ART. XXXVII.—*Datolite from Guanajuato;* by OLIVER C. FARRINGTON.

WHILE examining, about two years ago, the mineral collection of Sr. Ponciano Aguilar, the well-known mining engineer of Guanajuato, Mexico, my attention was attracted to some small transparent crystals accompanying a specimen of calcite from the San Carlos mine of Guanajuato.

As I could not at the time identify the crystals, Señor Aguilar kindly presented me with the specimen that I might give them further study. A subsequent determination of the blowpipe characters showed the mineral to be datolite, a species which has not so far as I know been previously reported from this locality. Examination of the crystal form showed the habit and development of the crystals to be unique and apparently peculiar to the locality. They were accordingly made the subject of the following study.

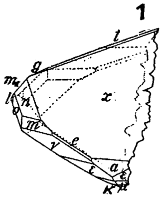
The calcite crystals with which the datolite is associated have the form of $-\frac{5}{4}$ rhombohedrons which are coated with drusy calcite. Small quartz crystals about 5^{mm} in length and made up of the usual prism terminated by the + and − rhombohedron also accompany them. Regarding the nature of the occurrence of the specimen, Señor Aguilar was unable to give any further information than that it was from the mine already mentioned. The rocks of the region are, however, well known to be altered andesites.

The datolite crystals are transparent, colorless, of vitreous luster and small size, the largest being not over 4^{mm} in length by 1^{mm} in thickness. Upon them a total number of 17 forms was identified, as follows, the symbols being in accordance with those chosen by Dana:

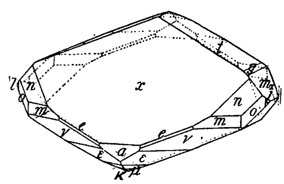
$a(100,\ i\text{-}\bar{i})$	$x(102,\ \text{-}\frac{1}{2}\text{-}\bar{i})$	$\kappa(\bar{1}15,\ \frac{1}{5})$
$b(010,\ i\text{-}\grave{i})$	$\Sigma(\bar{3}02,\ (\frac{3}{2}\text{-}i)$	$\mu(\bar{1}14,\ \frac{1}{4})$
$e(320,\ i\text{-}\bar{\frac{3}{2}})$	$t(013,\ \frac{1}{3}\text{-}\grave{i})$	$\lambda(\bar{1}13,\ \frac{1}{3})$
$m(110,\ I)$	$g(012,\ \frac{1}{2}\text{-}\grave{i})$	$\epsilon(\bar{1}12,\ \frac{1}{2})$
$o(120,\ i\text{-}\grave{2})$	$m_x(011,\ 1\text{-}\grave{i})$	$\nu(\bar{1}11,\ 1)$
$l(130,\ i\text{-}\grave{3})$	$n(111,\ \text{-}1)$	

The faces are fairly sharp and bright but in the zones of prisms and hemi-pyramids merge into one another so that it is difficult to distinguish them. The crystals all have about the same number of faces, but differ in the faces developed. The prisms have about the same development on all the crystals. Thus *e*, 320, is scarcely more than a line; *m*, 110, and *o*, 120, appear as well-defined faces, while *l*, 130, is always a minute triangular face at the edge of *e*. The negative hemi-pyramid *n*, 111, is always well-defined, and the positive hemi-pyramids, *ν*, $\bar{1}11$, and *ε*, $\bar{1}12$, are usually prominent. The succeeding faces of this zone round off in a manner which has been noted on datolite from other localities. The clinodomes can usually be distinguished by being duller in luster than the other faces and by their showing minute striations diagonal to their edges. The habit of the crystals is determined by the predominance of the orthodome *x*, 102, the crystals being tabular with respect to this face, and of the clinodomes *t*, *g* and m_x. To these faces the prisms and pyramids are quite subordinate and, as mentioned later, may become very minute. The habit produced by predominance of the faces mentioned may perhaps best be described as an arrow-point habit. It is illustrated by fig. 1. As here indicated,

1



2



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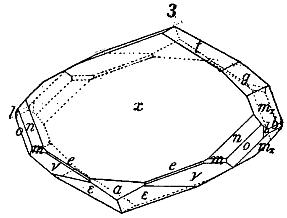

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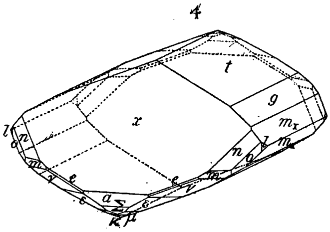

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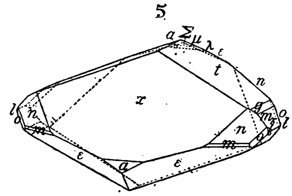

only half the crystal is present in nature and that the left half, the point of attachment being near the symmetry plane. This development is very constant and by being familiar with it one can recognize the prominent faces at a glance.

