

CRYSTALLOGRAPHY OF THREE MINERALS FROM RHODE ISLAND<sup>1</sup>ALFRED C. HAWKINS, *Rochester, New York*

The minerals here described are all from localities not previously mentioned in the literature. They were collected while the writer was teaching at Brown University in 1915-16. The apatite was measured on the two-circle goniometer at Harvard University, and thanks are herewith extended to Professor Palache for his assistance in working out this crystal. The aid of Dr. Edgar T. Wherry in the calculation and drawing of the epidote and hematite is also gratefully acknowledged.

## HEMATITE FROM MANTON

The crystals studied were found in 1916 in a quarry at Manton, near Providence. This quarry is worked for road material, and is located in "green schist," a hornblende rock representing an ancient basic igneous mass of gabbroid composition. The hematite is associated with orthoclase, epidote, excellent foliated green talc, and calcite. It has probably been formed by the action of a nearby granite intrusion during the formation of original silicate minerals, the alteration of which has afforded some of the above mentioned associates. The single reasonably complete crystal, 2 mm. in diameter, is here described and figured. (Figs. 1 and 2.)

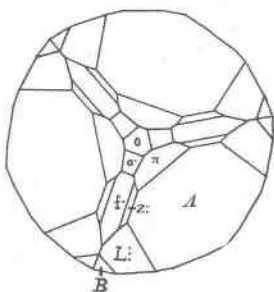


FIG. 1. TOP VIEW

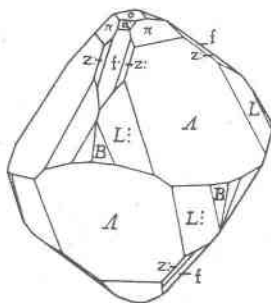


FIG. 2. FRONT VIEW

<sup>1</sup> Presented at the Amherst meeting of the Mineralogical Society of America, December 29, 1921.

TABLE 1. ANGLES OF HEMATITE FROM MANTON, R. I.

Letter	SYMBOLS		A N G L E S			
	Gdt.	Brav.	Measured		Calculated	
			$\phi$	$\rho$	$\phi$	$\rho$
o	0	0001		0°00'		0°00'
$\pi$	10	1011	0°23'	42 10	0°00'	42 14
* $\Delta$	$\frac{1}{9} 0$	16.0.16 9	0 02	58 07	"	58 14
a'	$-\frac{1}{5}$	1125	30 32	17 30	30 00	17 28
f' $\delta$	$\pm \frac{1}{2}$	1122	"	38 12	"	38 11
*B'	$\frac{1}{9} 0$	10.10.20.9	30 14	60 13	"	60 13
z:	$-\frac{4}{3} \frac{1}{5}$	4155	11 05	40 14	10 53	39 46
L:	$\frac{4}{3} \frac{2}{3}$	4263	19 29	59 05	19 06	58 01

Two new forms which prove to be present are designated by an asterisk. The faces of o and  $\pi$  are plane and bright, as also are f' and z; a' is stepped and repeated at intervals along f';  $\Delta$  is marked with a few deep striations parallel to rhombohedron f'; similar lines show on L: and B' which are otherwise bright and prominent forms.

#### EPIDOTE FROM PASCOAG

The epidote crystals from this new locality are 1 to 5 centimeters in length, and are very dark green in color, with sharp angles and plane faces except for a few of the domes which are striated. They are highly complicated, and all of the forms here listed occurred on one crystal.

c (001), t (100), u (210), z (110), k (012), o (011), e (101), R ( $\bar{1}03$ ), i ( $\bar{1}02$ ),  $\sigma$  ( $\bar{2}03$ ), r ( $\bar{1}01$ ), a ( $\bar{2}01$ ), f ( $\bar{3}01$ ), d (111),  $\vartheta$  (121), n ( $\bar{1}11$ ), M ( $\bar{2}11$ ); twinned on c.

The crystals occur embedded in the white quartz of a pegmatite vein which cuts a gabbro exposed in a glaciated knob of rock in the fields about a kilometer northwest of the town of Pascoag.

#### APATITE FROM SOUTH FOSTER

The apatite crystals here described were found in a road cutting at the white schoolhouse on the hill just west of the town of South Foster. They are developed along a contact line where a fine grained granite dike lies against a small mass of white crystalline limestone; they occur in small open cavities associated with crystallized biotite and scapolite. They are white and translucent, with so-called alpine habit, and are greatly distorted. The table

given below, obtained by measurement of a crystal slightly more than one millimeter in diameter, shows what seems to be a new form for the species. This is represented by two fairly prominent faces, which gave, however, only fair signals on the goniometer. It is indicated by an \* in the table.

TABLE 2. ANGLES OF APATITE FROM SOUTH FOSTER

Letter	SYMBOL		A N G L E S			
	Gdt.	Brav.	Measured		Calculated	
			$\phi$	$\rho$	$\phi$	$\rho$
c	0	0011		0°00'		0°00'
a	$\infty$ 0	10 $\bar{1}$ 0	0° 00'	90 07	0° 00'	90 00
r	$\frac{1}{2}$ 0	10 $\bar{1}$ 2	"	23 09	"	22 57
x	10	10 $\bar{1}$ 1	"	40 39	"	40 16
y	20	20 $\bar{2}$ 1	"	59 34	"	59 27
z	30	30 $\bar{3}$ 1	"	67 26	"	68 31
s	1	11 $\bar{2}$ 1	30 00	55 58	30 00	55 43
*	6	6.6.12.1	"	83 49	"	83 31

BOOK REVIEWS

ELEMENTE DER PHYSIKALISCHEN UND CHEMISCHEN KRYS-  
TALLOGRAPHIE, P. GROTH. 8-vo. x+363 pages, with 962 text figures,  
4 plates, and 25 stereoscopic photographs. R. Oldenbourg, Munich, 1921.

When Professor Groth first delivered a course of lectures at the School of Mines in Berlin in 1870 in which he discussed crystallography from the standpoint of the physical relationships, he departed materially from the then conventional method of presenting the subject. These lectures were subsequently repeated at the University of Strassburg and eventually led to the publication of his "Physikalische Krystallographie" in 1872, which has since passed thru several editions; the last of them, the fourth, appeared in 1905. Also, as is well known, he has just completed his "Chemische Krystallographie," a monumental work of 5 volumes, which is a critical survey of our knowledge of crystallized substances. In fact, Professor Groth has devoted the major portion of his very active life to problems in chemical and physical crystallography and hence is exceptionally well equipped to present in a single volume the salient facts concerning the intimate relationships existing between the chemical constitution and the various physical properties of crystals. Accordingly the present text attempts to give the student of chemistry and physics a knowledge of the fundamentals of crystallography without burdening him with a mass of information about minerals, for usually crystallography is presented only in connection with mineralogy.

The book is divided into two parts: (a) Physical Crystallography, and (b) Chemical Crystallography. The first part is sub-divided into two sections designated as General and Special, respectively. There is also an Appendix which is