green cacoxenite. Specimens of dufrenite may also be picked up on the dump on the site of the washer.

An abandoned manganese mine is situated on a spur of the Blue Ridge about $1\frac{1}{2}$ km. northeast of Midvale, but specimens of pyrolusite are the only thing obtainable there.

CALCULATION IN THE TRICLINIC SYSTEM ILLUSTRATED BY ANORTHITE

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University of Toronto

(Continued from page 194)

2. *Determination of v_0 from the angles of terminal faces.* Figure 44 and Tables 5 and 6

In figure 44 let $F_1 = p_1q_1$, and $F_2 = p_2q_2$ be any two terminal faces for each of which we have measured the pole distances $\rho_1\rho_2$ and the vertical circle readings V_1, V_2. These two faces determine a zone, *Z*, in which there must lie, at its intersection with the prism zone, a possible prism face. The symbol of this prism will be ∞ q where $q = \dfrac{q_2 - q_1}{p_2 - p_1}$.

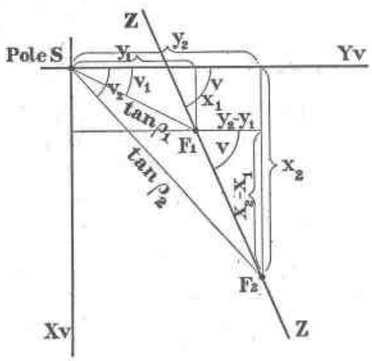

FIG. 44 (Parsons)

The angle v of all such prisms ∞ q determined by any pair of terminal faces can be calculated and will give a set of values which may be compared with the measured prism angles. Or the calculation may be confined as is here done to pairs of faces lying parallel to the direction line of 0∞, each of which will give a value of v_0. In figure 44 let X_v and Y_v be rectangular coördinates, the latter having the direction determined by S, the projection center, and the zero direction of the V values. From the figure it is evident that:

$$x_1 = \sin v_1 \tan \rho_1 \qquad x_2 = \sin v_2 \tan \rho_2$$

$$y_1 = \cos v_1 \tan \rho_1 \qquad y_2 = \cos v_2 \tan \rho_2$$

and that:

$$\tan v = \frac{x_2 - x_1}{y_2 - y_1}$$

In Table 5 the values x and y for each terminal face are calculated.

TABLE 5. CALCULATION OF X AND Y OF TERMINAL FACES

No.	V	ρ	log sin V log tan ρ log cos V	log x log y	x y
8	255°06′	69°20′	998 515 042 342 941 016	040 857 983 358	$\bar{2}.5619$ $\bar{0}.6817$
2	235 42	61 20	991 703 026 223 957 091	017 926 001 314	$\bar{1}.5110$ $\bar{1}.0307$
3	245 32	35 14	995 914 984 899 961 717	980 813 946 616	$\bar{0}64.29$ $\bar{0}.2925$
6	141 21	69 07	979 558 041 847 989 264	021 405 031 111	1.6370 $\bar{2}.0469$
10	147 19	37 00	973 239 987 711 992 514	960 950 980 225	0.4069 $\bar{0}.6342$
7	181 04	9 17	826 988 921 341 999 992	748 329 921 333	$\bar{0}.0030$ $\bar{0}.1634$
17	27 21	26 12	966 221 969 202 994 852	935 423 964 054	0.2266 0.4371
14	313 19	48 37	986 188 005 497 983 634	991 685 989 131	$\bar{0}.8257$ 0.7786
16	85 49	51 57	999 884 010 641 886 301	010 525 896 942	1.2742 0.0932
1	198 14	54 56	949 539 015 370 997 763	964 909 013 113	$\bar{0}.4457$ $\bar{1}.3531$
27	19 14	70 38	951 774 045 407 997 506	997 181 042 913	0.9372 2.6859

In Table 6 these values are paired as above described to obtain a series of values of v_0.

