NOTES AND NEWS

"CASTELLATED DOLOMITES" FROM MAJOR COUNTY, OKLAHOMA

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Dolomite in pyramidal-like forms was discovered in Major County, Oklahoma, by geologists on a field trip sponsored by the Oklahoma Geological Survey in April 1930. The unusual appearance of these specimens gave rise to the name, "castellated dolomites" and it is by this term that they are now known. They obviously are pseudomorphs as the forms are ones that could not be present on crystals of dolomite.

The "castellated dolomites" are abundant in Sec. 36, T. 22 N., R. 15 W., which locality is a few miles from the town of Sherman. The forms are found in the upper dolomite bed of the Dog Creek shales (Permian). This carbonate layer is dense, gray colored and varies from one to three inches in thickness. Its composition is essentially the same as that of the pyramidal-like forms. These latter are present in the dolomite bed, and as loose forms which have been separated from the rock by weathering.

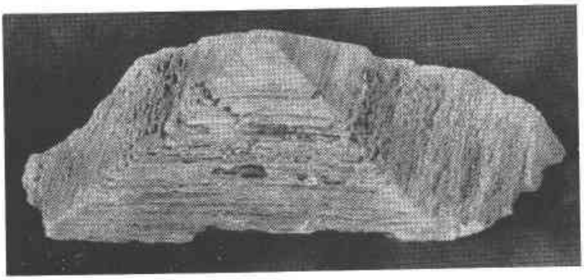

Fig. 1

The "castellated dolomites" vary in size from one-half inch to five inches along an edge. They are gray on fresh surfaces and a brown gray on weathered planes, the latter color being due to a slight iron oxide coating. The forms are of three types, namely, (1) single pyramidal-like forms (Fig. 1); (2) pyramidal forms of the first type but aggregated together in groups of two, three or four with the individuals meeting at a common central point (Fig. 2); and (3) cube-like forms, many of which exhibit hopper-shaped depressions (Fig. 3).

Microscopic studies of the specimens show that they are composed of a mosaic of minute dolomite crystals. Fine quartz and clay are distributed irregularly throughout the dolomite, but also form in thin bands. These bands are more resistant to weathering than the carbonate and therefore produce the laminated appearance so characteristic of these specimens. One small grain of blue tourmaline (elbaite) and a few shreds of chlorite were observed in the thin sections. The dolomite crystals are less than 0.01 mm. in size and the quartz varies from 0.01 to 0.1 mm. The latter mineral is angular to sub-angular in shape.

The interfacial angles vary from 45° to 65° in the pyramidal types and from 80° to 90° in the cube-like forms. This wide variation robs the

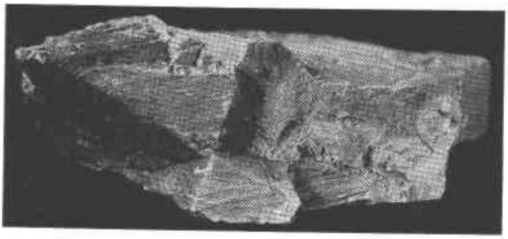

Fig. 2

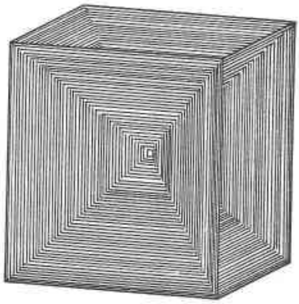

Fig. 3

angles of any value they might have as criterion indicating the character of the original mineral. Apparently the pseudomorphic changes have not operated along precise crystallographic directions.

Chemical analyses of the pyramidal-like forms gave the following results:

	1*	2*
SiO_2	10.60%	9.90%
FeO, Fe_2O_3 } as Fe_2O_3	0.93	0.79
Al_2O_3	2.56	2.00
MnO	0.13	0.61
CaO	26.50	27.90
MgO	18.66	17.05
Cl	trace	0.52
Na	trace	0.34
CO_2	41.15	40.50
total	100.53	99.61

* Analyses by Locke of the Oklahoma Geological Survey.

The results of the chemical and microscopic studies suggest that the iron and manganese are present as isomorphous replacements in the dolomite. The silica is chiefly in the form of quartz, but to a minor extent as clayey aluminum silicates whose exact characters were not determined.

