CRYSTALLOGRAPHIC NOTES ON CALCITE

By J. E. POGUE

Assistant Curator, Division of Mineralogy, U. S. National Museum

With Two Plates

(1) Calcite from Joplin, Missouri

Although the Joplin calcites have been very completely described by Farrington,[1] two specimens in the U. S. National Museum present features of sufficient difference and interest to warrant a brief note.

The first of these, bearing the National Museum number 84435, and represented in its true proportions in plate LIII, figure 1, is composed of the scalenohedron v $(21\bar{3}1)$, modified by the positive rhombohedron r $(10\bar{1}1)$, and the rarer scalenohedrons σ $(51\bar{6}4)$ and C $(61\bar{7}8)$. This crystal is similar in appearance to one figured by Farrington,[2] but in the latter the modifying scalenohedrons are w $(31\bar{4}5)$ and n $(41\bar{5}3)$. The measurements upon which the identification of the forms are based, made by the contact goniometer, are as follows:

	Measured (contact).	Theoretical.
$v : r = 21\bar{3}1 : 10\bar{1}1 =$	29°	29° 2′
$r : r' = 10\bar{1}1 : \bar{1}101 =$	75°	74° 55′
$v : v' = 21\bar{3}1 : \bar{2}3\bar{1}1 =$	75°	75° 22′
$v : \sigma = 21\bar{3}1 : 51\bar{6}4 =$	17°–18°	17° 30′
$\sigma : \sigma' = 51\bar{6}4 : \bar{5}61\bar{4} =$	77°	77° 54′
$\sigma : \sigma^v = 51\bar{6}4 : 61\bar{5}4 =$	15°	14° 27′
$v : C^v = 21\bar{3}1 : 71\bar{6}8 =$	37°–38°	37° 47′
$C : C' = 61\bar{7}8 : \bar{6}71\bar{8} =$	60°	59° 47′
$C : C^v = 61\bar{7}8 : 71\bar{0}8 =$	10°	9° 32′

This type, represented by two specimens in the collection, is of a honey-yellow color and about 8 cm. in length. Numerous cleavage cracks intersect within the crystal and reflect the light as the crystal is revolved. The faces r, σ, and C are dull; v, bright. Three faces of the scalenohedron v, as shown in the drawing, are stippled with

[1] Publ. Field Columb. Mus., Geol. Ser., vol. 1 (1900), pp. 232–41.

[2] *Ibid.*, plate XXIX, fig. 1.

marcasite in a most interesting manner. This forms a sandpaper-like surface, which extends to within 4 mm. of the edges $v\,\sigma$, where an even line of demarkation separates the stippled part from the remaining bright portion of the faces. This line runs parallel to $v\,\sigma$ to within a few millimeters of the sharp edges, $v\,v'$ and $v^{iv}v^{v}$, and then bends down in a direction roughly parallel to the cleavage, intersecting the edges at a sharp angle. Also, from the same sharp edges occasional narrow bands, lacking the stippling, extend toward the blunt edges in a direction parallel to the cleavage. The three back faces, v^{ii}, v^{iii}, and v^{iv}, are entirely wanting in marcasite. This mineral is confined to the surface of the crystal and must have been deposited after the growth of the calcite was completed or nearly completed; yet it is entirely controlled in its distribution by the crystallographic relations of the host crystal.

The second crystal described bears the Museum number 84435, and is shown in its natural development in plate LIII, figure 2. This is made up of the scalenohedron v $(21\bar{3}1)$ and negative rhombohedron e $(01\bar{1}2)$, modified by the rhombohedron l $(04\bar{4}5)$ and the scalenohedron t $(21\bar{3}4)$, and is a combination of Farrington's[1] type 1, composed of v and t, and type 2, composed of v and e. By a parallel shifting of vv^{v} and corresponding edges, the alternate t faces are distorted into long, narrow planes, which, on account of their small inclination to e and the striations of the latter, are not prominent. The crystal is of a honey-yellow color and in numerous positions is brilliantly illuminated from within by light reflected from a network of cleavage cracks. The v faces are all peculiarly marked, as shown in the drawing.