It will be noticed that face No. 1 gives results that are not in accord with the other values but reference to table 4 shows that

TABLE 6. CALCULATION OF v_0 FROM VALUES OF TABLE 5.

Nos.	$x_2 - x_1$, $y_2 - y_1$	log $(x_2 - x_1)$, log $(y_2 - y_1)$	log tan v_0	v_0
8 and 2	1.0509 $\bar{0}$.3490	002 157 954 283	047 874	[$\bar{7}$1°38′]
8 and 1	2.1162 0.6714	032 560 982 698	049 862	[$\bar{7}$2 24]
8 and 6	4.1989 1.3652	062 314 013 599	048 715	$\bar{7}$1 57
2 and 1	1.0653 0.3224	002 745 950 840	051 905	[$\bar{7}$3 10]
2 and 6	$\bar{3}$.1480 $\bar{1}$.0162	049 807 000 697	049 110	$\bar{7}$2 07
1 and 6	$\bar{2}$.0827 0.6938	031 863 984 123	047 740	[$\bar{7}$1 35]
3 and 10	1.0598 0.3417	002 523 953 364	049 159	$\bar{7}$2 08
14 and 17	1.0523 0.3415	002 216 953 339	048 875	$\bar{7}$2 01
14 and 16	2.0999 0.6854	032 220 983 594	048 626	$\bar{7}$1 56
17 and 16	1.0476 0.3439	002 019 953 643	048 376	$\bar{7}$1 50
	Average of all 72°0.46′		Average of 6 best 72°00′	

this face is not in accord with the other faces. The poor value obtained from faces 8 and 2 is due to a displacement of face No. 2 both on the vertical and horizontal circles. In general the results obtained by this method of averaging will be less accurate than by the first method.

3. DETERMINATION OF v_0 FROM THE ANGLES OF PRISM FACES

One of the well-known relations between faces in a zone may be stated as follows: If the angles between three faces of known indices in a zone are known, the angle to a fourth face in the zone with given indices may be calculated. If now we take the measured faces of the prism zone by threes and, employing this relation, calculate the position of the face 010 or 0∞, we obtain a series of independent values of v_0. The Goldschmidt symbol for a prism may be written as $p/q\infty$ or as $\infty q/p$; and the latter quantity, a rational quantity, may be equally well written as simply q. Take three prism faces, ∞q_1, ∞q_2, and ∞q_3, whose angles as read on the vertical circle are v_1, v_2, and v_3;

