Midgård. Geologists from Exeter University mapping the Buksefjorden map sheet (Coe *et al.*, this report) were also supported from Midgård. Ib Olsen (GGU) took care of most of the practical arrangements. The work from 1970–1975 in the Fiskenæsset region will be published as four 1:100 000 map sheets (fig. 27). Field work on the Buksefjorden map sheet will continue until 1977.

Recent results of field and laboratory investigations have been published in two progress reports (*Rapp. Grønlands geol. Unders.* 51, 1973 and 73, 1976) and little needs to be added here.

The existence of very old gneisses, comparable to the Amîtsoq gneisses in the Godthåb area, has not been proven even in the northernmost part of the area near 64°N. Isotope work of R. T. Pidgeon (Pidgeon & Hopgood, 1975; Pidgeon, personal communication, 1975) has shown that gneiss formation and metamorphism in the southern part of the Fiskenæsset area probably started around 3000 m.y. and continued to around 2650 m.y. The Ilivertalik granite near Midgård has been dated at 2800 m.y. and was probably intruded during the granulite facies metamorphism.

The rocks in the northern part of the area are partly in high amphibolite facies and partly in hornblende-granulite facies. Hypersthene seems to be irregularly distributed. Contrary to earlier opinion, it now seems most probable that the amphibolite facies rocks in the southern part of the area have never been in granulite facies. Correlation and comparison of anorthosite layers throughout the Fiskenæsset area by J. S. Myers (Myers, this report) has resulted in a better understanding of the overall stratigraphy of the Fiskenæsset complex.

Field mapping of nunatak 1390 m, east of Alángordlia, southern West Greenland

Jan C. Escher and Robert T. Pidgeon

In August 1975 nunatak 1390 m, situated just south of 63°45′N and east of the glacier Sermilik, was visited by J. C. E., who completed mapping it and by R. T. P., who collected samples for geochronological work. The nunatak had been previously visited by J. C. E., Poul Holm and Celina Zetterstrøm.

Rock types

The main rock types composing the bedrock are amphibolite, grey gneiss, augen gneiss, muscovite-bearing gneiss, and porphyritic granite. Also present are grey dykes of intermediate composition and porphyritic dykes which are restricted to the amphibolite and the grey gneiss. Much of the nunatak is covered with moraine and talus.

Amphibolite

The amphibolite locally shows well preserved pillow lava structures with vesicules along the chilled margins of the pillows. A summarised description has been given by Escher &

Myers (1974). The shapes of the pillows indicate the sequence youngs to the south-east. A few pods of ultramafic rock with igneous layering, and pods of well-preserved volcanic breccia, occur between the pillows. Elsewhere pillows can still be recognised in various stages of deformation until the amphibolite becomes strongly deformed.

Grey gneiss

A layer of fine-grained homogeneous grey gneiss, 80 m across, occurs in the central part of the nunatak and appears to have concordant contact relationships with the adjacent pillow lava. The grey gneiss shows a strongly developed linear fabric. The concordant contact relationships suggest that the grey gneiss was a unit within the supracrustals. However, the presence in the gneisses of three lens-shaped bodies of amphibolite a few metres across, with cores of well preserved pillow structures, is taken as evidence that the grey gneiss intruded the amphibolite.

Fine-grained grey dykes of intermediate composition, and porphyritic dykes cut the amphibolite and grey gneiss. The dykes are well preserved and show chilled margins. They are more numerous in the grey gneiss than in the amphibolite and it is possible that they are inter-related. Thus dykes may represent a late stage in the intrusive history of the grey gneiss, consequently cross-cutting it as well as the amphibolite. Porphyritic dykes cut the grey dykes but are less common.

Augen gneiss

A band of this rock type some 600 m wide, outcrops along the central spine of the nunatak and appears to be concordant with the adjacent amphibolite and the porphyritic granite described later. Augen gneiss is also found in the south-easternmost extension of the nunatak where it contains amphibolite agmatites indicating that the augen gneiss intruded the amphibolite. K-feldspar porphyroblasts can reach 5 mm across and they constitute about half the volume of the rock. The gneiss has a strong foliation and is crossed by thin, generally parallel, acid veinlets. No grey or porphyritic dykes were found in this rock suggesting that it post-dates the grey gneiss.

Muscovite-bearing gneiss

This rock type occurs as a transgressive body in the westernmost part of the nunatak. The gneiss can be seen locally to cut the foliation of the adjacent amphibolite. The rock is homogeneous, medium grained and without augen structure. It has a strongly developed foliation and linear fabric and the muscovite flakes lie in the foliation plane. No dykes of any type were found in this rock and the age relationship with the augen gneiss is not clear.

