dices was accordingly undertaken. For this purpose it was necessary to use the phenocrysts, a few of which were picked out of a pantelleritic lava from Lake Niavasha, powdered, and the indices determined by the method of matching in immersion media. No great accuracy is obtainable in a mineral with such strong absorption. The results in sodium light are as follows: $\alpha = 1.81 \pm .01$ (in substantial agreement with Larsen), $\beta = 1.82 \pm .01$ and $\gamma = 1.88 \pm .015$.[8] The optic axial angle 2V is therefore small and positive, a relation generally accepted for aenigmatite. The maximum extinction angle in the zone of the cleavages is 38° and the pleochroism very strong, α = yellow brown, β = brown, γ = deep brown to black.

The refractive indices of three other aenigmatites were measured, one from Pantelleria, one from Kangerdluarsuk, Greenland, and one from Chibina-Tundra, all obtained from the U. S. National Museum through the kindess of Dr. Foshag. Although there is considerable variation of composition, the same values of the refractive indices, within the large limits of error stated, seem to suit all of them.

Aenigmatite is thus a mineral of high rather than low birefringence.

NOTES ON MINERALIZATION AT CRESTMORE, CALIFORNIA

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Recently, in connection with short field trips to the Crestmore quarries several interesting specimens have been collected which reveal some phases of mineralization heretofore unrecorded.

On one trip a large sample of sulphide ore in contact with coarse grained marble was obtained, which came from recent underground workings of the Riverside Cement Company. The sulphide mass is fine grained and bronze-brown in color. It is slightly banded parallel to the marble contact and bedding, suggesting replacement of the marble. Several sections of the sulphides were polished and examined in reflected light. Such study revealed the banding to be due to segregations into blebby stringers and layers of pyrrhotite and chalcopyrite in sphalerite, the last mineral forming the continuous matrix. A few cross veinlets of chalcopyrite cut the other two sulphides. Likewise there is evidence that the sphalerite replaced the pyrrhotite. Also scattered sparingly through the mass are small lenses of hard sulphide. These were found to consist of centers of

[8] The absorption of γ for yellow light is very great. In red light the mineral does not approach opacity so closely for that ray and conviction of the high value of γ is somewhat more readily reached by using red light.

löllingite surrounded and replaced by arsenopyrite which maintains diamond shaped outlines against the matrix of softer sulphides. This is the first mention of löllingite from Crestmore. The genetic sequence thus established for these minerals is: löllingite, arsenopyrite, pyrrhotite, sphalerite, and chalcopyrite.

During the same visits to Crestmore numerous miarolitic cavities were collected from along the north end of the bold face in the Commercial rock quarry. The cavities are irregular and sharply angular in outline, resembling true contraction structures. They exist along a shattered contact between an offshoot of the quartz monzonite porphyry and blue limestone and garnet rock. The rock in which the cavities occur is coarse grained and composed of microcline, quartz, epidote, and brown garnet. The cavities are as much as eight or ten inches in diameter. Microcline, which is the principal mineral, forms stout crystals up to one inch in length. Less abundant are glassy quartz and green epidote crystals ranging up to nearly an inch in length. Both epidote and garnet in numerous small crystals approaching a druse, coat the microcline in many of the cavities.

Euhedral idocrase is well known in the contact rock associated with blue calcite and diopside. Little has been recorded as to the size of these crystals and most of them are under one or two inches in diameter. Recently the writer obtained a nearly complete idocrase crystal made up dominantly of first and second order unit dipyramids with a horizontal diameter of nearly six inches, and a vertical dimension of three inches.

Several specimens have been collected of idocrase and diopside contact-rock which are cut by veins of sky-blue calcite exactly like that of the sky-blue limestone. Eakle[1] suggested the color of the latter was due to carbonaceous material but Daly[2] noted that although occasional graphite flakes were present, the color was not related to the bedding but was sporadic and more intense near the quartz monzonite dikes. This together with its occurrence in primary veins seems to indicate coloration by magmatic introductions into the limestones rather than by substances already present.

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[1] Eakle, A. S., Minerals associated with crystalline limestone at Crestmore, Calif.: *Bull. Dept. of Geol., Univ. of Calif. Pub.*, vol. **10**, p. 343, 1917.

[2] Daly, J. W., A masters thesis presented to the California Institute of Technology, 1931.