TABLE 7

CALCULATION OF v_0 FROM THE PRISMATIC FACES

No. " "	Symbol " "	q_3 q_2 q_1	Q $1-Q$	v_3 v_2 v_1	v_3-v_2 v_2-v_1	$\cot(v_3-v_2)$ $\cot(v_2-v_1)$	$Q\cot(v_3-v_2)$ $(1-Q)\cot(v_2-v_1)$	Diff $=\cot(v_0-v_2)$ v_0-v_2	v_0
22 23 24	∞ ∞ $\overline{\infty}$ ∞ $\bar{3}$	1 $\bar{1}$ $\bar{3}$	$\frac{1}{2}$ $\frac{1}{2}$	410°06′ 350°35′ 319°00′	59°31′ 31°35′	1.6265368 0.5886533	.8132684 .2943267	.5189417 117°25′	108°00′
21 22 23	∞3 ∞ ∞ $\overline{\infty}$	3 1 $\bar{1}$	$\frac{1}{2}$ $\frac{1}{2}$	438°40′ 410°06′ 350°35′	28°34′ 59°31′	1.8366713 0.5886533	.9183357 .2943267	.6240090 58°02′	108°08′
21 22 24	∞3 ∞ ∞ $\bar{3}$	3 1 $\bar{3}$	$\frac{1}{3}$ $\frac{2}{3}$	438°40′ 410°06′ 319°00′	28°34′ 91°06′	1.8366713 0.0192010	.6122238 .0128007	.6250345 57°59′	108°05′
21 23 24	∞3 ∞ $\overline{\infty}$ ∞ $\bar{3}$	3 $\bar{1}$ $\bar{3}$	$\frac{2}{3}$ $\frac{1}{3}$	438°40′ 350°35′ 319°00′	88°05′ 31°35′	0.0334648 1.6265368	.0223097 .5421789	.5198692 117°28′	108°03′
12 11 4	∞3 ∞ ∞ $\overline{\infty}$	3 1 $\bar{1}$	$\frac{1}{2}$ $\frac{1}{2}$	258°04′ 229°57′ 170°27′	28°07′ 59°30′	1.7954162 0.5890450	.8977081 .2945225	.6031856 58°54′	108°51′
12 11 5	∞3 ∞ ∞ $\bar{3}$	3 1 $\bar{3}$	$\frac{1}{3}$ $\frac{2}{3}$	258°04′ 229°57′ 138°57′	28°07′ 91°00′	1.7954162 0.0174551	.5984721 .0116367	.6101088 58°37′	108°34′
12 4 5	∞3 ∞ $\overline{\infty}$ ∞ $\bar{3}$	3 $\bar{1}$ $\bar{3}$	$\frac{2}{3}$ $\frac{1}{3}$	258°04′ 170°27′ 138°57′	87°37′ 31°30′	0.0416210 1.6318517	.0277473 .5439506	.5162033 117°18′	108°45′
11 4 5	∞ ∞ $\overline{\infty}$ ∞ $\bar{3}$	1 $\bar{1}$ $\bar{3}$	$\frac{1}{2}$ $\frac{1}{2}$	229°57′ 170°27′ 138°57′	59°30′ 31°30′	0.5890450 1.6318517	.2945225 .8159259	.5214034 117°32′	107°59′

as the fourth face take 0∞ whose angle v_0 we wish to find. Then it may be proved that the following relation holds:

$$\cot (v_0 - v_2) = Q \cot (v_3 - v_2) - (1 - Q) \cot (v_2 - v_1),$$

where

$$Q = \frac{q_3 - q_2}{q_3 - q_1}.$$

In Table 7 is shown the result of the application of this formula to the measurements obtained. In this calculation only those faces which are in the same half-circle can be used. Where one of the faces is on the opposite side of the zero-point from the other two, 360° should be added to the readings that are less than 180° in order to avoid the use of negative quantities. Average of 8 values of v_0 = 108°18′ or $\overline{71}$°42′. But face 12 is badly out of position, as seen in the calculations of Table 4. Using therefore the five values for v_0 which do not depend upon face 12, the average is 108°02′ or $\overline{71}$′58°.

Summary of values of v_0.

Table 4,	18 faces	give average of	$\overline{71}$°57′
" 6,	6 values	" "	72 00
" 7,	5 "	" "	71 58
		Weighted average	$\overline{71}$°58′

The calculation of v_0 gives the position of the face 010, but gives no direct clue as to the further use of the value obtained. As the negative end of the crystal has been measured it will be necessary in calculating V^- to use the supplement 71°58′ as a negative quantity.

After the calculation of v_0 this value is subtracted from the vertical circle readings, thus securing the value V^-, or the reading on the vertical circle when the face 010 is at the zero position.

$V - v_0 = V^-$ which may also be indicated as φ'.

For the arithmetical calculation of the crystal constants this value, with the corresponding ρ values, is all that are required, but for comparing angles with those given in tables it is necessary to make a further adjustment to obtain the angle φ corresponding to V^+.

In the triclinic system the angle φ is measured from the zero position, and is never greater than 180°, so that positive and negative values are given.

