

## NOTES – NOTISER

### Deep-seated Volcanism along the Major Precambrian Breccia in South Norway

#### I. Degernes at Lake Vegår

JACQUES TOURET

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Brief petrographical description and chemical analysis of a hornblende and clinopyroxene-bearing peridotite occurring in the 'Great Bressia' between Bamble and Telemark areas. The age of intrusion is possibly westphalian (300 m.y.).

*Jacques Touret, Ecole Nationale Supérieure de Géologie Appliquée, B. P. No. 452, 54, Nancy, France*

Lake Vegår is situated on the great breccia zone from Porsgrunn to Kristiansand and is outlined by a tectonic net of mylonites with one branch approximately E–W, the other NE–SW. At the intersection of these two branches a circular neck of ultramafic rock protrudes as a truncated conical mound (see Fig. 1). The fact that the rock remains in relief is interesting, for the country was strongly glaciated and the contiguous mylonites were extremely eroded by the ice.

A thin section of a fresh specimen is shown in Fig. 2 (in most samples the olivine is considerably more altered). The determinations of the following minerals have only been done with an ordinary microscope and could be refined by other methods.

*Olivine* – about 30 % of the rock, plus some 10 % serpentine and alteration products deposited along cracks forming the familiar reticular pattern.  $2V$  is about  $90^\circ$ , corresponding to around 10 Fa. The crystals definitely present a tendency towards idiomorphism.

*Clinopyroxene* – about 30 %, slightly yellowish in section, sometimes twinned (polysynthetic or more seldomly hourglass twins), cleavage not well developed. The positive optical angle is about  $40\text{--}50^\circ$ , the extinction angle  $c : \gamma$  is about  $22^\circ$ , which is very small for an augite, and indicates a clinostatite.

*Barkevikitic brown hornblende* – about 20 %,  $2V\text{--}70^\circ$ , extinction angle about  $20^\circ$ , in very large poikiloblastic crystals. It contains numerous inclusions of saogenite.

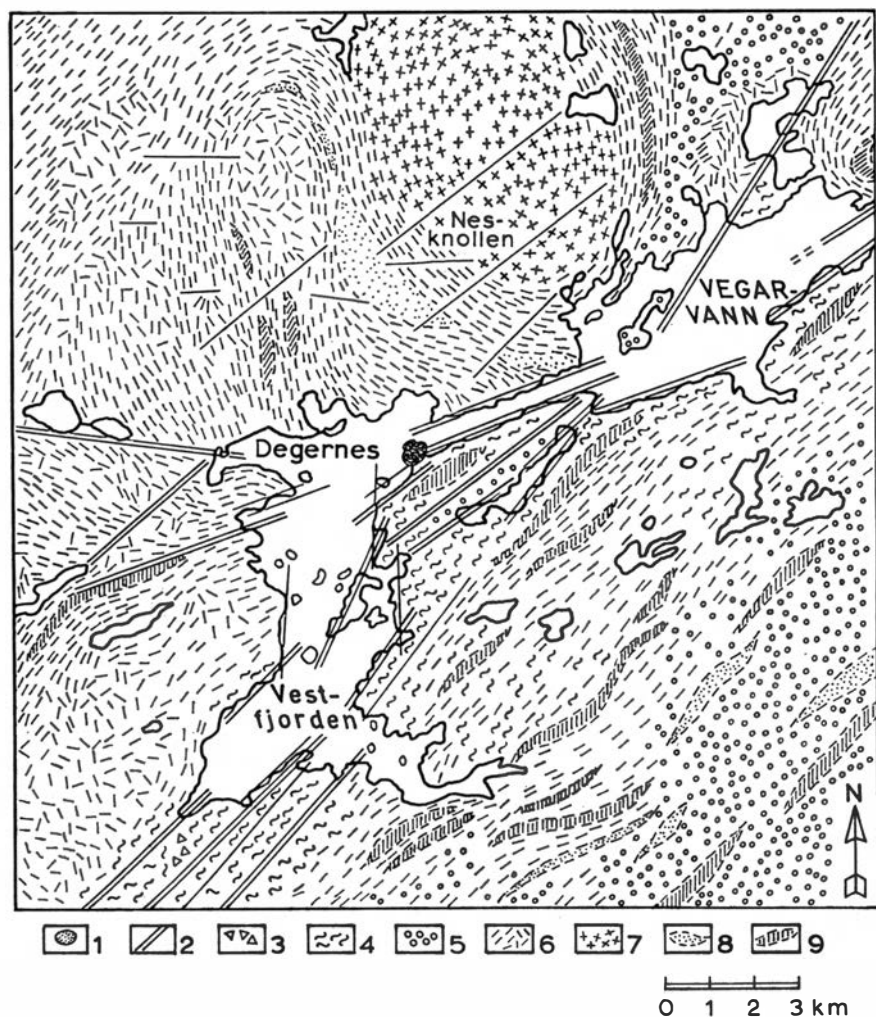


Fig. 1. The intrusive ultrabasite of Degernes and its geological environment. 1) Ultrabasite. - 2) Main lines of mylonites. - 3) Tectonic quartz breccias. - 4) Intensely folded and retromorphosed migmatites. - 5) Augen gneisses of Vegårshei and Gjerstad. - 6) Undifferentiated banded or nebulitic migmatites. - 7) Microfolded gneissic granodiorites (Nesknollen dôme). - 8) Quartzites. - 9) Amphibolites.

