

PLATE 14.

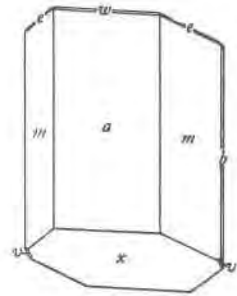
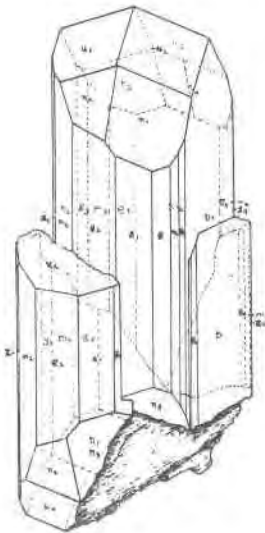
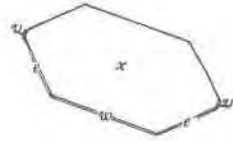
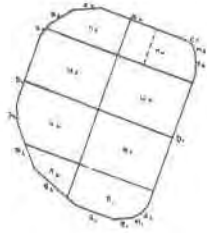


FIG. 1. COLUMBITE
 FIG. 2. MONAZITE.
 MINERALS FROM BOOTHWYN, DELAWARE COUNTY, PENNSYLVANIA.

A COLUMBITE CRYSTAL FROM BOOTHWYN, PENNSYLVANIA

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The association of columbite is with granitic, pegmatitic, and metamorphic rocks, and its occurrence is to be expected in southeastern Pennsylvania, where such rocks are well developed. The following localities have, in fact, been noted in this region:¹ In Delaware County: Ridley township, quarry southeast of Avondale, on the east bank of Crum Creek, in granite gneiss; Springfield Township, quarry $\frac{1}{2}$ km. ($\frac{3}{8}$ mile) northwest of Morton Station, also in granite gneiss; Middletown township, two localities, in pegmatite (exact locations not recorded); Middletown Township, Mineral Hill, 2 km. ($1\frac{1}{4}$ miles) west of Media, between Ridley Creek and Black Horse, in pegmatite; and Upper Chichester Township, about 0.8 km. ($\frac{1}{2}$ mile) southwest of Boothwyn station, in pegmatite. In Chester County: London Britain Township, 1.6 km. (1 mile) southeast of Landenberg, east of the East Branch of White Clay Creek, where the

¹ Genth, F. A., *Mineralogy of Pennsylvania, 2d Geol. Survey Pa., Rept. B*, 137 (1874), 1875.

Lewis, H. C., On two new localities of columbite, *Proc. Acad. Nat. Sci. Phila.*, **1882**, 51.

Genth, F. A., On two minerals from Delaware County, Pa., *Proc. Acad. Nat. Sci. Phila.*, **1889**, 50-52.

Rand, T. D., Jefferis, W. W., and Cardeza, J. T. M., "Mineral localities of Philadelphia and vicinity. *Proc. Acad. Nat. Sci. Phila.*, **1892**, 200.

Dana, J. D. and E. S., *System of Mineralogy*, 6th ed., 735, 1892.

Benge, Elmer, and Wherry, Edgar T., Directory of the mineral localities in and around Philadelphia, *Min. Coll.*, **13**, 151, 152, 162, 183, 1906; **14**, 7, 26, 42, 1907; **15**, 56, 1908.

Phila. Min. Club (report by E. S. Law), *Min. Coll.*, **13**, 79, 1906.

Wherry, Edgar T., Radium in Pennsylvania, *Min. Coll.*, **14**, 20, 1907.

Wherry, Edgar T., Radioactive minerals found in Pennsylvania and their effect on the photographic plate, *J. Franklin Inst.*, **165**, 63, 66, 70, 71, 75-78, 1908.

country rock is crystalline limestone, but the matrix of the columbite uncertain. In Philadelphia County (City of Philadelphia): southwest corner of Broad Street and Olney Avenue, in pegmatite.

With the exception of two rather well developed crystals recorded from Mineral Hill,¹ as far as known the specimens obtained at the majority of these localities have not been well crystallized. In the Theodore D. Rand collection, in Bryn Mawr College, however, there is a fine crystal from Boothwyn, Delaware County, which will be described in this paper.