When V^+ is less than 180°

$$V^+ - 0° = \varphi$$

When V^+ is greater than 180°

$$V^+ - 360° = \varphi.$$

In the present case, where the negative end of the crystal has been measured, the subtraction of v_0 from V gives a value which will be indicated by V^-. To convert the V^- values to V^+ use is made of the following formula:

$$360° - (V^- - 180°) = V^+$$

Calculation of the Projection Elements

The calculation of these elements may now proceed by means of the formulas given on page 186.

$$(3)\quad x' = x_0' + pp_0' \sin \nu,$$

$$(4)\quad y' = y_0' + qq_0' + pp_0' \cos \nu.$$

The values of x′ determined in table 3 are introduced into equation 3 as shown in table 8. Faces with like values of p are grouped to yield average values and a series of equations is secured. These are then solved in pairs for the two unknown quantities. Similarly in table 9 the equations (4) with values of y′ from table 3 introduced are collected and solved in pairs for the three unknown quantities. Figure 40 shows clearly the significance of the values obtained and examination of figures 38 and 39, where the symbols of each face are shown, will reveal the influence of the positive or negative values of p and q upon the form of the equations.

Summary of Projection Elements

$x_0' = 0.4844$	$p_0' = 0.9590$	$\nu = 87°08'$
$y_0' = 0.0795$	$q_0' = 0.5521$	$\frac{p_0'}{q_0'} = 1.7370$

Calculation of ν from the Prisms

In figure 40 imagine a line drawn thru 0 and the face-pole pq. This would be the direction-line of the prism $\infty(q/p)$. Let the angle which it makes to the line thru 0 and 0∞ be φ_1. Then from the figure:

$$\tan \varphi_1 = \frac{pp_0 \sin \nu}{qq_0 + pp_0 \cos \nu}$$

which can also be written

$$\tan \varphi_1 = \frac{\frac{p^0}{q_0} \cdot \sin \nu}{\frac{q}{p} + \frac{p_0}{q_0} \cdot \cos \nu}.$$

If we consider the unknown quantities in this equation to be

$$A = \frac{p_0}{q_0} \cdot \sin \nu \text{ and } B = \frac{p_0}{q_0} \cdot \cos \nu,$$

we can substitute these values as follows:

$$\tan \varphi_1 = \frac{A}{\frac{q}{p} + B} \text{ or } A \cot \varphi_1 = \frac{q}{p} + B.$$

Taking now two prisms $\infty q_1/p_1$ with angle φ_1 and $\infty q_2/p_2$ with angle φ_2 and introducing their known values in the last equation we contain:

$$A \cot \varphi_1 = \frac{q_1}{p_1} + B \text{ and } A \cot \varphi_2 = \frac{q_2}{p_2} + B$$

TABLE 8

CALCULATION OF x_0' AND p_0' SIN ν

Numbers are values of x′ taken from Table 3.

A	17 $p = 0$	$.4856 = x_0'$	
	14 $p = 0$	$.4844 = x_0'$	
	16 $p = 0$	$.4834 = x_0'$	$.4844 = x_0'$
B	3 $p = \bar{1}$	$.4773 = x_0' - p_0' \sin \nu$	
	10 $p = \bar{1}$	$.4769 = x_0' - p \sin \nu$	$.4771 = x_0' - p_0' \sin \nu$
C	8 $p = \bar{2}$	$\bar{1}.4419 = x_0' - 2p_0' \sin \nu$	
	2 $p = \bar{2}$	$\bar{1}.4483 = x_0' - 2p_0' \sin \nu$	
	6 $p = \bar{2}$	$\bar{1}.4390 = x_0' - 2p_0' \sin \nu$	
	1 $p = \bar{2}$	$\bar{1}.4246 = x_0' - 2p_0' \sin \nu$	$1.4384 = x_0' - 2p_0' \sin \nu$
D	27 $p = 2$	$2.8443 = x_0' - 2p_0' \sin \nu$	$2.8443 = x_0' + 2p_0' \sin \nu$
E	7 $p = \frac{\bar{2}}{3}$	$.1563 = x_0' - \frac{2}{3} p_0' \sin \nu$	$.1563 = x_0' - \frac{2}{3} p_0' \sin$

