediately west of Monumentet, disturbances in the granitic gneiss may be connected with the thrusting movements, but no evidence was found further south.

It is evident that this thrust took place later than the metamorphism of the schists. The accompanying drag-fold is co-axial with folding in the schists away from the thrust, folding which is parallel to the lineation. Thus it seems likely that the structures in the Eastern Schists and Gneisses were produced either at two different periods, or by continuous movements during declining metamorphism, the rocks yielding at first by plastic flow, and later by rupture.

Western Gneisses.

In the southern half of Dronning Louise Land, and to a lesser extent as far north as Admiralty Gletscher, the prevailing dip of the various types of gneiss is towards the east or south-east for some kilometres westward of the presumed paraschist-gneiss boundary. Further west, the geological reconnaissance did not reveal any well-marked structural plan, though in the extreme south-west, a roughly eastward dip seems to continue beneath the unconformable sediments of the Trekant Series. Linear structures are poorly developed in the Western Gneisses, and their significance obscure.

Crush belts occur in the granitic rocks of St. Andrews Klippe and Cloos Klippe. In these, the rocks are reduced to medium-grained cataclastic augen gneisses. Commonly the belts run parallel to the planar elements in the surrounding gneisses—striking N.N.E.—and also at an angle to this direction. Some of the schistose rocks among the flaser and granitic gneisses also seem to have been formed by cataclasis.

Near folded sediments in northern Dronning Louise Land, the gneisses take on a schistosity or cleavage parallel to the bedding planes in the neighbouring sediments, and this may give an illusory gradation from gneiss to sheared quartzite in places.

6. THE RELATIONSHIP BETWEEN SEDMIENTS AND METAMORPHIC ROCKS

It is evident that the N.N.E. fold-system in the Trekant and Zebra Series, and the N.N.W.-trending structures in the Eastern Schists and Gneisses, must meet in north Dronning Louise Land. Also, if there is any stratigraphical connection between sediments and paraschists, the evidence should be strongest in this area. Unfortunately, the Britannia Gletscher obscures vital evidence, and only at Prins Axel Nunatak is it possible to obtain a pointer regarding the relations. The following account refers to the geological section of the nunatak shown in fig. 8.

The Zebra Series exposed in the north-west of the section at Kap Treklöver is thin-bedded, grading upwards into massive white quartzite in a short distance. Both it and the underlying Trekant Series show field and petrographic evidence of shearing, and there are thin beds of chlorite-schist among the grits. Incompetent folding is developed in the thinly-bedded Zebra Series at Kap Treklöver, and also at outcrops elsewhere on the nunatak, the fold axes running N.N.E

At Kap Treklöver, the Zebra rocks are separated from the Trekant beds by a thick sill of quartz-dolerite (see Fig. 8). Apart from a comparable example at the head of the Admiralty Gletscher, this is the only observed occurrence of quartz-dolerite in contact with rocks of the Zebra Series. Since there is no angular unconformity here, and subsequent shearing has obliterated any possible fossil weathered surface on the sill, it cannot be stated with certainty that the sill is intrusive into the Zebra rocks.

Below the Zebra Series, the quartzitic sandstones of the Trekant Series outcrop, grey, green, and brown in colour, and folded into an anticline, the crest of which is broken by two basic intrusions. Toward the icefall, the dip becomes increasingly steep towards the E.S.E. Just above the icefall, two deep pink bands outcrop, which can be traced N.N.E. across the nunatak, and in this neighbourhood the intervening beds are red quartzitic sandstones with pale patches and occasional stretched quartz pebbles. These latter beds are of a type found near the basal conglomerate elsewhere, and thus they may mark the limb of

