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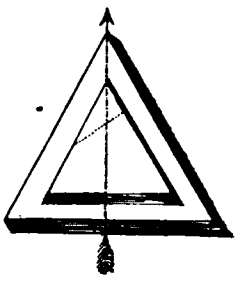
Art. XXXIV.—*Optical and Blowpipe Examination of the supposed Chlorite of Chester County, Pa.;* by W. P. Blake.

Read before the American Association for the Advancement of Science, at Albany, August, 1851.

In September, 1850, Prof. B. Silliman, Jr., handed me a specimen of a beautiful green foliated mineral for optical examination; it was unexpectedly found to be biaxial; but as the locality of the specimen was not known, no further examination than the measurement of the angles was made at that time. In May, of this year, I received from Prof. J. D. Dana specimens of the hitherto supposed chlorite, of Chester Co., Pa., which I examined by polarized light, and obtained results so similar to those obtained with the specimen first referred to, as to leave no doubt of its being from the same locality.*

The mineral occurs three miles south of West Chester, in serpentine associated with magnesite, and is found in plates of irregular outline, sometimes three inches broad, and in triangular plates and tabular masses, one of which is represented in the annexed figure. These plates are equilateral triangles; and they much resemble the triangular cleavage specimens of the micas from Greenwood furnace and Monroe, N. Y. The cleavage is perfect, parallel with the broad faces of these crystals, but is not so perfect as in mica, and the laminæ are more brittle. The laminæ are flexible and elastic, but less elastic than mica. Color, beautiful emerald green. Hardness of cleavage surface, 2 to 2·25, scale of Mohs. Specific gravity 2·714, which is perhaps too low, as no specimen could be obtained perfectly free from air.



Optically it is biaxial, with a high angle, and the following are the results obtained:

Specimen *a*, examined in September, plate one decimetre long and six centimetres broad, with an irregular outline.

Specimen *b*, a triangular plate measuring one and one-fourth inches along each side, examined in May.

Apparent angle between the optic axes in *a*, 84°·30′ mean of nine measurements.

Apparent angle in *b*, 85°·59′ mean of five measurements.

The plane of the axes is perpendicular to the cleavage surface and at right angles with the base of the triangle, as indicated by the arrow in the figure. I was also able to obtain evidences of

* Prof. Dana received his specimen from Thos. F. Seal, of Philadelphia.

optic axes in the angle of the plate opposite to the base, and found them to have an equal inclination with *b*; and the plane of these axes was found to form an angle of about 60° with the plane of the others, or to be at right angles with one of the sides of the triangle, (which is as near the angle as could be determined by marking the direction upon the plate and subsequent measurement by goniometer and protractor,) this peculiar relation of two systems of optic axes, had been noticed in *a* also, and there is probably a line of composition in most of the crystals from the locality. The position of this line is represented by the shorter dotted line in the figure.

Another interesting peculiarity is, that the optic axes are ***not equally inclined to the cleavage surface***, or to a line perpendicular to it, (the "normal" of Biot.) The inclinations were measured, but as the instrument had not been adapted to this mode of measurement, the angles given can be regarded only as approximations, and are here given merely to show the existing inequality of the inclinations.

Spec. *a* gave the angles . . . 50° and 34°.
" *b* " " " . . . 58°·13′ and 27°·40′.

The greater angle being on the side of the "normal" adjoining the base of the plate or triangle.

From these results the mineral must be referred to one of the systems of crystallization having the three axes unequal,—and it cannot therefore be classed with the species chlorite or ripidolite, which according to authors is rhombohedral or hexagonal. The Ala chlorite was examined optically by Biot and reported to be *uniaxial.*

It is here interesting to observe that we have this undoubtedly *clinometric* mineral with such a peculiarly high angle between the optic axes, occurring in triangular plates and masses so much resembling the micas from Monroe, N. Y., whose biaxial character is so difficult of determination, and which by reason of this form have been referred by some eminent crystallographers to the rhombohedral system. The form in both cases may be considered as resulting from an acute oblique rhombic prism by the replacement of the acute solid angles.*

Examined with the blowpipe the mineral gives the following reactions.

B.B. in the forceps, contracts and becomes opaque and white, with traces of fusion on the edges. Alone, on charcoal, same as with forceps. In an open tube, gives off water, and a white ring is formed near the assay when strongly heated. With borax in the oxydating flame, dissolves readily with much ebullition; the glass while hot, red and brownish, but becomes

* Dana's Mineralogy, 1st edition, p. 264, and Am. Jour Sci., 2d Ser., xii, p. 8.

green when cold; in the reducing flame, while hot, color not so deep as in the oxydating flame, and passes through the shades of olive green while cooling, to beautiful emerald green when cold. With phosphate of soda and ammonia in the oxydating flame, dissolves slowly, leaving a skeleton of the fragments; glass red and yellowish while hot, fine green when cold. When much of the assay is added, the glass becomes opalescent to opaque when cooling; in the reducing flame, skeleton disappears, bead brown while hot, opalescent and green while cold. With carbonate of soda on platina foil, no reaction for manganese.

The constituents of the mineral so far as indicated by the above reactions are, H, Si, Cr, Fe. Analyses are now in progress at the Yale Analytical Laboratory.

In addition to the optical character, the mineral is shown to differ from chlorite in hardness and elasticity, and by the presence of chromium.

I propose for the species the name *Clinochlore*, in allusion to the great obliquity between the optic axes, and its green color resembling that of chlorite.

A similar mineral from Unionville occurring in triangular and hexagonal forms, I have found to be biaxial and probably like the above; but I have not yet succeeded in obtaining any measurements.

ART. XXXV.—*Notes of a Discussion of Tidal Observations made in Connection with the Coast Survey, at Cat Island, in the Gulf of Mexico;* by Prof. A. D. BACHE, Superintendent,* with five plates.

IN executing the hydrography of the entrance of Mobile Bay and of Mississippi Sound, connected tidal observations were made under the immediate direction of Lieut. Comd'g. C. P. Patterson, U. S. N., Assistant in the Coast Survey.

The observations at Cat Island, at the entrance to Lake Borgne, Louisiana, and at Fort Morgan, at the entrance to Mobile Bay, have undergone more than one discussion, the peculiarities of the tides giving great interest to the observations.

The results, as obtained from a year's hourly observations day and night at Cat Island, will be given as far as obtained, the steps taken for further progress stated, and the information which has been obtained from other sources bearing upon this most interesting problem of the tides in the Gulf of Mexico, will be briefly touched upon.

* From the Proceedings of the American Association for the Advancement of Science, 4th meeting at New Haven, 1850, p. 281. Revised by the author for this Journal.