noted in only one sample disseminated in quartz and as needles projecting into a vug.

Defiance Group, Sumallo River, Yale M.D., B. C. These claims are situated on the south bank of the Sumallo River about a mile below its junction with the Skagit. Specimens brought in by Peter Henson consisted of vuggy quartz and soft finely fibrous jamesonite partially filling many of the vugs. A spectrographic analysis showed traces of Ag, Cu, and As in addition to the main constituents of the mineral. So far as is known, no antimony mineral has heretofore been reported from this group; however, Cairnes (*Geol. Surv. Canada*, Summ. Rep., **1920**, 41 A) suggested the possibility of jamesonite and berthierite being present on the neighbouring Rainbow Claim.

Brown McDade Property, Carmacks District, Yukon Territory (see "bournonite"). Jamesonite was noted in minor amounts in polished sections of ore from three diamond drill holes. It is closely associated with tetrahedrite and sphalerite, but it was also noted in fractures in brecciated masses of pyrite and arsenopyrite in long fibrous crystals sometimes slightly bent, with occasional cross-fractures resulting from the basal cleavage.

Akaitcho Property, Yellowknife, N.W.T. (see "bournonite"). Jamesonite occurs in small pockets and fine veinlets associated with stibnite, etc., and gold at the boundaries and as blebs within the jamesonite. Spectrographic analyses showed Ag in addition to Au, Pb, Fe, and Sb, but As was not found.

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OBSERVATIONS ON KOBELLITE

Kobellite is a little-known ore mineral originally described from Hvena, Sweden, by Setterberg (*Ak. Stockholm, Handl.*, **27**, 188, 1841 for 1839) and later reported by Keller (*Zs. Kryst.*, **17**, 67, 1889) from Ouray, Colorado. On the basis of this early work the mineral is given in Dana (*Syst. Min.*, 1944, p. 447) as a doubtful species of unknown crystallography with composition possibly $2PbS.(Bi,Sb)_2S_3$ in which Bi : Sb $\sim$ 2 : 1. Kobellite thus has the appearance of an antimonian variety of cosalite, $2PbS.Bi_2S_3$.

Nothing has been added to th
the microscopical details in Schn
skopie, **2**, 431, 1931) and the
(*Am. Mineral.*, **27**, 88, 1942).
Sweden (Harvard Mineralogical
years ago by Professor Palach
further observations on this min

Kobellite occurs in compact
grey colour and good metallic l
and chalcopyrite in quartz gang
good cleavage parallel to the
cleavage fragments are difficult t
several measurements of the sp
with the Berman balance gave
6.33 in the literature.

Dr. R. M. Thompson suppli
notes. A polished section shows
and argentite in shade, with s
moderate anisotropism, giving co
brown. Extinction appears to be
enlongation and the cleavage tr
with effervescence and produces
with HCl, KCN, $FeCl_3$, KOH, H
strong positive reactions for Pb,
Fe. The hardness is A +, slightl

Fragments showing longitudi
used for rotation and Weissenbe
elongation and striation, the axis
striations, and the axis normal t
orthorhombic symmetry (as infer
behaviour) and the space group L

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y of cosalite, $2PbS.Bi_2S_3$.

Nothing has been added to the description of kobellite beyond the microscopical details in Schneiderhöhn & Ramdohr (*Erzmikroskopie*, **2**, 431, 1931) and the X-ray powder data by Harcourt (*Am. Mineral.*, **27**, 88, 1942). A typical specimen from Hvena, Sweden (Harvard Mineralogical Museum, 82435), kindly lent some years ago by Professor Palache, gave the opportunity to make further observations on this mineral.

Kobellite occurs in compact coarsely fibrous masses with lead-grey colour and good metallic lustre, intergrown with pyrrhotite and chalcopyrite in quartz gangue. Broken surfaces show a single good cleavage parallel to the fibre direction but single-crystal cleavage fragments are difficult to obtain. The hardness is $2\frac{1}{2}$ and several measurements of the specific gravity of clean fragments with the Berman balance gave 6.48 ± 0.05, as compared to 6.29-6.33 in the literature.

