NOTE – *NOTIS*

On the Mode of Formation of the Otta Serpentine Conglomerate

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In a recent paper entitled: 'Caledonian pyroclastic (?) serpentinite in central Norway' Oftedahl gives an interesting interpretation of the mode of formation of the Otta serpentine conglomerate; this forms a part of the eugeosynclinal Cambro-Ordovician sequence in the northern Gudbrandsdalen district, south Norway, in an area described by the present writer (Strand 1951). Over most of its distribution the Otta serpentine conglomerate is a pure serpentine rock, and where the serpentine has been changed into talc it is a talc rock or soapstone of economic value. However, the rock is not everywhere so pure; the writer has found outcrops with quartz-bearing talc rocks and boulders of light quartz-rich rock in the conglomerate. The outcrops of the serpentine rock are confined within a quadrangular area measuring 40 km ESE–WNW by nearly 15 km SSW–NNE. A minimum estimate of the original distribution must be twice its present extension. In places it contains a rich fauna indicating a late Lower Ordovician or early Middle Ordovician age.

All geologists who have studied the Otta serpentine rock in the field have recognized it as a supracrustal deposit at a distinct stratigraphic horizon, and prior to Oftedahl all regarded it as a conglomerate with boulders worn and rounded by water.

In his recent paper Oftedahl discusses the origin of the Otta serpentine rock and with some reservations suggests a pyroclastic origin. Citing the purity of the rock, he argues against its origin by the deposition of material transported from serpentine outcrops over intervening ground covered by other rocks, as in that case it would seem impossible for pure serpentine rocks to have formed. This argument is accepted by the present writer. It implies that serpentinite must have covered the area occupied by the conglomerate as a supracrustal, volcanic deposit (not necessarily of a pyroclastic nature).

Oftedahl's case for an essentially pyroclastic origin of the conglomerate seems less strong. To quote: 'The conglomerate should · · · by a pyroclastic deposit · · ·, perhaps most probably the result of gas jet action on already solid serpentinite. The assumption of such a phenomeneon is completely hypothetical at present.' The pyroclastic hypothesis is thus regarded as tentative. The wide extension of the conglomerate and the absence of any

observation of boulders with an angular or irregular form are arguments against the pyroclastic hypothesis, as is also the fossil content of the conglomerate rock.

Oftedahl describes the serpentinite rock in the Lalm-Sagflaten area studied by him as consisting of well-rounded to sub-rounded pebbles measuring on average 3 to 5 cm (with sizes down to 1 cm and up to 10 cm) in a fine-grained matrix. Outside the area studied by Oftedahl there are outcrops of conglomerate with larger boulders, measuring 30 to 40 cm with a maximum of 50 cm. The boulders are well-rounded and usually have an ellipsoidal shape, probably because of deformation. An easily accessible locality is at Dalen farm, north of Kvarberg, 1.5 km east of Vågåmo. Other good localities are a hillock 1 km ENE of the outlet of Lake Tesse, and a hill 1 km NE of Darthus seter, all within the area of the Vågå quadrangle map.

The writer has been impressed by the rounded form of the boulders in the serpentine rock and has never doubted that they were once rolled and rounded in moving water. Thus a combined volcanic-sedimæentary mode of origin of the rock seems probable. Formed as a layer of serpentinite on the earth's surface, it happened to be in shallow water subject to wave action. The serpentinite rock might have been fractured and thus would easily disintegrate, and the fragments of soft serpentinite could have been rounded in a rather short time.

According to this hypothesis one should expect to find somewhere remnants of the original serpentinite rock not disintegrated to form a conglomerate. According to Oftedahl (l. c., p. 309) field observations suggest a gradual transition between massive serpentinite and serpentine conglomerate. He also (p. 311) records a pure semiprecious serpentinite with bands of magnetite crystals, looking like a sediment. At a locality not far to the east of Oftedahl's area the writer observed and collected a massive serpentinite at the conglomerate horizon. An outcrop of serpentinite near the road at Darthus seter has puzzled the writer, because it is in the strike direction from an outcrop of serpentine conglomerate 1 km to the east, but is wholly massive, without any conglomerate structure.

The interpretation of the Otta serpentine rock as an originally volcanic deposit is the more probable as volcanic serpentinites have been testified from a number of other areas (for references to pertinent literature see Oftedahl). In the present area the serpentinite does not occur in direct connection with other basic volcanics, an underlying formation with basaltic volcanics being separated by an intervening polygeneous conglomerate.

Serpentine conglomerates are also known from other parts of the Scandinavian Caledonides. A local occurrence in Folldal (62° 10' N, 10° 43' E) may be at the same stratigraphic horizon as the Otta conglomerate (I. Rui, personal communication). In Västerbotten, Sweden (65° 30' N) a large number of outcrops of peridotite and peridotite conglomerate (partly serpentinized) occur as a lowermost stratigraphic unit (Rotik series) protruding

from beneath younger deposits. Here it seems possible that the ultrabasic bodies with conglomerates form a continuous layer, or did so originally (Kulling 1933, p. 256, p. 321, p. 368, and map).

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REFERENCES

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