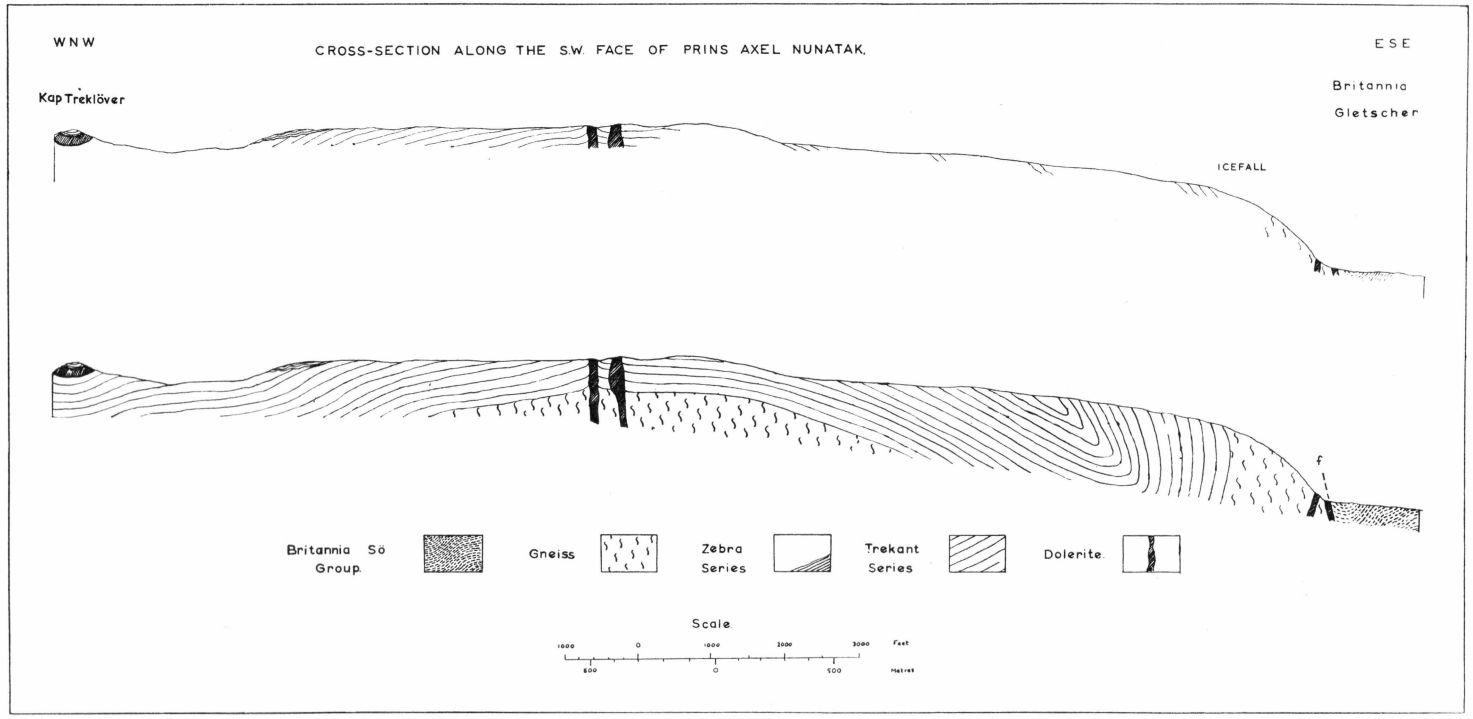


Fig. 8. Cross-section along the south-west face of Prins Axel Nunatak. The upper diagram shows the known data only; the lower diagram shows the interpretation given in the text.

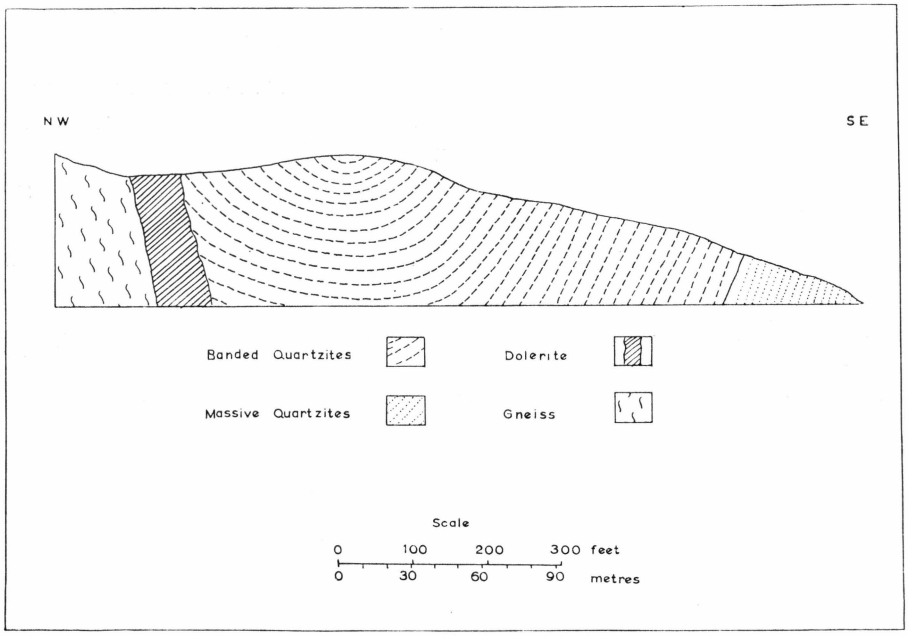


Fig. 9. Enlargement of the east end of fig. 8.

an inclined syncline with axial plane dipping east. Alternatively, there may be concealed faulting, but the first interpretation fits with the style of folding seen at other places.

