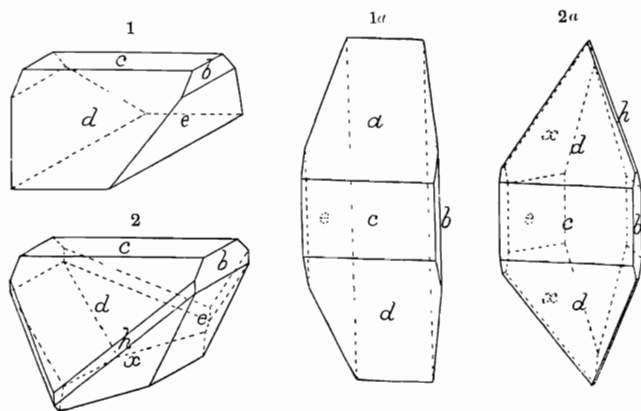


ART. XXV.—*Crystallized Bertrandite from Stoneham, Me., and Mt. Antero, Colorado*; by S. L. PENFIELD.1. *Stoneham, Maine.*

FOR the bertrandite from Stoneham, Me., the second locality in the United States,* I am indebted to Mr. George F. Kunz of New York. He states that, at the time herderite was found and described by Mr. Hidden,† he noted the small crystals occurring in pockets with the herderite and laid them aside as an unknown mineral; the quantity was too small to warrant any further investigation at the time. Becoming convinced, after the identification of bertrandite at Mt. Antero,‡ that his crystals were the same mineral he generously turned them over to me for identification and description. Only a few specimens were observed and the crystals were all small, the largest of the three which were detached for measurement being about 2.5^{mm} long by 1.5^{mm} broad. The luster of the faces is not very perfect and the measurements with the reflecting goniometer not as good as could be desired. The habit of the crystals is unlike anything that has been previously described and as it throws considerable light on the crystallization of the mineral is worthy of a detailed description. The forms which were observed were as follows:



c , 001, O ; b , 010, i - x ; h , 130, i - $\bar{3}$; d , 102, $\frac{1}{2}$ - $\bar{1}$; e , 03 $\bar{1}$, 3- x and x , 16 $\bar{2}$, 3- $\bar{6}$.

The simplest combination is shown in fig. 1, where the faces c and d are prominent at one end of the vertical axis and c

* In a letter, dated Sept. 26, 1888, Mr. W. E. Hidden announced to us that he had identified bertrandite (or a new mineral) on specimens of herderite from Stoneham.—EDS.

† This Journal, III, xxvii, 135, Feb., 1884.

‡ Ibid., III, xxxvi, p. 52, 1888.

and e at the other. This can be explained most readily by considering the crystal as hemimorphic in the direction of the vertical axis. As in our ordinary crystallographic projection the figures of our crystals are very much fore-shortened in the direction of the brachy axis \bar{a} , and as the bertrandite crystals are elongated in this direction, I have re-drawn fig. 1 making \bar{a} the vertical axis, c the front and leaving \bar{b} unchanged as in fig. 1*a*, which gives a very good idea of the crystals. Figures 2 and 2*a* drawn the same as above represent a more highly developed crystal. The most conspicuous faces on these crystals are c and \bar{d} above, both of which are highly polished and give good reflections. The faces at the other end of the c axis are by no means as good, the luster is poor and the faces oscillate and combine with one another in such a way that the edges are not sharp and continuous; this is especially the case when x is present. The x faces are not sharp and well defined but round off the ends of the crystal in such a way that they do not form straight edges with c and e ; they gave also no sharp reflection of the signal with the goniometer. Approximate measurements, however, and the occurrence of the faces in the zone \bar{d} and h determine its indices to be $16\bar{2}$ (3-8). The brachy-pinacoid b gave fairly good reflections, h was in all cases small and gave faint reflections. One twin crystal was observed, the basal plane c being the twinning plane and the \bar{d} faces making a very prominent reëntrant angle. The crystals are usually attached at one end of the brachy axis and as only one of the bright \bar{d} faces is conspicuous they have a very decided monoclinic appearance. In one of the detached crystals part of a second \bar{d} face was present developed as in the figures and showing that the crystals are truly hemimorphic and not monoclinic. In detaching one of the crystals a very perfect cleavage parallel to \bar{b} was developed which has not been observed before; the highly perfect prismatic and basal cleavages were also observed, the same as in the Mt. Antero crystals. If we take the best measurements which were obtained,