Crystals approaching these in habit, in that they are tabular with respect to *x*, have been described by E. S. Dana from Bergen Hill, N. J.,* and by Franzenau from the Swiss Alps in Tyrol.† The Guanajuato crystals differ, however, from those described by Dana in that they only rarely have a rhombo-

* This Journal, III, vol. iv, p. 17, and fig. 14, pl. I.

† Handbuch der Mineralogie, C. Hintze, p. 173.

hedral aspect and from those of both authors in the predominance of the clinodome *t*, 013. Through the kindness of Prof. Dana, I have had an opportunity to examine some undescribed crystals from Bergen Hill which resemble the Guanajuato forms more closely. In these the clinodomes *t* and *g* are still lacking, their place being supplied by the pyramid G, but the habit, mode of attachment and relative development of the faces is such as to make the crystals in other respects very similar to the Guanajuato forms. They differ from the Bergen Hill type already referred to, chiefly in the subordinacy of ϵ, $\bar{1}12$. They may therefore be considered as a simple modification of this type.

In order to illustrate the different types observed on the Guanajuato datolites, four crystals, which are represented in the accompanying figures, were chosen. Crystal No. 1 is shown in completed form in fig. 2, fig. 1 showing the left half of the same crystal. This crystal illustrates what is perhaps the commonest type, the crystal being thin by reason of the shortness of the clinodiagonal axis, and rather acutely terminated on account of the predominance of the clinodome *t*. From the series of positive hemi-pyramids it will be noticed by the figure that the pyramid λ, $\bar{1}13$, is wanting and this was usually true, the face being found on only one crystal.

Measurements in the zones of prisms, pyramids and domes showed in all cases close approximation of measured to calculated values. A zone well brought out on this crystal is that of *x* over *n* to *x*. Measured and calculated angular values in this zone compared as follows:

	Measured.	Calculated.
$102 \wedge 1\bar{1}1$	34° 20′	34° 21′
$1\bar{1}1 \wedge 1\bar{2}0$	29 42	29 50
$1\bar{2}0 \wedge 0\bar{1}\bar{1}$	52 1	51 53
$0\bar{1}\bar{1} \wedge \bar{1}0\bar{2}$	63 57	63 56

Fig. 3 illustrates the second crystal chosen. Here the clinodomes have a more nearly equal development than in the previous forms and the crystal has, therefore, a more blunt termination. The clinopinacoid is present, but only two of the series of positive hemi-pyramids occur, these being, as may be noted on the figure, ν, $\bar{1}11$, and ϵ, $\bar{1}12$. Measurement of the zone *x* over *n* on this crystal gave the following results:

	Measured.	Calculated.
$102 \wedge 1\bar{1}1$	34° 21′	34° 21′
$1\bar{1}1 \wedge 1\bar{2}0$	29 51	29 50
$1\bar{2}0 \wedge 0\bar{1}\bar{1}$	51 54	51 53
$0\bar{1}\bar{1} \wedge \bar{1}0\bar{2}$	63 49	63 56

Another interesting zone well developed on this crystal is that of x over t to x. In this zone the measured and calculated angles compared as follows:

	Measured.	Calculated.
$102 \wedge 3\bar{2}0$	49° 20′	49° 21′
$3\bar{2}0 \wedge 1\bar{1}\bar{1}$	24 46	24 46
$1\bar{1}\bar{1} \wedge 0\bar{1}\bar{3}$	56 45	56 40
$0\bar{1}\bar{3} \wedge \bar{1}0\bar{2}$	49 15	49 13

In crystal No. 3, shown in fig. 4, the forms are much extended in the direction of the clinodiagonal axis, making a thicker crystal and one which displays more than the others the rhombohedral appearance noted by Dana. Here the pyramids and prisms appear only as a slight truncation of the edge formed by the meeting of the orthodome and the clinodomes, and might therefore easily be overlooked. The crystal shows no new faces except the positive hemi-orthodome Σ, $\bar{3}02$, which here appears for the first time.

The crystal shown in fig. 5 is peculiar for displaying a merohedrism worthy of note. The series of fundamental positive hemi-pyramids is here represented in the upper rear octants by ϵ, $\bar{1}12$, λ, $\bar{1}13$, (this face not being wanting from the series as in the other crystals) and κ, $\bar{1}14$. These faces are all small, and only slightly truncate the edge formed by the junction of the orthodome x and clinodome t. In the lower front octants, however, λ and κ are wanting and only ϵ appears, so greatly enlarged that it is equal to t in size. The crystal shows, therefore, inclined-faced hemihedrism with respect to λ and κ, and were ϵ not present could properly be termed hemihedral. As this face is present, however, the absence of the other faces should more properly perhaps be regarded as accidental and the occurrence be considered due to merohedrism.

It may be worthy of note that in measuring the smaller faces I found direct sunlight reflected by a movable mirror a more satisfactory source of light than any artificial light. Signals could be obtained from faces by this means which gave none whatever with artificial light. With a darkening attachment on the goniometer work in a dark room with its heat and bad ventilation is thus avoided and in most cases good readings could be made from sunlight even without the darkening attachment.

Field Columbian Museum, Chicago, Feb. 1, 1898.