DOLOMITE FROM THE MIDDLE ORDOVICIAN OF THE OSLO REGION

By

PER JØRGENSEN and NILS SPJELDNÆS

(Institutt for geologi, Blindern, Oslo, Norway)

The Cambro-Silurian carbonate rocks of the Oslo Region are usually calcitic (HOLTEDAHL 1912), and dolomites have not been reported. During a student excursion in 1963 the authors found a sediment from the Middle Ordovician Mjøsa Limestone which from its macroscopic lithology was suspected to be a dolomitic rock. This was confirmed by laboratory studies.

TABLE I.

The quantitative composition of different limestones (as parts of ten).

Sample	Locality	Calcite	Dolomite	Quartz	Mica
A	Mjøsa limestone. M. Torseter bridge, Brumundal. Sample 4	9	0	1	0
B	Mjøsa limestone, Sund Einavann	7	0	3	0
C	Encrinite Limestone Kjørholt kalkbrudd (old.).	9	tr.	1	0
D	Limestone from Hole Kalkbrudd. Brown colour	3	5	2	0
E	Limestone from Hole Kalkbrudd. Yellowish grey colour	2½	5½	1½	½
F	Limestone from Hole Kalkbrudd. Dark yellowish grey colour	4½	5	½	0
G	Limestone from Hole Kalkbrudd. Light grey and yellowish colour	8	1½	½	0

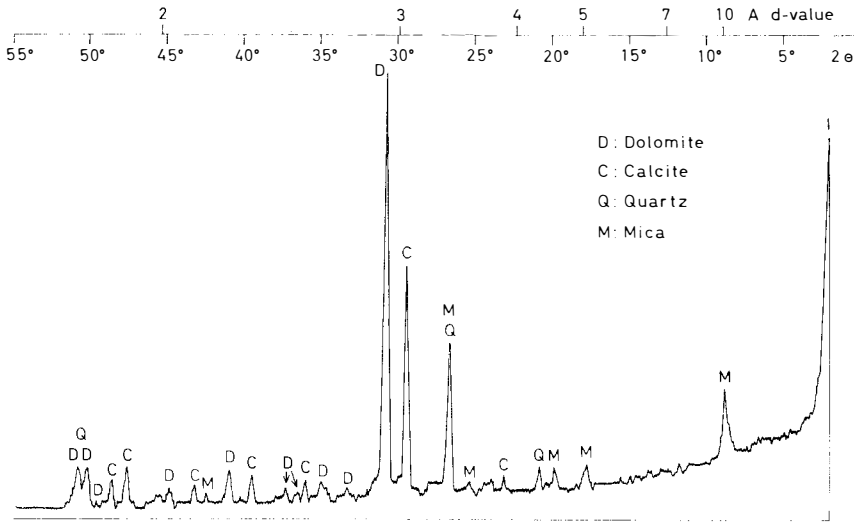

Fig. 1. Diffraction curve for a carbonate rock from Hole kalkbrudd (Sample E in Table I).

Method: Slices of the rocks were cut and used directly for x-raying. This can, because of preferential orientation, often give some changes in the relative intensities of the different reflections.

We used a Philips diffractometer (PW 1050/PW 1051) having Ni-filtered CuKα radiation and a scanning speed of 2° 2 Θ per minute. One diffraction curve is shown in Fig. 1. The quantitative compositions of the different samples were estimated by using the working curve in TENNANT & BERGER's work (1957). The semi-quantitative results are given in Table 1 as parts of ten.

The rock was found in the western quarry of Hole Kalkverk, near Bøverbru in Toten (W. of the lake Mjøsa, ab. 80 kms N. of Oslo). Here a considerable thickness of the rock is a limestone spotted with irregular, brownish-yellow lenses, which make up 5—40% of the whole rock. The lenses, which consist partly of dolomite, are arranged in layers parallel to the bedding, and indicate a dolomitisation of an original limestone. Above this spotted rock, close to the upper contact of the carbonate horizon, the rock is more uniformly brown, with some spots of lighter and darker shades. This rock is also rich in dolomite (Sample D, Table I). The dolomitic lenses are greyish/yellow, and contrast against the grey limestone (colour index 5Y7/2 for dolomite,