A stretch of scree separates the Trekant beds from the next outcrop. Here chloritic granitic gneisses and dark schists build a north-east trending cliff feature over which the glacier bounding the south-west side of the nunatak cascades as an icefall. The foliation in the gneisses here strikes roughly north and south.

Eastwards, a small patch of altered dolerite is exposed from under the mantle of glacial drift, separated in turn from the next outcrop by more drift. Here a small syncline in thin-bedded white and purple quartzites (fig. 9) is exposed; the axis is only about 50 yards east of the granitic gneiss, and plunges gently N.N.E. The west limb of the syncline dips at about 70 degrees, and the east limb 50 degrees. A few hundred metres to the east, the purple-white quartzite is underlain by massive red-stained quartzite, patchy outcrops of which continue to the lake shore. Since the west limb of the small syncline could not accomodate all these beds, a fault must separate the quartzites from the gneiss, and this fault probably follows the line of the basic dyke. Thus the stratigraphical relationship of quartzite to gneiss remains obscure.

These outcrops show that rocks of the sedimentary groups and Britannia Sö Group are folded on the same lines where the two structural

systems meet, and that the dominant fold system is probably the N.N.E. trending one.

As has already been noted, there is considerable field resemblance between the quartzites of the Britannia Sö Group exposed on Prins Axel Nunatak, and the quartzitic sandstones of the Zebra Series further west. There is doubtless increasing eastward metamorphism in the basic dykes of central Dronning Louise Land, and therefore the possibility of transition from sedimentary to metaquartzite in such an area as Prins Axel Nunatak.

The quartzites of the Britannia Sö type at the south-east corner of Prins Axel Nunatak are shown from two specimens to be blastopsammitic, with relict coarse-grained clastic quartz in a ground of medium-grained recrystallised quartz. A specimen of Zebra Series quartzite collected not far above the icefall shows strong deformation, but relatively little recrystallisation of the mortar quartz. Thus there seems to be some chance of a metamorphic transition, but the detailed results of petrographical examination of the material connected with this problem is beyond the scope of this paper.

7. THE GEOLOGY OF DRONNING LOUISE LAND IN RELATION TO OTHER PARTS OF NORTH-EAST GREENLAND

In west Kronprins Christian Land, coloured sandstones and quartzites of the Thule Formation (Norsemandal Sandstone, 300 metres) are penetrated by diabase and porphyrite dykes. Overlying these are some 130 metres of dolomite, shales and sandstones, not penetrated by intrusions, and presumed to overlie the Norsemandal Sandstone disconformably. These unfossiliferous strata are succeeded by limestone and dolomites of Ordovician and Silurian age. (ADAMS and COWIE, 1953).

Eastward, these rocks are overridden by a thrust nappe, which carries elements of the Thule Formation overlain by greywackes, shales and sandstones reaching 2500 metres in thickness, these being the geosynclinal equivalent of some of the unfossiliferous strata overlying the Norsemandal Sandstone. The Thule Formation of the autochthon is separated at one point from the nappe by patches of conglomerate which include pebbles of Thule diabase (FRÄNKL 1953).

In the Fjord region of North-east Greenland, the oldest rocks belong to the geosynclinal Eleanore Bay Formation. The lowest exposed strata are the Alpefjord and Eremitdal Series (7000 metres), which are mainly pelitic, but with thin quartzitic and carbonate bands. These are followed by the Quartzite, Multicoloured and Limestone-dolomite Series, totalling some 4000 metres in thickness. The Alpefjord and Eremitdal Series show considerable lateral variation, and are strongly metamorphosed in many areas. The overlying Quartzite, Multicoloured, and Limestone-dolomite Series are much more constant in detailed lithology (FRÄNKL 1953). FRÄNKL compares the Eleanore Bay Formation with part of the geosynclinal series found on the thrust nappe in Kronprins Christian Land (FRÄNKL 1954).

The Eleanore Bay Formation is overlain unconformably or disconformably by the Tillite Series (Mörkebjerg Formation of KATZ, 1954), which is succeeded without a break by Cambrian. FRÄNKL compares the Tillite Series with similar rocks forming the uppermost group on the nappe in Kronprins Christian Land.

The Norsemandal Sandstone bears a strong resemblance to the Trekant Series. The lithology is similar, and the strong unconformity on the underlying gneiss is characteristic of the Thule Formation in other parts of North Greenland. Both series are penetrated by basic dykes, though this fact is of doubtful value in correlation.

As regards the Zebra Series, the lithology of the exposed beds does not resemble anything hitherto described in East and North Greenland. Unconformable relations have not been described within the Thule Formation itself, and therefore it seems possible that the Zebra Series represents beds overlying the Norsemandal Sandstone and equates with the base of the Eleanore Bay Formation further south, thus linking with Fränkl's interpretation. On the other hand, the relationship of the Zebra Series to the quartz-dolerite intrusions is not clearly shown, though it appears more likely than not that the intrusions are later than the laying down of the sediments. The fact that more than one period of intrusion of these dykes is known might support the tenuous correlation given above, i. e. that the Zebra Series equate with the base of the Eleanore Bay Formation.