From

A & B	$x_0' = .4844$	$p_0' \sin \nu = .9615$
B & C	$x_0' = .4842$	$p_0' \sin \nu = .9613$
A & E		$p_0' \sin \nu = .9610$
Best	x_0' .4844	$p_0' \sin \nu = .9613$

TABLE 9

CALCULATION OF y_0', q_0' AND $p_0' \cos \nu$

Numbers are values of y' taken from Table 3

A	17	$p = 0$	$q = 0$	$0.0795 = y_0$	$y_0' = 0.0795$
B	14	$p = 0$	$q = \bar{2}$	$1.0264 = y_0' - 2q_0'$	
	16	$p = 0$	$q = 2$	$1.1826 = y_0' + 2q_0'$	$y_0' = 0.0781$
C	3	$p = \bar{1}$	$q = \bar{1}$	$0.5206 = y_0' - q_0' - p_0' \cos \nu$	
	10	$p = \bar{1}$	$q = 1$	$0.5838 = y_0' + q_0' - p_0' \cos \nu$	$2y_0' - 2p_0' \cos \nu = 1.0632$
D	8	$p = \bar{2}$	$q = \bar{4}$	$2.2247 = y_0' - 4q_0' - 2p_0' \cos \nu$	
	6	$p = \bar{2}$	$q = 4$	$2.1907 = y_0' + 4q_0' - 2p_0' \cos \nu$	$2y_0' - 4p_0' \cos \nu = 0.0340$
E	2	$p = \bar{2}$	$q = \bar{2}$	$1.1173 = y_0' - 2q_0' - 2p_0' \cos \nu$	$y_0' - 2q_0' - 2p_0' \cos \nu = 1.1173$
F	1	$p = \bar{2}$	$q = 0$	$0.0045 = y_0' - 2p_0' \cos \nu$	$[y_0' = 0.0271]$
	27	$p = 2$	$q = 0$	$0.0587 = y_0' + 2p_0' \cos \nu$	

From			
A	$y_0' = 0.0795$		
B	$y_0' = 0.0781$	$q_0' = 0.5522$	
C		$q_0' = 0.5522$	
D		$q_0' = 0.5519$	
C & D	$y_0' = 0.0802$		
A & C			$p_0' \cos \nu = 0.0479$
A & D			$p_0' \cos \nu = 0.0482$
Mean	$y_0' = 0.0795$	$q_0' = 0.5521$	$p_0' \cos \nu = 0.0480$

But $\tan \nu = \dfrac{p_0' \sin \nu}{p_0' \cos \nu} = \dfrac{.9613}{.0480} \quad \therefore \nu = 87°08\tfrac{1}{4}'$

and by substitution $p_0' = 0.9590$

Solving for A we obtain:

$$A = \frac{\dfrac{q_1}{p_1} - \dfrac{q_2}{p_2}}{\cot \varphi_1 - \cot \varphi_2}.$$

Performing this operation for successive pairs of prisms and substituting the mean value of A in the same equations, we obtain a series of values for B of the form:

$$B = A \cot \varphi_1 - \frac{q_1}{p_1} = A \cot \varphi_2 - \frac{q_2}{p_2} = \cdots.$$

Combining the original equations for A and B, we have $B/A = \cot \nu$. Substituting ν in the same equations we obtain

$$\frac{p_0}{q_0} = \frac{p_0'}{q_0'} = \frac{A}{\sin \nu} = \frac{B}{\cos \nu}.$$

TABLE 10

CALCULATION OF ν AND $\frac{p'_0}{q'_0}$ FROM PRISMS

Values from table 2.