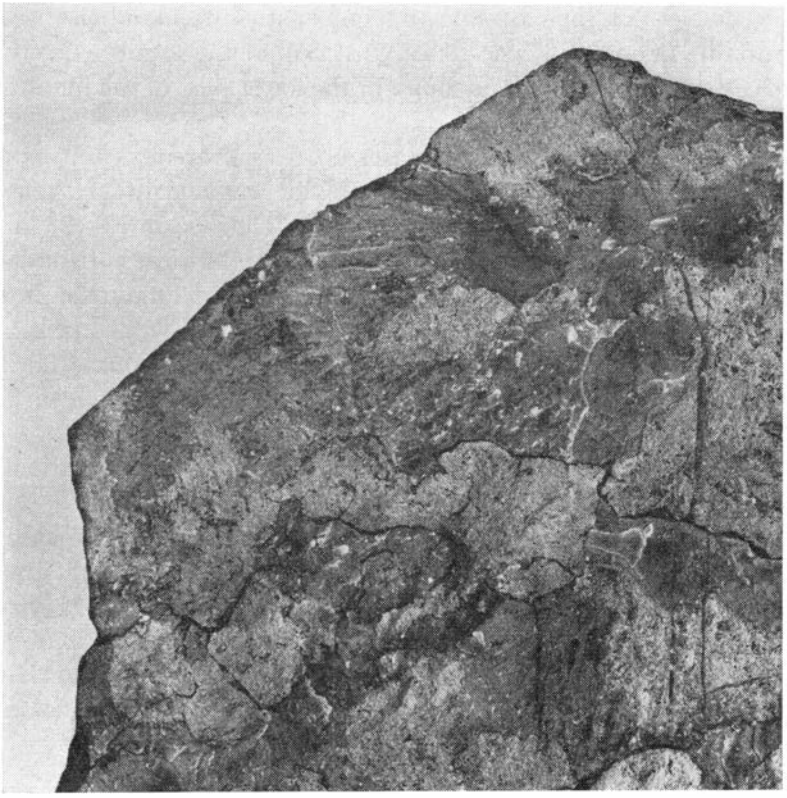

Fig. 2. Photograph of a slab from Hole Kalkverk, showing dolomite (light) in limestone (Sample G in Table I). Natural size.

5GY5/1 for limestone). The border between the two types of rock is usually a stylolite-like, irregular shale film, but in some cases it is diffuse. Calcite grains are common in the dolomitic rock, most of them being echinoderm fragments, which appearently have not been dolomitized because of the large size of the crystals.

The dolomite is found in the Mjøsa Limestone, the uppermost part of the Middle Ordovician in this Region. The detailed stratigraphy has not been worked out in this area, and the discrimination between the Mjøsa Limestone and the Furuberg Formation below is difficult. Above the Mjøsa Limestone is the Silurian Helgøy Quartzite, which rests on the Mjøsa Limestone with a distinct erosional disconformity, in some localities developed as carst-like cavities (cf. SKJESETH 1963

p. 68, 76, figs. 23, 27—28). Such disconformities are found also within the Middle Ordovician limestones. Just SW of the locality described here a 5 meter deep cavity is found in the lower part of the limestone. It is filled with limestone debris.

The limestones are in most cases coarse calcarenites (intra- and biosparites) with some fossils, especially echinoderm fragments, *Solenopora* and *Liopora*. In other localities (Helgøya in Nes 23 km E of Hole) stromatoporoid bioherms are found in this horizon also. Rapid facies variations are characteristic of these limestones in the Mjøsa District, and since they are limited upwards by a considerable erosional disconformity, it is not evident that the dolomite horizon is in the original uppermost part of the Mjøsa Limestone, even if it is now just below the contact to the Silurian.

Being deposited in shallow, warm water, and under conditions of fluctuating sea level, (cf. SPJELDNÆS 1961, pp. 51, 72), the Mjøsa Limestone would be among the horizons most strongly exposed to dolomitization in the Oslo Region. The corresponding beds in Esthonia (The Vasalemma beds) are also dolomitized, and beds in North America with about the same fauna are also often dolomitized.

A rapid search for dolomite in the same horizon in other localities was almost negative, only traces, and very small spots of dolomite were found (cf. Table I).

According to HOLTEDAHL (1912, p. 65, 69) the carbonate rocks of the Oslo Region are very poor in magnesia (less than 1% MgO). One of the very few analyses given (HOLTEDAHL 1912, p. 60) which shows more magnesia (1,74% MgO, corresponding to about 6% dolomite) is from Sivesind in Toten, which is very close to Hole Kalkverk.

The presence of dolomite in the Middle Ordovician carbonate rocks of the Oslo Region might have some economic importance, because they are quarried intensively, and used both for agricultural and industrial purposes.

REFERENCES

HOLTEDAHL, O., 1912. Kalkstensforekomster i Kristianiafeltet (with english summary). Norges Geol. Unders. *63*, 69 pp. 8 pls. Kristiania (Oslo).

SKJESETH, S., 1963. Contributions to the Geology of the Mjøsa Districts and the classical Sparagmite Area in Southern Norway. Norges Geol. Unders. *220*, 126 pp. 2 pls. Oslo.

SPJELDNÆS, N., 1961. Ordovician Climatic Zones. Norsk Geol. Tidsskr. *41*, pp. 45—77. Bergen.

TENNANT, C. B. and BERGER, R. W. 1957. X-ray determination of dolomite-calcite ratio of a carbonate rock. Am. Mineralogist, v. 42, pp. 23—29. Menasha, Wis.

Accepted for publication May 1964.

Printed October 1964.