The eastern paraschists and gneisses show some resemblances to the Alpefjord or Eremitdal sequences described from East Greenland. Thin quartzite and carbonate rocks occur at intervals in both successions, but true pelitic beds are not common in Dronning Louise Land. However, as has been suggested above, the boundary between the Western Gneisses and the paraschists to the east is capable of more than one interpretation.

One factor is clear, however, that the quartz-dolerite dykes show increasing metamorphism eastwards, and this metamorphism is later than the Trekant and probably the Zebra Series. In view of the probable equation of the Trekant Series with part of the Thule Formation, there is reason to believe that such metamorphism is due to the Caledonian Orogeny in East Greenland.

Table of Strata.

WEST DRONNING LOUISE LAND

100 metres. Zebra Series. White, yellow and purple quartzites, quartzitic sandstones and grits. Thin shales.

— — — Unconformity — — —

500 metres. Trekant Series. Red, purple, green and grey quartzitic sandstones with rare thin mudstone partings. Basal breccias and conglomerates.

— — — Unconformity — — —

Western Gneisses. Granitic gneisses, flaser gneisses and augen gneisses, with a few schist bands. Granulitic basic gneiss widespread but subordinate in south-west Dronning Louise Land.

Minor Intrusions. Quartz-dolerite. Dykes and sills in Western Gneisses, Trekant Series, and possibly Zebra Series.

Cleaved Dykes of dioritic affinities. Cut Western Gneisses only.

EAST DRONNING LOUISE LAND

3,000 metres. Eastern Schists and Gneisses.
Mainly semi-pelitic schists with thin quartzites and limestones. In the Britannia Sö area, quartzites and limestones become important, forming the Britannia Sö Group. Felspathised rocks developed locally.
These rocks apparently lie conformably on the Western Gneisses.

Minor Intrusions. Quartz-dolerite. Probably intruded into Britannia Sö Group at Prins Axel and Suzanne Nunataks.

Amphibolite Dykes. At Britannia Sö, and lower Borgjökel.

Metadolerite. Lower Borgjökel.

SKETCH CORRELATION TABLE

North Greenland		West Dronning Louise Land	East Dronning Louise Land	East Greenland
Pre-Cambrian	Greenlandian (in part)	? Zebra Series	? Eastern Schists and Gneisses	Eremitdal and Alpefjord Series
	Thule Formation	Trekant Series	— —	— —
Archaean		Western Gneisses	— —	— —

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Færdig fra trykkeriet den 16. marts 1956.

PLATE

Plate I.

Geological Sketch-map of Dronning Louise Land, North-east Greenland.

GEOLOGICAL SKETCH MAP OF DRONNING LOUISE LAND N. E. GREENLAND

Scale

1 : 250,000

5 0 5 10 km

5 0 5 miles

YMER NUNATAK

Suzanne Nunatak

Prins Axel Nunatak

Treklöver

Splinten

Zebra Klippe

Juel-Brockdorff Bjerg

Prinsessen

Newton Klippe

Regnbueklippe

Poulsen Nunatakker

Trekanten

Cloos Klippe

Revaltoppe

Kilen

Eigil Sö

St Vitus Bjerg

Farmagsö

Kaldbakur

Kamæleon

Falkonerklippe

Helgoland

St Andrews Klippe

Dickens Bjerg

Dronningestolen

Monumentet

Durham Klippe

Sösterséer

H.A.Jensen Bjerg

Britannia Sö

Kap Bellevue

Trefork Sö

Paradisklippe

Rosmule

BRITANNIA GLETSCHER

STORSTRÖMMEN

ADMIRALTY GLETSCHER

BORG I

JÖKEL

KURSBRÆ

BUDOLFI ISSTRÖM

L. BISTRUP BRÆ

GLETSCHER

A. B. DRACHMANN

77°

76°30′

76°

27°

26°

25°

24°

TABLE OF STRATA

EAST DRONNING LOUISE LAND

Eastern Schists & Gneisses
Britannia Sö Group — EG / BS

WEST DRONNING LOUISE LAND

Zebra Series — ZS

Trekant Series — TS

Western Gneisses — WG

Gneiss & schist undifferentiated — G

Geological Boundary: Observed / Inferred / Hypothetical

Anticline

Syncline

Plunge of lineation & small folds

Dip of bedding or schistosity: Horizontal + ; Gentle ∠ Strong / ; Vertical ⊥ ; Variable ⊥ ; Dip & strike variable ⊥

Fault — f — Thrust — t

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