$$\begin{aligned} c \wedge d, 001 \wedge 102 &= 27^\circ 42' \quad \text{and} \\ m \wedge m, 110 \wedge 1\bar{1}0 &= 59^\circ 16', \end{aligned}$$

the latter being cleavage faces, we obtain the axial ratio given below, while for comparison the ratio obtained from the Mt. Antero mineral is also given:

$$\begin{aligned} \text{Stoneham, Me. } c:b:a &= 0.5973:1:0.5688 \\ \text{Mt. Antero, Col. } c:b:a &= 0.5953:1:0.5723 \end{aligned}$$

I am inclined to give the preference to the measurements on the Stoneham crystals; if so, the angles which have been measured and the calculated values are as follows:

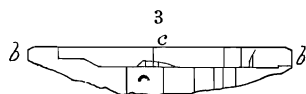
	No. 1.	No. 2.	Calculated.
$c \wedge d$ 001 \wedge 102 =	27° 40'	27° 42'	27° 42'
$c \wedge e$ 001 \wedge 031 =	60° 22'	60° 53'	60° 50'
$c \wedge e$ 001 \wedge 031 =	60° 58'	60° 50'	60° 50'
$c \wedge b$ 001 \wedge 010 =	90° 1'		90°
$m \wedge m$		59° 16'	59° 16'
$b \wedge h$ 010 \wedge 130 =		29° 30'	30° 22'

The crystals are not very transparent and favorable for the determination of the optical properties; in converging polarized light with the microscope, an obtuse bisectrix was seen normal to c , the plane of the optic axes being the brachypinacoid.

The specific gravity was carefully taken, by just floating the mineral in the Thoulet solution, and found to be 2.598, exactly the same as that found for the Mt. Antero bertrandite. The material being very limited no chemical tests were made.

2. Bertrandite from Mt. Antero, Colorado.

In a previous communication* I described crystals from Mt. Antero which had a curious hemimorphic development. The crystals were composed of the three pinacoids; but while one of the basal planes was flat the other was rounded and striated parallel to the a axis by oscillatory combinations of the basal plane with a brachy-dome, probably 011. Figure 3 represents



a section across one of the Mt. Antero crystals parallel to the macro-pinacoid which was drawn with a camera lucida and magnified 17 diameters. During the past summer a number of bertrandite specimens were found and all of them showed this peculiarity. Some of the crystals which are now in the collection of Mr. C. S. Bement of Philadelphia, are 25^{mm} long, 8^{mm} wide and 3^{mm} thick. That the rounding of one of the basal planes is not accidental, but is owing to a hemimorphic development of the crystals, cannot be doubted. As proof of this, one of the largest crystals was tested for pyro-electricity by the admirable method proposed by Prof. A. Kundt.† The crystal was heated in the air-bath to 100° C. and on cooling was dusted with a mixture of red oxide of lead and sulphur. The experiment was most satisfactory, the flat basal plane showed strong positive electricity and became coated with the yellow sulphur, while the rounded basal plane showed negative electricity and was coated with red oxide of lead.

Tests for pyro-electricity were also made on the Stoneham crystals but they were so small that it could scarcely be deter-

* This Journal, III, xxxvi, p. 52, 1888.

† Annalen der Physik u. Chemie, xx. p. 592, 1883.

mined with certainty. It seemed, however, as if the basal plane in combination with the α face showed positive electricity, the same as the flat basal plane of the Mt. Antero crystals, while the other basal plane showed negative electricity.

In closing, I wish to express my thanks to Messrs. George F. Kunz and C. S. Bement, who provided me with material for study and to Mr. George L. English of Philadelphia, who sent me a large number of Mt. Antero crystals for examination.

Mineralogical Laboratory, Sheffield Scientific School, Dec. 12, 1888.