Boothwyn is situated in the southwest corner of the Chester Quadrangle, 7.5 km. (4.7 miles) southwest of the city of Chester, on the Baltimore and Ohio Railroad. The locality from which the crystal was obtained was undoubtedly the pegmatite mass in the gabbro on the west side of Naaman Creek, between the bridge 0.8 km. southwest of Boothwyn and the railroad tracks. Two pits can still be seen at this locality, but they are completely overgrown, and nothing is now obtainable but minute fragments of rare-earth minerals in the feldspar on the dumps.

The crystal is prismatic in habit, approximately $1\frac{1}{2}$ cm. in length, and less than $\frac{1}{2}$ cm. in breadth and thickness. It is black in color, with slight iridescence, and submetallic in luster. The faces are for the most part too dull to give satisfactory results with the reflecting goniometer (altho one measurement of the best prism, m (130), was obtained showing its φ to be $39^\circ 34'$, which is but $5'$ from the usually accepted value for this mineral), so the Goldschmidt two-circle contact goniometer was used for the measurements. Seven forms of frequent occurrence on columbite, as listed in Table 1, were recognized, and in addition the faces of the pyramid n (211), especially n_4 , were found to be curved toward the position of the dome (201) (a form not definitely present) in such a way as to suggest the presence of a vicinal form which might perhaps have the symbol (412). The faces of this form were, however, too indefinite for measurement, so it can not be regarded as established. The angles of the prominent forms agreed as closely as could be expected in work with the contact goniometer with those given by Professor Goldschmidt in the *Winkeltabellen*. The orientation and lettering used in the figures, (Frontispiece, Fig. 1) are those of Schrauf and of Goldschmidt rather than those of Dana. (a and b axes interchanged.)

¹ Lewis, H. C., *place cited*; Genth, F. A., *place cited*.

TABLE 1
 ANGLES OF COLUMBITE FROM BOOTHWYN, PA.

Letter	Form		Observed		Calculated	
	Symbol		ϕ	ρ	ϕ	ρ
	Gdt.	Mill.				
a	$\infty 0$	(100)	89° 40'	90° 00'	90° 00'	90° 00'
b	0 ∞	(010)	0 00	"	0 00	"
g	∞	(110)	68 00	"	68 05	"
m	$\infty 3$	(130)	39 50	"	39 39	"
z	$\infty 5$	(150)	27 00	"	26 26	"
u	1	(111)	67 40	43 30	68 05	43 48
n	21	(211)	79 10	61 40	78 37	61 09
*	2½	(412)?	—	—	84 16	60 48

MONAZITE FROM BOOTHWYN, PENNSYLVANIA

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There are but two known occurrences of monazite in Pennsylvania, one near Morgan Station, Delaware County¹ and the other in the quarry near Boothwyn which yielded the columbite described in the preceding paper. The latter occurrence has never been described, but merely mentioned in notes by the writer.² The present seems an opportune time to publish some data on this occurrence.

Some years ago, while looking thru various old collections of Pennsylvania minerals, especially the Theodore D. Rand collection, at Bryn Mawr College, and private collections of several mineralogists of Delaware County, the writer found included therein, under the name of "sphene" (titanite), some more or less transparent brown crystals, from 1 to 3 cm. in length, labeled as found in the quarry southwest of Boothwyn. These were seen at once to be erroneously identified (altho there were true titanite crystals from the same locality included in the collec-

¹ Hamilton, S. H., Monazite in Delaware County, Pa. (Report of discovery by J. Glanding Dailey). *Proc. Acad. Nat. Sci. Phila.*, **1899**, 377-378.

² In the following publications: Directory of the mineral localities in and around Philadelphia (by Elmer Bengé and E. T. W.), *Min. Coll.*, **14**, 7, 1907; Radium in Pennsylvania. *Min. Coll.*, **14**, 20, 1907; Philadelphia Mineralogical Club (minutes), *Min. Coll.*, **14**, 45, 1907; and Radioactive minerals found in Pennsylvania and their effect on the photographic plate," *J. Franklin Inst.*, **165**, 67, 70, 71, and 77, 1908.