Dr. R. M. Thompson supplied the following mineralographic notes. A polished section shows a white mineral, between galena and argentite in shade, with slight reflection pleochroism and moderate anisotropism, giving colours from steel grey to light grey-brown. Extinction appears to be parallel to the somewhat columnar enlongation and the cleavage traces. HNO_3 attacks the surface with effervescence and produces a black stain; there is no reaction with HCl, KCN, $FeCl_3$, KOH, $HgCl_2$. Microchemical tests gave strong positive reactions for Pb, Bi, Sb and indications of Cu and Fe. The hardness is A +, slightly softer than galena.

Fragments showing longitudinal cleavage and striations were used for rotation and Weissenberg photographs about the axis of elongation and striation, the axis in the cleavage and normal to the striations, and the axis normal to the cleavage. The films show orthorhombic symmetry (as inferred by Ramdohr from the optical behaviour) and the space group D_{2h}^{13}—*Pnmm*; cell dimensions:

$$a = 22.57,\ b = 34.01,\ c = 4.01 \text{ kX}$$

With reference to this cell the elongation is [001] and the cleavage (010).

The composition of kobellite, known only through two early and unsatisfactory analyses (1, 2), suggests three possible interpretations of the cell contents (*A*, *B*, *C*). The calculated composition (*A*) for a cell containing $4[6PbS.2Bi_2S_3.Sb_2S_3]$ agrees fairly well with the twice recalculated analysis (1*a*) of Setterberg, but the calculated density for this cell is distinctly too low. If it may be assumed that Fe in the analysis (1) is actually due to constitutional Fe, as in jamesonite, the cell content $4[6PbS.FeS.2Bi_2S_3.Sb_2S_3]$ gives the calculated composition and density (*B*), in better agreement with the analyses. Finally, to raise the calculated density to the new measured value the cell content $4[7PbS.2Bi_2S_3.Sb_2S_3]$ might be considered; but the composition (*C*) for this formula agrees poorly with the analyses. Provisionally the interpretation (*B*) could be retained until the question of the cell content of kobellite can be settled by a new analysis on pure material.

KOBELLITE: ANALYSES AND CALCULATED COMPOSITIONS

	1	1*a*	2	*A*	*B*	*C*
Pb	40.74	42.66	38.95	44.34	43.00	47.67
Fe	2.02	...	...	...	1.93	...
Cu	0.88	...	0.97	...	...	...
Ag	...	...	3.58	...	...	...
Bi	28.37	29.71	30.61	29.82	28.91	27.47
Sb	9.38	9.82	8.13	8.69	8.42	8.00
S	18.61	17.81	17.76	17.15	17.74	16.86
	100.00	100.00	100.00	100.00	100.00	100.00
G	6.29-6.32 6.48 (E.W.N.)	(Sett.)	6.334 (Keller)	6.01 (calc.)	6.20 (calc).	6.52 (calc.)

1—Hvena, Sweden; anal. Setterberg (1839) recalculated to new atomic weights by Rammelsberg, 1875, in Dana (1944, p. 447).

1*a*—Foregoing analysis recalculated with removal of $CuFeS_2$ and FeS.

2—Ouray, Colorado; anal. Keller (1889) in Dana (1944, p. 447); average of four analyses of massive material, recalculated with removal of ZnS, $CuFeS_2$, and gangue.

A. Calculated composition and density for $4[6PbS.2Bi_2S_3.Sb_2S_3]$.

B. Calculated composition and density for $4[6PbS.FeS.2Bi_2S_3.Sb_2S_3]$.

C. Calculated composition and density for $4[7PbS.2Bi_2S_3.Sb_2S_3]$.

Kobellite gives a distinctive X-ray powder pattern which has a superficial resemblance but no real similarity to that of cosalite. The pattern agrees substantially with that of Harcourt (1942, p. 88); it is indexed with the new cell dimensions in the following table.

KOBELLITE—6PbS.

Orthorhombic, P*nmm*; *a* = 22.