No. of Face.	Symb.	φ.	$\frac{q}{p}$.	cot φ.	$\frac{\frac{q_1}{p_1} - \frac{q_2}{p_2}}{\cot\varphi_1 - \cot\varphi_2} = A.$	$A \cot\varphi - \frac{q}{p} = B.$
12	$\infty 3$	330°01′	3	1.7332	$\frac{2}{1.1108} = \frac{1}{0.5554}$	$\frac{1.7332}{0.5731} - 3 = \frac{0.0139}{0.5731}$
11	∞	301 54	1	0.6224	$\frac{2}{1.1452} = \frac{1}{0.5726}$	$\frac{0.6224}{0.5731} - 1 = \frac{0.0493}{0.5731}$
4	$\infty\ \bar{\infty}$	242 24	$\bar{1}$	$\bar{0}.5228$	$\frac{2}{1.1481} = \frac{1}{0.5740}$	$\frac{\bar{0}.5228}{0.5731} + 1 = \frac{0.0503}{0.5731}$
5	$\infty\bar{3}$	210 54	$\bar{3}$	$\bar{1}.6709$	$\frac{\bar{6}}{3.4468} = \frac{1}{0.5745}$	$\frac{\bar{1}.6709}{0.5731} + 3 = \frac{0.0484}{0.5731}$
21	$\infty 3$	150 37	3	1.7759	$\frac{2}{1.1498} = \frac{1}{0.5749}$	$\frac{1.7759}{0.5731} - 3 = \frac{0.0566}{0.5731}$
22	∞	122 03	1	0.6261	$\frac{2}{1.1459} = \frac{1}{0.5729}$	$\frac{0.6261}{0.5731} - 1 = \frac{0.0530}{0.5731}$
23	$\infty\ \bar{\infty}$	62 32	$\bar{1}$	$\bar{0}.5198$	$\frac{2}{1.1478} = \frac{1}{0.5739}$	$\frac{\bar{0}.5198}{0.5731} + 1 = \frac{0.0533}{0.5731}$
24	$\infty\bar{3}$	30 57	$\bar{3}$	$\bar{1}.6676$	$\frac{\bar{3}}{\bar{1}.6676} = \frac{1}{0.5558}$	$\frac{\bar{1}.6676}{0.5731} + 3 = \frac{0.0517}{0.5731}$
18	0∞	359 59	0	∞		

Average value of $A = \frac{1}{0.5731}$, which is used in calculating the values of the last column. Average value of $B = \frac{0.0518}{0.5731}$.

These operations are contained in table 10 which gives the following results:

$$A \text{ (av. of 7)} = \frac{1}{0.5731}. \quad B \text{ (av. of 7)} = \frac{0.0518}{0.5731}. \quad \frac{B}{A} = \cot\nu = .0518.$$

Therefore $\nu = 87°02'$. From tables 8 and 9, $\nu = 87°08'$.

Av. $\nu = 87°05'$.

$$\frac{p_0'}{q_0'} = 1.7472. \quad \text{From tables 8 and 9, } \frac{p_0'}{q_0'} = 1.7370.$$

$$\text{Av. } \frac{p_0'}{q_0'} = 1.7421.$$

We use this last value for a revision of p_0' and q_0' as follows: $p_0' + q_0' = 1.5111$, $p_0'/q_0' = 1.7421$. Combining we obtain $p_0' = .9600$, $q_0' = .5511$.

Calculation of Polar Elements

See page 188.

$x_0' = 0.4844$, $p_0' = 0.9600$, $\nu = 87°05'$.

$y_0' = 0.0795$, $q_0' = 0.5511$,

$$\delta = \varphi \text{ of the face } 0. \quad \tan\delta = \frac{x_0'}{y_0'} = 6.093, \; \delta = 80°41',$$

Measured $\delta = 80'42'$,

$$\rho_0 = \rho \text{ of the face } 0. \quad \tan\rho_0 = \frac{x_0'}{\sin\delta} = 0.4909, \; \rho_0 = 26°08',$$

Measured $\delta = 26°12'$,

$d' = \tan\rho_0 = 0.4909$, $p_0 = p_0' \cos\rho_0 = 0.8619$,

$x_0 = x_0' \cos\rho_0 = 0.4349$, $q_0 = q_0' \cos\rho_0 = 0.4948$,

$y_0 = y_0' \cos\rho_0 = 0.0714$, $r_0 = 1$,

$\lambda = 85°54'$,

$\cos\lambda = y_0 = 0.0714$, $\mu = 64°02'$,

$\cos\mu = y_0 \cos\nu + x_0 \sin\nu$, $\nu = 87°05'$.

