The new diploid, (10.7.4), occurred on seven of the ten crystals, and was identified by its angular position in the zone [210: 111]. The reflections were for the most part of good quality and the faces, tho narrow, were bright and well defined.

The measurements which served to identify the modifying forms are as follows:

TABLE 2. ANGLES OF PYRITE FROM NEW YORK CITY

Letter	Angle	Number of measurements	Measured	Calculated	Limits
$a : q$	100 : 211	23	35° 17′	35° 16′	34° 55′–35 42′
$: n$	: 322	3	43 21	43 19	43 15 –43 31
:	: 766	16	49 25	49 24	48 50 –49 57
$o : \mathfrak{B}_1$	111 : 654	7	9 22	9 16½	9 8 – 9 32
$: x$	: 543	7	11 38½	11 32	11 14 –11 57
:	: 753	5	18 17½	18 5½	18 4 –18 37
: *	: 10.7.4	21	19 1½	19 17	18 35 –19 36
: s	: 321	32	22 21	22 12½	21 46 –22 57

* New form.

CRYSTALLOGRAPHY OF SOME CANADIAN MINERALS: 8. AXINITE

EUGENE POITEVIN

Geological Survey of Canada[1]

The crystals here described were collected during the summer of 1908[2] by Charles Camsell of the Canada Geological Survey, from the western slope of the Nickel Plate Mountain, Osoyoos Mining Division, British Columbia, where the mineral occurs in hair-brown crystals and crystalline masses associated with crystalline mispickel, opaline quartz, and calcite at the contact of a gabbro porphyry and sedimentary beds.

An analysis made by R. A. A. Johnston of the Geological Survey[3] from carefully selected crystal fragments gave the following results, which with the exception of the water content (which is too low) agree with the formula proposed by W. T. Schaller,[4]

$$8SiO_2.2Al_2O_3.1B_2O_3.2\ (Fe, Mn, Mg)\ O.4CaO.1H_2O.$$

[1] Published by permission of the Director of the Geological Survey of Canada. Continued from page 25.

[2] *Summary Rept. Geol. Survey*, **1910**, 259; *Geol. Survey Memoir* No. **2**, 148; ECONOMIC GEOLOGY, Ries, Ed. 4, 686, 1916.

[3] *Summary Rept. Geol. Survey*, **1910**, 259.

[4] Mineralogical Notes, Series I. *U. S. Geol. Survey, Bull.* **490**, 39.

TABLE 4. ANALYSIS AND RATIOS OF AXINITE, BRITISH COLUMBIA

			Ratios		
SiO_2	42.18	SiO_2		.6995	8.000
B_2O_3	5.22	B_2O_3		.0884	1.011
Al_2O_3	18.12	Al_2O_3	.1773	.1834	2.097
Fe_2O_3	0.98	Fe_2O_3	.0061		
FeO	7.20	FeO	.1002		
MnO	3.89	MnO	.0584	.1951	2.190
ZnO	0.09	ZnO	.0011		
MgO	1.43	MgO	.0354		
CaO	19.91	CaO		.3549	4.058
H_2O	0.35	H_2O		.1093	0.022
Sum	99.37				
Sp. Gr. 3.296.					

It was observed that the finest crystals were implanted upon the opaline quartz. The largest of these so far observed do not exceed 1 cm. in length, while the remainder were of smaller dimensions, some being almost of microscopic size. Owing to the firmness with which they were implanted upon the matrix it was found impossible to detach more than fragments of individuals for purposes of measurement.

Altho a large number of the crystals were examined, measurements were carried out on only nine of them; of the thirty-nine forms which were observed, nine are new. Three others are still uncertain. All symbols are given in Miller's orientation, as modified by Professor V. Goldschmidt.

The prisms $u(1\bar{1}0)$ and $c(010)$ are striated vertically. The domes, also, are usually striated parallel to their zonal intersections. Of forms hitherto rare on axinite, three were observed:

γ (120) was first described by Sjögren[1] and later by Schaller;[2] on crystals from Nickel Plate Mountain it occurs as a very narrow face.

N $(2\bar{9}0)$ of Franck[3] was observed as a face of vicinal character.

ω (203) was observed as a very small face, which gave poor reflections; this form was described by Gonnard,[4] and tabulated with uncertain forms of axinite in Goldschmidt's Atlas der Krystallformen.

[1] *Bull. Geol. Inst. Upsala*, **1**, 1, 1892.

[2] *Work cited*, 43, 1911.

[3] *Bull. Acad. Belgique*, **25**, 17, 1893.