Porphyritic granite

A large outcrop of porphyritic granite is situated in the southern part of the nunatak. The rock is characterised by well-developed K-feldspar phenocrysts which in some exposure reach up to 10 cm in length. A very faint foliation is visible. Towards the contact with the augen gneiss (which is obscured by a vast talus slope) blocks of the augen gneiss show increasing numbers of K-feldspar porphyroblasts and a gradual fading of the metamorphic texture. This transition zone merges into the granite proper which suggests that the granite probably is an anatectic derivative of the augen gneiss. It is also possible that the granite is a late intrusion accompanied by marginal metasomatism of the augen gneiss. However, such metasomatic effects have not been observed in the adjacent amphibolites. No grey or porphyritic dykes have been found in the granite but allanite- and magnetite-bearing pegmatites occur. These are restricted to the granite and probably represent late-stage fluids.

Deformation and metamorphism

All the rock types are generally steeply dipping having a N–S trend in the south-eastern part of the nunatak and a NE–SW trend in the rest of the area. With exception of the porphyritic granite, the rocks are strongly deformed and in places mylonitised. Nevertheless excellent pillow lava structures, volcanic pebble beds and original intrusive forms of the grey dykes are preserved, in some cases near other rocks which have experienced extreme deformation. Whereas the shapes of the pillows appear to be little distorted in a horizontal plane, in section they can be seen to have been stretched parallel to the sub-vertical direction of the strongly developed mineral lineation. The presence of extensive mylonite and epidote veins suggests low temperature deformation. The major deformation in the gneisses appears to have taken place during low amphibolite facies metamorphism, with mineral assemblages of muscovite, biotite, epidote, calcite and hornblende. The mylonites were probably formed during this event – the deformation continuing and increasing during waning of the metamorphism. The foliation of the dykes and mylonite layers has locally been folded into mesoscopic tight to isoclinal folds with axes generally parallel to the main lineation and with axial planes parallel to the main trend of the foliation. These folds have not been seen in the grey gneiss and the muscovite-bearing gneiss, but the homogeneity of these rocks may make the presence of folding difficult to detect. Coarse muscovite pods in 'vugs' in the grey gneiss and black tourmaline crystals along the margins of the ultramafic bodies post-date the main deformation.

Sequence of geological events

From the available field criteria the following sequence of events is tentatively proposed as a basis for the geochronological study.

9 Anatectic formation (and/or emplacement) of porphyritic granite and muscovite pods in grey gneiss.
8 Late deformations (with minor folding).
7 Low amphibolite facies metamorphism and accompanying deformation with late stage mylonitisation.
5 & 6 Emplacement of augen gneiss.
Emplacement of muscovite granite.
4 Intrusion of grey dykes.
3 Intrusion of porphyritic dykes.
2 Intrusion of grey gneiss.
1 Extrusion of supracrustals.

Reference

Escher, J. C. & Myers, J. S. 1974: New evidence concerning the original relationships of early Precambrian volcanics and anorthosites in the Fiskenæsset region, southern West Greenland. *Rapp. Grønlands geol. Unders.* **75**, 72–77.

R. T. P.,
Scottish Research Reactor Centre,
East Kilbride,
Glasgow,
Scotland.

Stratigraphy of the Fiskenæsset anorthosite complex, southern West Greenland, and comparison with the Bushveld and Stillwater complexes

John S. Myers

The Fiskenæsset complex is a thin layered sheet of deformed and metamorphosed anorthosite, leucogabbro, gabbro, peridotite and dunite, with numerous chromitite layers and lenses. It occurs in an Archaean terrain of amphibolite and granulite facies gneisses as layers up to 500 m thick with outcrop lengths of up to 25 km and as trains of fragments in gneisses, in a belt 50 km wide and 100 km long in the Fiskenæsset region (fig. 28). The Fiskenæsset complex has given an Rb/Sr whole rock age of 2810 ± 120 m.y. (Alexander *et al.*, 1973), and gneisses which cut it have given an Rb/Sr whole rock age of 2880 ± 50 m.y. (Moorbath & Pankhurst, in press) and a U/Pb zircon age of 2835 ± 10 m.y. (Pidgeon *et al.*, 1976). A Pb/Pb whole rock age of 2810 ± 70 m.y. from both anorthosite and gneiss from Fiskenæsset has been interpreted as the age of metamorphism (Black *et al.*, 1973).

The Fiskenæsset complex was intruded as a sill into basic volcanic rocks which are now amphibolites (Escher & Myers, 1975). It was then disrupted by thrusting and the intrusion of sheets of granitoid rocks which are now gneisses (Myers, 1976a & b) and these rocks were repeatedly deformed and metamorphosed. These events confused and blurred the original igneous stratigraphy of the Fiskenæsset complex, and the complete stratigraphy is no longer intact at any one locality.

Early descriptions of parts of the stratigraphy of the Fiskenæsset complex were given by Gormsen (1971), Windley (1971), Windley *et al.* (1973) and Hutt (1974), and more recently by Myers (1975). During 1975 the author visited all the main outcrops of the Fiskenæsset complex in order to correlate the stratigraphy throughout the whole Fiskenæsset region. A large number of new sections were measured and mapped in detail, and previously described sections were reappraised in the light of newly discovered way-up structures and the overall stratigraphy and structure of the region.

The complete stratigraphy of the Fiskenæsset complex deduced from this field study is shown in Table 9, where it is compared with the stratigraphy described from Qeqertarssuat-