*Biotite* or *phlogopite* - strongly pleochroic, ( $\alpha$  pale yellow,  $\beta = \gamma$  reddish brown) occurs in smaller amounts, perhaps about 5 % of the rock.

In addition there are ore minerals, secondary calcite and alteration products.

From the mineralogy, the conspicuously coarse-grained structure, and the chemical composition (Table 1), the best name would be hornblende - clinopyroxene *peridotite*. The habit of the olivine crystals and the presence of micas indicate an affinity to kimberlite, but the typical texture of kimberlite is lacking.

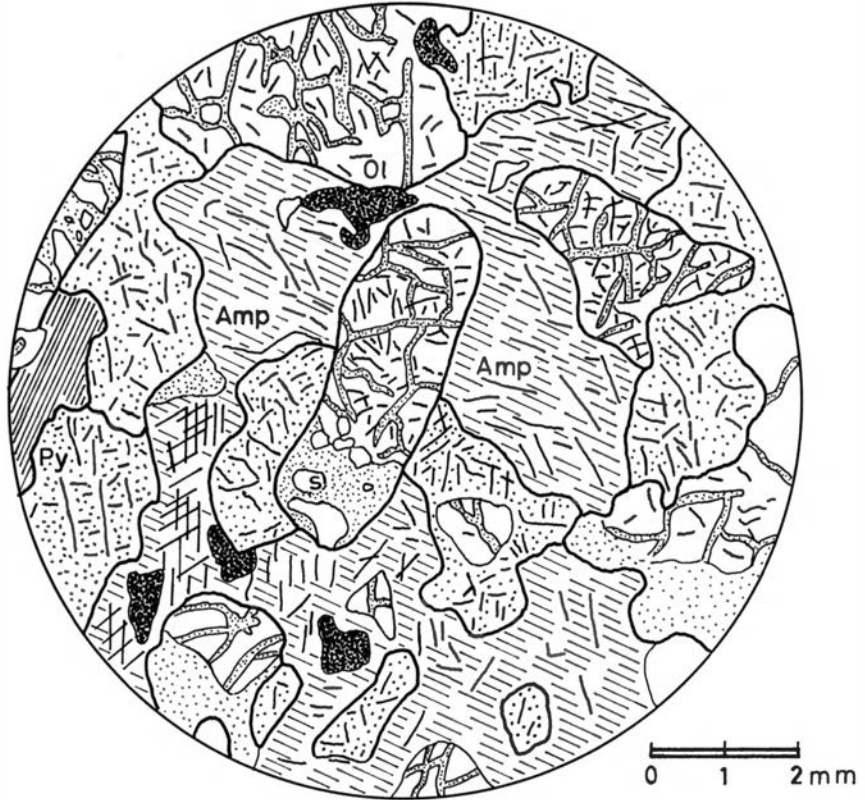


Fig. 2. Camera lucida drawing of Degernes ultrabasic intrusive.  
 Amp = Brown amphibole (barkevikite), poikiloblastic. - Ol = Mg-rich olivine partially altered into serpentine, etc. (s). - Py = Clinopyroxene (clinoenstatite).

Table 1. Geochemical data

Total Rock (1)	Mica (2)
SiO <sub>2</sub> : 35.52	K <sub>2</sub> O(%) : 4.12 K <sub>40</sub> (10 <sup>5</sup> g/at) : 74.847
TiO <sub>2</sub> : 2.28	A <sub>40</sub> (10 <sup>5</sup> g/at) : a) 1.47932 Age 311 my
Al <sub>2</sub> O <sub>3</sub> : 2.80	b) 1.40104 Age 295 my
Fe <sub>2</sub> O <sub>3</sub> : 7.18	Rb tot. (ppm): 205.57
FeO : 9.54	Sr tot. (ppm): 1019.85
MnO : 0.26	
MgO : 28.53	
CaO : 3.66	(1) Analysis: Centre de Recherches Pé-
Na <sub>2</sub> O : 0.38	trographiques et Géochimiques (C.R.
K <sub>2</sub> O : 0.32	P.G.), Department of Chemistry,
P <sub>2</sub> O <sub>5</sub> : 0.22	Nancy. (Analyst: S. Manzon)
CO <sub>2</sub> : 0.99	(2) Analysis: C.R.P.G., Department of
H <sub>2</sub> O (tot.) : 6.94	Mass Spectrometry, Nancy
Total : 99.34	
Loss on ignition : 8.65	

A similar rock of palaeozoic age, called hornblende peridotite from Lugar Sill, Scotland, is mentioned in Johannsen's *Descriptive Petrography* (1937), pages 416–18. Its chemical composition (Johannsen op. cit. Table 142, No. 2, p. 147) is very similar to that of the Degernes peridotite and differs only by a higher content in sodium.

The peridotite at Degernes might be an attendant on the Norwegian Palaeozoic volcanism, and material was therefore collected for age determinations. Preliminary results are now available for the mica (Table 1). Two measurements of  $K_{40}/Ar_{40}$  give ages of 311 my and 295 my, respectively, thus corresponding to the *Westphalian*, which in continental Europe is marked by strong orogenic plutonism (Asturian phase of the Hercynian orogeny). However, the surprisingly low content of potassium (4.12 %) remains to be explained and may indicate an unusual type of mica. Because of the high content of Sr (1019 ppm), Rb/Sr methods cannot be used. More work is necessary on the amphibole and total rock to establish a definite age.

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