The measurements, made by contact, are as follows:

	Measured (contact).	Theoretical.
$v : l = 21\bar{3}1 : 04\bar{4}5 =$	44°	44° 6′
$e : l = 01\bar{1}2 : 04\bar{4}5 =$	12°	12° 2′
$e : v = 01\bar{1}2 : 21\bar{3}1 =$	45°–52°	50° 36′
$v : l^{v} = 21\bar{3}1 : 3\bar{1}24 =$	47°	45° 31′

(2) CALCITE WITH MOVING BUBBLE, FROM GUANAJUATO, MEXICO

A calcite twin from Guanajuato, Mexico, bearing the National Museum number 75672, is shown in its true size and development in plate LIV, figure 1. The form shows the scalenohedron v $(21\bar{3}1)$, terminated above by the negative rhombohedron e $(01\bar{1}2)$, which,

[1] Publ. Field Columb. Mus., Geol. Ser., vol. 1 (1900), pp. 233–34.

imperfectly developed at the lower end of the crystal, appears here by a mere rounding. The crystal is twinned parallel to the basal plane *c* (0001), following a common law for calcite. The feature of interest is a moving bubble, which has a free course over the area outlined by dots in the drawing. This space is roughly rectilinear in shape, about 16 x 6.5 mm. in size, and is situated 1 to 3 mm. beneath and parallel to the surface; its edge of greatest length is also approximately parallel to edge $\underline{vv'}$ of the crystal. The space is apparently located in a definite manner in regard to the orientation of the calcite.

Complex twins from the same locality have been described by Pirsson.[1]

(3) Calcite from Virgilina, Virginia

A small suite of calcite crystals have been found in the Virgilina copper district of Virginia by Dr. F. B. Laney, who kindly placed the material at the disposal of the writer. As no descriptions of calcite from this locality, so far as the writer knows, appear in the literature, a brief note is deemed desirable.

Crystallized calcite occurs at the High Hill Copper Mine, Halifax County, Virginia, about nine miles north of Virgilina. It is found in small cavities or vuggs, distributed at irregular intervals in a quartz vein 4 to 8 feet in width, which traverses a greenstone schist (probably a mashed andesitic tuff). The crystals are rare and are associated with crystalline quartz, cuprite, malachite, and one or more other copper minerals. The mine is 300 feet deep, but the depth from which the present specimens were obtained is not known. Massive calcite as a gangue is not common at this mine, though very prominent at the Blue Wing Mine in the same district.[2] The crystals range in size from 1 to 7 mm. in greatest length and occur in two distinct types.

Type 1, shown enlarged in plate LIV, figure 2, is rarer and smaller than type 2 (figs. 3 and 4). The former is very simple, being a combination of the positive rhombohedron *r* ($10\bar{1}1$) and the rare scalenohedron *G*: ($72\bar{9}5$).[3] This form was noted by Farrington and Tillotson[4] on calcite from Joplin, and by Palache[5] on calcite from the copper mines of Lake Superior, but has not otherwise been described on

[1] Amer. Journ. Sci., vol. 41 (1891), pp. 61–64.

[2] For these details of occurrence the writer is indebted to Dr. Laney.

[3] Goldschmidt's symbol. This form is not given in Dana's Mineralogy.

[4] Publ. Field Columb. Mus., Geol. Ser., vol. 3 (1908), p. 141.

[5] Zeitschr. für Kryst., vol. 24 (1895), p. 589; Mich. Geol. Survey, vol. 6, pt. 2 (1898), p. 168.