Calculation of Linear Elements

Formulas, see page 189.

$a = 0.6369$, $\alpha = 93°08\frac{1}{2}'$,

$b = 1$, $\beta = 115°50\frac{1}{2}'$,

$c = 0.5496$, $\gamma = 91°15'$.

For the model of this discussion the reader is referred to a paper by Borgström and Goldschmidt, *Krystallberechnung im triklinen System, illustriert am Anorthit.*[1] The discussion is there even fuller and the derivation of several formulas used above without proof may there be found. The projection and drawing of an anorthite crystal in an earlier paper of this series, page 92, will also help to illustrate the present discussion.

[1] *Z. Kryst. Min.*, 41, 63–91, 1905.

LIST OF TRICLINIC MINERALS INCLUDED IN GOLDSCHMIDT'S WINKELTABELLEN. EDGAR T. WHERRY. *Washington, D. C.*—The triclinic minerals are arranged as were those of the two preceding systems in the order of increasing values of axis *a*. The approximate values of the three axial angles are given here.

TRICLINIC MINERALS

	a	c	α	β	γ	Page
Fairfieldite	0.28	0.20	102	95	77	138
Chalcanthite (Kupfervitriol)	0.53	0.52	113	107	93	210
Lansfordite	0.55	0.57	95	100	92	212
Sassolite	0.58	0.53	104	93	90	311
Albite (Schuster's data)	0.62	0.56	94	117	89	139
Anorthite	0.63	0.55	93	116	91	141
Albite (Brezina's data)	0.64	0.56	94	117	88	140
Hannayite	0.70	0.97	123	127	54	170
Veszelyite	0.71	0.91	90	104	90	359
Amblygonite	0.73	0.76	109	98	106	37
Amarantite	0.77	0.57	85	90	97	36
Axinite	0.78	0.98	92	82	103	58
Chalcosiderite	0.79	0.61	93	94	108	93
Cyanite, Kyanite	0.90	0.70	90	100	106	106
Inesite	0.98	1.32	92	133	94	189
Hiortdahlite	1.0–	0.35	89	91	90	178
Babingtonite	1.12	1.83	94	112	86	286
Rhodonite	1.16	1.83	95	111	86	287
Roselite	1.31	0.91	91	91	89	296
Roemerite	2.64	0.97	100	95	64	295
Pseudomalachite (Lunnite)	2.83	1.53	89	91	91	224

This concludes the series of articles on the Goldschmidt two-circle method. They are all to be reprinted, in a single pamphlet, for the use of teachers and students of crystallography.

PROCEEDINGS OF SOCIETIES

PHILADEPLHIA MINERALOGICAL SOCIETY

Wagner Free Institute of Science, October 14, 1920

A stated meeting of the Philadelphia Mineralogical Society was held on the above date with the president, Dr. Burgin, in the chair. Fourteen members and four visitors were present.

The following officers were elected for 1920–1921; President: Dr. Alfred C. Hawkins; vice-president: Mr. Harry W. Trudell; Treasurer: Mr. Harry A. Warford; Secretary: Mr. Samuel G. Gordon.

Mr. Trudell reported a trip to Lenni and Dismal Run, Delaware County, attended by Messrs. Ford, Frankenfield, Knabe, Jones, Gordon, and himself. Mr. Hoadley gave an account of collecting experiences in Connecticut during the past summer, specimens being exhibited. Mr. Gordon described an Ordovician basalt flow in Lebanon County; no zeolites were found; and reported that Mr. Oldach had found arsenopyrite and erythrite at Robeson, Berks County. Dr. Hawkins described a trip taken by Mr. Gordon and himself along the Susquehanna River in Maryland.