[4] *Bull. soc. franc. min.*, **16**, 95, 1893; Goldschmidt, Atlas d. Krystallformen, Text I, p. 129.

TABLE 5. ANGLE TABLE FOR AXINITE FROM BRITISH COLUMBIA

Letter	Symbol	Calculated		Measured Average		No. of Readings
		ϕ	ρ	ϕ	ρ	
m	001	$\bar{9}0°\ 34'$	7° 58′	$\bar{9}0°\ 22'$	8° 21′	4
c	010	00 00	90 00	00 00	90 00	10
γ	120	36 14	"	36 14	"	1
w	110	60 16	"	60 23	"	8
M	100	102 30	"	102 34	"	8
u	$1\bar{1}0$	135 24	"	135 23	"	10
H	$2\bar{3}0$	144 40	"	143 56	"	1
l	$1\bar{2}0$	151 23	"	151 57	"	1
N	$2\bar{9}0$	165 18	"	166 00	"	2
e	011	$\bar{7}$ 58	45 16	$\bar{7}$ 55	45 17	4
z	$0\bar{1}2$	$\bar{1}64$ 24	27 32	$\bar{1}64$ 01	27 25	10
r	$0\bar{1}1$	$\bar{1}72$ 02	45 21	$\bar{1}71$ 50	45 15	11
q	103	108 38	16 30	108 30	16 38	6
f	102	106 03	27 04	106 53	26 50	3
ω	203	105 00	38 47	105 31	38 04	1
a	101	104 04	49 10	104 25	49 16	6
b	$\bar{1}01$	$\bar{7}\bar{8}$ 46	55 02	$\bar{7}8$ 54	55 24	3
μ	$\bar{2}01$	$\bar{7}\bar{8}$ 10	69 50	$\bar{7}8$ 18	70 08	1
o	112	53 49	31 19	$\bar{5}3$ 57	31 12	7
δ	$\bar{1}\bar{1}2$	$\bar{1}\bar{1}5$ 08	40 26	$\bar{1}\bar{1}5$ 00	40 34	3
y	111	57 19	53 08	57 36	53 06	9
x	$1\bar{1}1$	138 48	59 36	138 54	59 43	6
n	$\bar{1}\bar{1}1$	$\bar{1}\bar{1}7$ 16	57 38	$\bar{1}\bar{1}7$ 07	57 41	3
σ	121	33 06	64 03	33 55	64 21	1
W	$2\bar{3}2$	147 48	64 36	148 28	63 43	1
s	$1\bar{2}1$	153 49	68 32	153 42	68 30	5
q	211	79 33	67 35	80 05	67 41	2
$*\sigma_0$	130	24 55	90 00	25 15	90 00	4
$*\psi_0$	201	103 15	67 48	102 49	67 55	2
$*\Pi$	205	107 16	20 55	107 48	20 43	3
$*\Sigma$	104	112 07	10 44	112 27	10 26	2
$*\Delta$	021	4 00	63 30	3 17	63 30	1
$*\phi_0$	$0\bar{3}4$	$\bar{1}69$ 27	37 26	$\bar{1}69$ 09	37 39	1
$*p_0$	735	82 44	58 38	83 33	58 48	1
$*\lambda_0$	312	$\bar{8}7$ 25	60 20	$\bar{8}7$ 13	60 10	1
$*x_0$	$\bar{3}\bar{2}2$	$\bar{1}05$ 59	64 42	$\bar{1}05$ 57	64 42	1
$*\Omega$	$\bar{1}80$	$\bar{1}0$ 03	90 00	$\bar{9}$ 30	90 00	1
$*A_0$	$1\bar{6}0$	169 00	"	169 24	"	1
$*B_0$	$3\bar{7}0$	154 14	"	154 49	"	2

*New forms.