I	θ(Cu)	*d*(meas.)	(*hkl*)	*d*(calc.
½	10.55°	4.20	(080)	4.251
1	11.15	3.98	(280)	3.97
			(011)	3.98
½	11.95	3.72	(600)	3.76
			(190)	3.72
9	12.65	3.51	(560)	3.531
10	13.1	3.39	(0.10.0)	3.40
			(480)	3.39
2	13.65	3.26	(401)	3.26
			(341)	3.21
			(2.10.0)	3.25

I	θ(Cu)	*d*(meas.)	*I*	θ(
3	21.1°	2.14	½	25
½	21.7	2.08	2	26
4	22.1	2.04	2	27
½	22.4	2.02	½	28
1	23.7	1.912	½	29
½	24.1	1.883	½	31
½	24.7	1.840	1	33

The foregoing observations
and show that this mineral is
but an independent species. T
patterns of the two minerals is
of their cell dimensions.

Cosalite: *a* = 19.0
Kobellite: *a* = 22.5

The above values for cosa
Berry (these *Studies*, Geol. Ser

$bS.2Bi_2S_3.Sb_2S_3$] agrees fairly
alysis (1*a*) of Setterberg, but
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he cell content 4[$7PbS.2Bi_2S_3$.-
the composition (*C*) for this
alyses. Provisionally the in-
until the question of the cell
l by a new analysis on pure

LCULATED COMPOSITIONS

	A	*B*	*C*
.95	44.34	43.00	47.67
..	...	1.93	...
.97	...	...	...
.58	...	...	...
.61	29.82	28.91	27.47
.13	8.69	8.42	8.00
.76	17.15	17.74	16.86
.00	100.00	100.00	100.00
334	6.01	6.20	6.52
ler)	(calc.)	(calc).	(calc.)

(1839) recalculated to new atomic
1944, p. 447).
ith removal of $CuFeS_2$ and FeS.
89) in Dana (1944, p. 447); average
culated with removal of ZnS, $CuFeS_2$,

y for 4[$6PbS.2Bi_2S_3.Sb_2S_3$].
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ray powder pattern which has a
l similarity to that of cosalite.
h that of Harcourt (1942, p. 88);
ensions in the following table.

KOBELLITE—$6PbS.FeS.2Bi_2S_3.Sb_2S_3$

Orthorhombic, P*nmm*; $a = 22.57$, $b = 34.01$, $c = 4.01$ kX; $Z = 4$

I	θ(Cu)	*d*(meas.)	(*hkl*)	*d*(calc.)	*I*	θ(Cu)	*d*(meas.)	(*hkl*)	*d*(calc.)
½	10.55°	4.20	(080)	4.251	2	14.25°	3.12	(660)	3.134
1	11.15	3.98	(280)	3.978	2	15.05	2.96	(670)	2.975
			(011)	3.982	3	15.75	2.83	(0.12.0)	2.834
½	11.95	3.72	(600)	3.762				(800)	2.821
			(190)	3.727	3	16.6	2.69	(770)	2.687
9	12.65	3.51	(560)	3.531	½	17.25	2.59	(1.13.0)	2.599
10	13.1	3.39	(0.10.0)	3.401	½	19.65	2.29	(3.14.0)	2.312
			(480)	3.395				(811)	2.302
2	13.65	3.26	(401)	3.269	½	20.0	2.25	(10.0.0)	2.257
			(341)	3.217					
			(2.10.0)	3.257					

I	θ(Cu)	*d*(meas.)	*I*	θ(Cu)	*d*(meas.)	*I*	θ(Cu)	*d*(meas.)
3	21.1°	2.14	½	25.15°	1.809	1	35.75°	1.316
½	21.7	2.08	2	26.2	1.741	½	36.15	1.303
4	22.1	2.04	2	27.0	1.693	½	37.25	1.270
½	22.4	2.02	½	28.85	1.594	½	38.0	1.249
1	23.7	1.912	½	29.65	1.554	½	38.6	1.232
½	24.1	1.883	½	31.95	1.453	½	39.3	1.214
½	24.7	1.840	1	33.8	1.382	½	40.05	1.194
						½	40.7	1.179

The foregoing observations confirm the individuality of kobellite and show that this mineral is not merely an antimonian cosalite but an independent species. The partial resemblance of the powder patterns of the two minerals is in keeping with the partial similarity of their cell dimensions.

Cosalite: $a = 19.05$, $b = 23.82$, $c = 4.047$ kX
Kobellite: $a = 22.57$, $b = 34.01$, $c = 4.01$ kX

The above values for cosalite are from the original paper by Berry (these *Studies*, Geol. Ser., **42**, 23, 1939).

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