American calcite. *r* is dull and *G:* is fairly brilliant, though its signal is not well defined. The measurements upon which the identification is based are as follows:

	Measured.	Theoretical.
$G:G:' = (72\bar{9}5) : (\bar{7}9\bar{2}5) =$	78° 16′	78° 3′
$G:G:^{v} = (72\bar{9}5) : (9\bar{2}\bar{7}5) =$	21° 0′	20° 44′
$r:G: = (10\bar{1}1) : (72\bar{9}5) =$	17° 8′	17° 36′

Type 2, an average crystal of which, enlarged, is shown in orthographic projection in plate LIV, figure 3, and in clinographic projection in figure 4, is the common type. It occurs very symmetrically developed and is composed of the scalenohedron *y* $(32\bar{5}1)$ and the negative rhombohedron *e* $(01\bar{1}2)$, modified by the positive rhombohedrons *r* $(10\bar{1}1)$ and *k* $(50\bar{5}2)$, and the rare scalenohedron *G:* $(72\bar{9}5)$. *e* is deeply striated parallel to *rr'*; *r*, *k*, and *G:* are dull, and *y* only slightly lustrous. The crystals were measured by the reflection goniometer, but as direct reflections could not be obtained, the measurements were made by bringing the faces into parallel alignment with the vertical cross-hair. This method gave readings only slightly more accurate than those obtained by contact on larger crystals, but such were sufficient to identify the forms. The identification of *G:* was strengthened by its more accurate determination on type 1. The faces of the scalenohedron *y* have a tendency toward rounding, so that the edges between the upper and lower faces are not always well developed; hence the crystals have a barrel-shaped appearance.

The specimens described have been placed in the National Museum collections under the number 86574.

EXPLANATION OF PLATES

PLATE LIII, Fig. 1.—Joplin calcite, showing peculiar stippling of marcasite. Natural size. Nat. Mus. No. 84435.

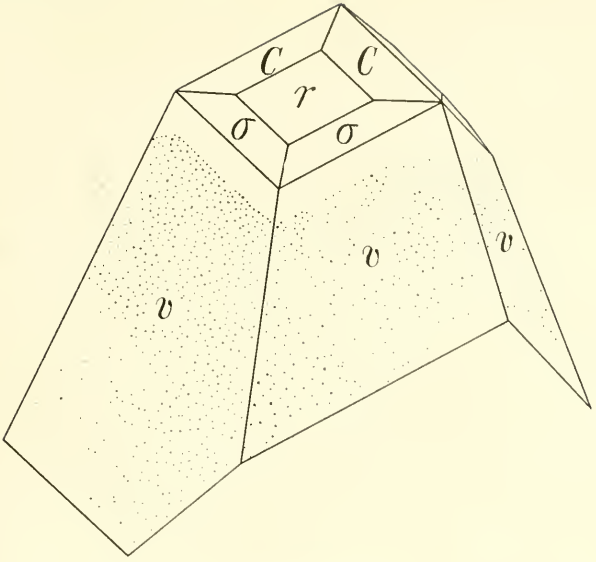
Fig. 2.—Joplin calcite, combination of *v*, *c*, and *t*. Natural size. Nat. Mus. No. 84435.

PLATE LIV, Fig. 1—Calcite twin, Guanajuato, Mexico. Path of moving bubble outlined by dots. Natural size. Nat. Mus. No. 75672.