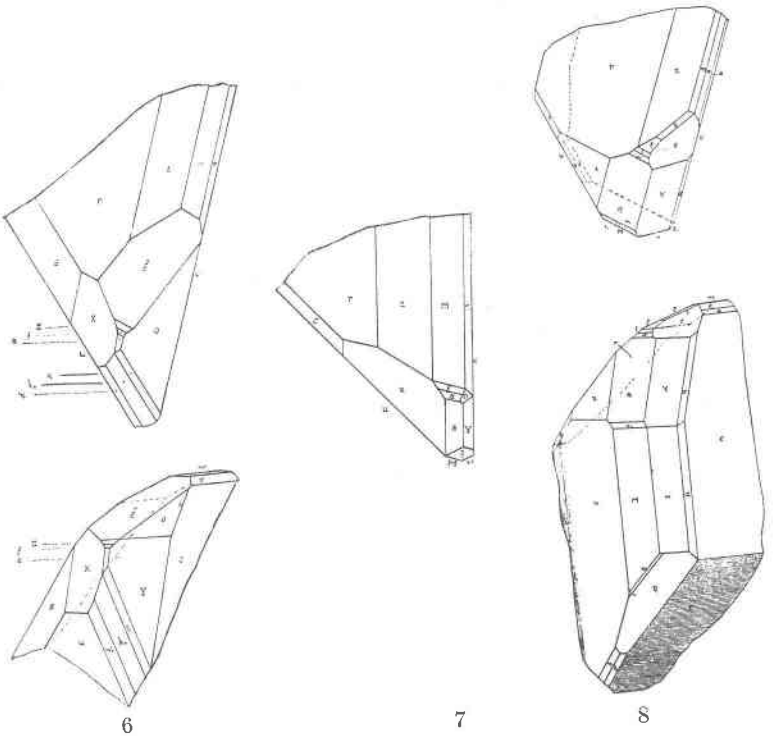
The new macro domes: ψ_0 (201), II (205), and Σ (104), altho of small size, possess sufficient brilliancy to give good reflections. (See Figs. 6, 7 and 8.)

The brachy prism: σ (130) was observed four times as a long narrow face. (Fig. 8.)

The brachydomes: Δ (021) and φ_0 ($0\bar{3}4$) are among the new forms. They were observed in but single instances. (Fig. 8.)

The new macro pyramids: p_0 (735); λ_0 (312); x_0 ($\bar{3}\bar{2}2$) were observed as faces of fair size and of brilliant luster. (Figs. 6 and 8.)

The brachy prisms: Ω ($\bar{1}80$); A_0 ($1\bar{6}0$); B_0 ($3\bar{7}0$) are placed here as uncertain vicinal forms.



6 7 8

AXINITE, NICKEL PLATE MOUNTAIN

FIG. 6. Orthographic and clinographic projections of crystal showing the new forms II (205), ψ_0(201), λ_0(312), and p_0(735).

FIG. 7. Orthographic projection of a crystal showing the new form II (205).

FIG. 8. Orthographic and clinographic projections of crystal showing the new forms Σ(104), ψ_0(201), Δ(021), σ_0(130) and x_0 ($\bar{3}\bar{2}2$).

The following table is arranged to show the combinations of forms on nine measured crystals:

TABLE 6. COMBINATIONS OF FORMS ON AXINITE CRYSTALS

		1	2	3	4	5	6	7	8	9
m	001	+	+	+	+	+	+		+	+
c	010	+	+	+	+	+	+	+	+	+
α	120	+								
w	110	+	+	+	+	+	+		+	
M	100	+	+	+	+	+	+		+	
u	$1\bar{1}0$	+	+	+		+	+	+	+	+
H	$2\bar{3}0$	+								
l	$1\bar{2}0$					+	+		+	+
N	$2\bar{9}0$	+		+						
c	011	+		+		+		+		
z	$0\bar{1}2$	+	+	+		+	+	+	+	+
r	$0\bar{1}1$	+	+	+		+	+		+	+
g	103	+	+	+	+	+		+		
f	102	+			+			+		
ω	203	+								
a	101	+	+	+	+	+		+	+	
b	$\bar{1}01$	+	+				+			
μ	$\bar{2}01$						+			
o	112	+	+	+	+	+		+	+	+
δ	$\bar{1}\bar{1}2$	+	+				+			
y	111	+	+	+	+	+		+	+	+
x	$1\bar{1}1$	+	+	+	+	+		+	+	+
n	$\bar{1}\bar{1}1$	+	+				+			
σ	121	+				+				
W	$2\bar{3}2$				+					
s	$1\bar{2}1$	+		+		+		+		+
q	211		+		+					
$*\sigma_0$	130	+	+							
$*\psi_0$	201	+						+		
$*\Pi$	205		+	+				+		
$*\Sigma$	104	+	+							
$*\Delta$	021	+								
$*\varphi_0$	$0\bar{3}4$		+							
$*p_0$	735							+		
$*\lambda_0$	312		+					+		
$*x_0$	$\bar{3}\bar{2}2$	+								
$*\Omega$	$\bar{1}80$	+								
$*A_0$	$1\bar{6}0$			+	+					
$*B_0$	$3\bar{7}0$	+		+						

New forms marked *.