The presence of NaCl in some of the specimens and the cube-like forms with hopper depressions indicate that the original mineral was halite. The manner in which the pyramidal-like forms aggregate together (Fig. 2) suggests that these shapes resulted from the filling of the hopper cavities of halite cubes of the type illustrated in Fig. 3. The cube has six hoppers and the filling of these would give rise to six hopper casts all meeting at a common center. By weathering these could be separated into single forms or aggregates of two, three, four or five casts.

The pyramidal-like form is thus considered to be a pseudomorphic cast of one hopper depression of an unusually large halite cube. The dolomite cast may represent the original filling of the hopper cavity or the carbonate may have replaced some other material such as sand and clay which previously had occupied this space. The presence of fine quartz and clay in the specimens lends some support to the second alternative.

The variation in the interfacial angles of the pyramidal types indicates that the filling of the hoppers did not take place along exact crystallographic lines, which is a feature that the writer finds difficulty in explaining. Differences in the shapes of the hopper depressions and consequently in the interfacial angles might result from uneven solution of the halite. However, such solution should produce uneven planes and edges whereas the dolomite casts have clearcut planes and sharp edges. The variations of the interfacial angles of the cubes is likewise a problem.

Another confusing feature is the orientation of the fine bands of quartz and clay which produce the laminated appearance of the forms. If this clastic material was deposited by sedimentary processes in the hopper depressions of halite cubes, the layers so formed should be essentially horizontal, whereas the fine laminae actually are parallel to the bases of the pyramidal casts. The bands are thus in three distinct planes, two vertical and one horizontal and all three approximately at right angles to one another. A tentative explanation is that the halite cubes were being moved and turned by waves or currents while the clastic material was being deposited. If this were the case, first one hopper and then another would be faced upwards in the sea and filled with the settling sediments.

Cubes and hopper-shaped cubes of red sandy shale have been described by Evans[1] as occuring in Sec. 27, T. 24 N., R. 8 W., in Garfield County.

[1] Evans, O. F., *Oklahoma Academy of Science*, p. 120, **1928**.

This locality is approximately forty-five miles from the one discussed in this paper but the two occurrences have many similarities. Their origins are probably the same, except that in one case the shale pseudomorphic casts were replaced by dolomite and in the other case they were not.

Two other similar forms are in the Oklahoma Geological Survey collections. One is a gray shale from Sec. 24, T. 21 N., R. 15 W., and the other is a pinkish shale from Sec. 34, T. 22 N., R. 1 W. The forms apparently are rather widespread in the Permian of Oklahoma.

CUMMINGTONITE FROM THE BLACK HILLS, SOUTH DAKOTA

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INTRODUCTION

The mineral cummingtonite occurs abundantly in the Homestake mine, Lead, South Dakota, and likewise to the north of this locality. It also occurs near Rochford, twenty miles southwest of Lead. The cummingtonite is developed in iron-magnesium carbonate horizons in pre-Cambrian schists. It has been described[1] as due to regional metamorphism and to direct reaction between the original iron-magnesium carbonate (sideroplesite) grains and associated grains of sedimentary quartz. However, recent mapping by the geological department of the Homestake Mining Company has shown cummingtonite to be developed only locally and to be associated with original unaltered quartz grains. It is closely related to ore minerals and shows none of the fracturing that might be expected if it had been subjected to regional stresses. In view of this, an alternative hypothesis is that the cummingtonite was formed by the action of hot silica-bearing solutions on sideroplesite. Some of the cummingtonite replaces minerals of known hydrothermal origin.

The greatest metamorphic intensity in the vicinity of Lead occurs about three miles to the northeast of the Homestake mine. Here the cummingtonite seems to be more strongly developed than in the mine. Specimens were collected in regular sequence southward to the mine from this more highly metamorphosed area by Mr. James A. Noble, chief geologist for the Homestake Mining Company. The writer has studied these in order to discover any progressive variations in chemical composition or physical properties which might throw light on the origin of the cummingtonite. This regular variation was not found, however; even the four specimens of cummingtonite taken from near Rochford,

[1] Gustafson, J. K., Metamorphism and hydrothermal alteration of the Homestake gold-bearing formation: *Econ. Geology*, vol. **28**, p. 133, 1933.