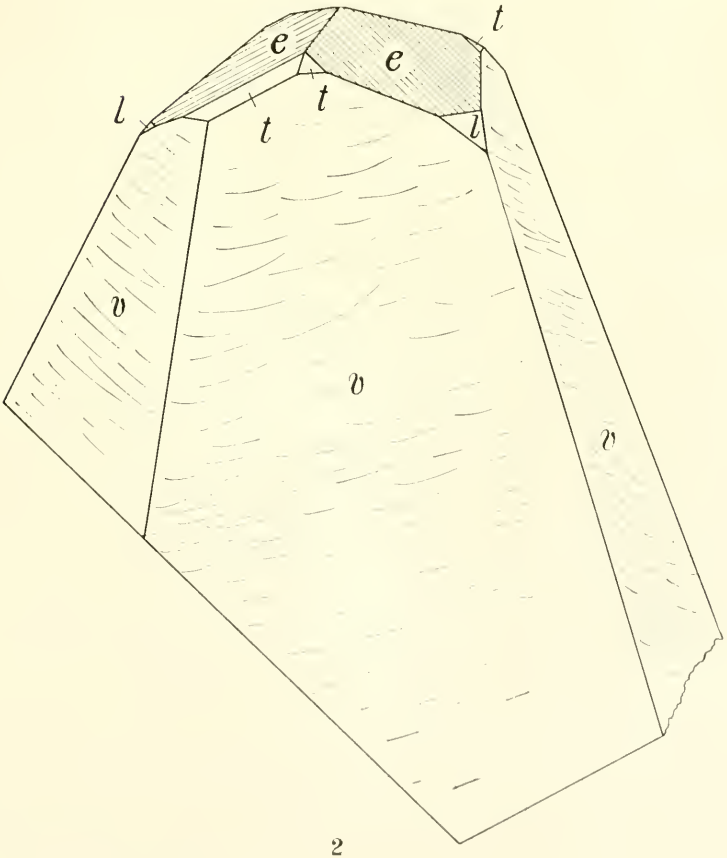
Fig. 2.—Crystal of type 1, Virgilina calcite. Enlarged. Nat. Mus. No. 86574.

Fig. 3.—Crystal of type 2, Virgilina calcite. Orthographic projection. Enlarged. Nat. Mus. No. 86574.

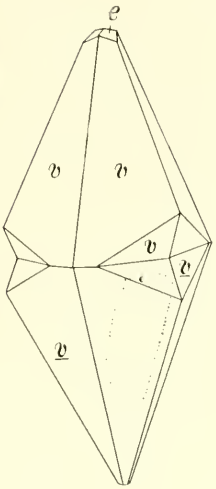
Fig. 4.—Crystal of type 2, Virgilina calcite. Clinographic projection. Enlarged. Nat. Mus. No. 86574.



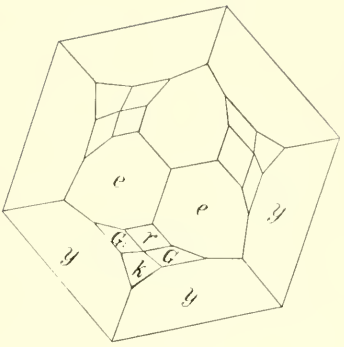
1



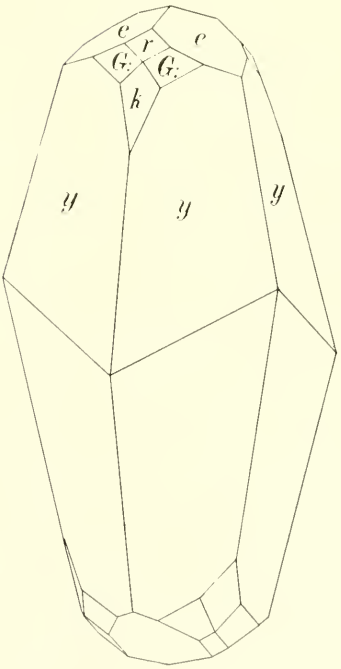
2



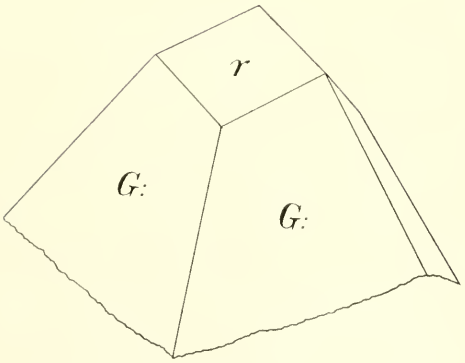
1



3



4



2