600079

A STUDY OF THE MINERALOGY OF ORE FROM THE TCHAIKAZAN RIVER PROPERTY OF THE CONWEST EXPLORATION COMPANY.

BY

JOHN LAMB

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THE UNIVERSITY OF BRITISH COLUMBIA

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Acknowledgments:

This study was carried out during the Autumn and Winter of 1946 - '47 in the Geological laboratories at the University of British Columbia. Dr. H.V. Warren, Professor of Mineralogy and Petrography, personally directed the work and advised on the many problems which confronted the writer.

Valuable assistance was obtained from Mr. J.A. Donnan, technician, who supervised the work of preparing the polished sections of ore, and Mr. P.E. Page who prepared some interesting sections.

Assaying of samples was done by Mr. A. Affleck of the Department of Metallurgy, and several X-ray powder analyses were performed by Dr. R.M. Thompson at the University of Toronto.

For advice freely given by fellow students Messrs. J.W. Hoadley and J.W. Young, the writer is indebted. ~~to them.~~

The work was carried out with the aid of the Cariboo Gold Quartz Mining Company scholarship, presented for such research.

I Introduction:

During the Summers of the past few years the Conwest Exploration Company has had prospecting parties in the Taseko Lake Area, under Dr. H.V. Warren. The Tchaikazan River discovery is a result of this work.

Previous research on ores from other properties in the district has shown that the mineralogies of these deposits are similar in a general way, and of a type not represented in the producing mining camps of B.C. They are characterized chiefly by the presence of considerable amounts of tellurides. The present work attempts not only to study the mineralogy of the Tchaikazan ore, but to add to the knowledge of tellurides in British Columbia.

Preliminary work on the ore was carried out in 1946 by Messrs F.R.R. Jones and A.F. Shepherd in the laboratories of the University of B.C. Their results are contained in papers mentioned in the bibliography. Since these were completed, more prospecting has yielded further samples of ore. Much additional information has been obtained from these samples, and is presented in this report as a supplement to the preliminary work.

II System of Study:

Approximately 300 Lbs of ore were available for use, in which was a number of picked samples. These were known to be of higher grade, often containing visible tellurides, some of which were identified in the field by Dr. Warren.

Almost twenty samples were cut, mounted in bakelite and polished by either of the following methods.

1. Superpolishing:

This is done on the Graton-Vanderwilt polishing machine. It imparts a good polish to harder minerals.

2. Hand Polishing:

This method is quick and simple, giving an excellent polish to the soft minerals. It is not as satisfactory as method No. 1., for hard minerals. Because most of the samples contained soft minerals the method was used almost exclusively. It consists of rubbing the face of the specimen on a glass lap using the following abrasives in the order given: powdered carborundum, aloxite, microid alumina or F 1234 fine abrasive. A final polish is obtained on a revolving billiard cloth lap using chromic oxide as an abrasive. This reduces relief to a minimum and gives a high gloss to the mineral.

The polished sections were then studied under mineralographic microscopes using the methods described by Short [8].

Where concentrations of metallic minerals were desired the Superpanner was used. The concentrates were assayed, also mounted and polished and studied as above. This technique is useful in studying the distribution of gold and silver values in the ore, and in proving the presence of minerals not previously located.

Several samples were sent to R.M. Thompson for X-ray powder analyses of unidentified minerals.

III Location:

The property lies about 5 miles west of Taseko Lake,

LOOKING SOUTH TOWARDS TCHAIKAZAN RIDGE
ELEVATION OVER 8000'
CLAIMS LIE BEYOND THE RIDGE

LOOKING SOUTH - THE TCHAIKAZAN RIVER VALLEY
IS BEYOND THE SKYLINE

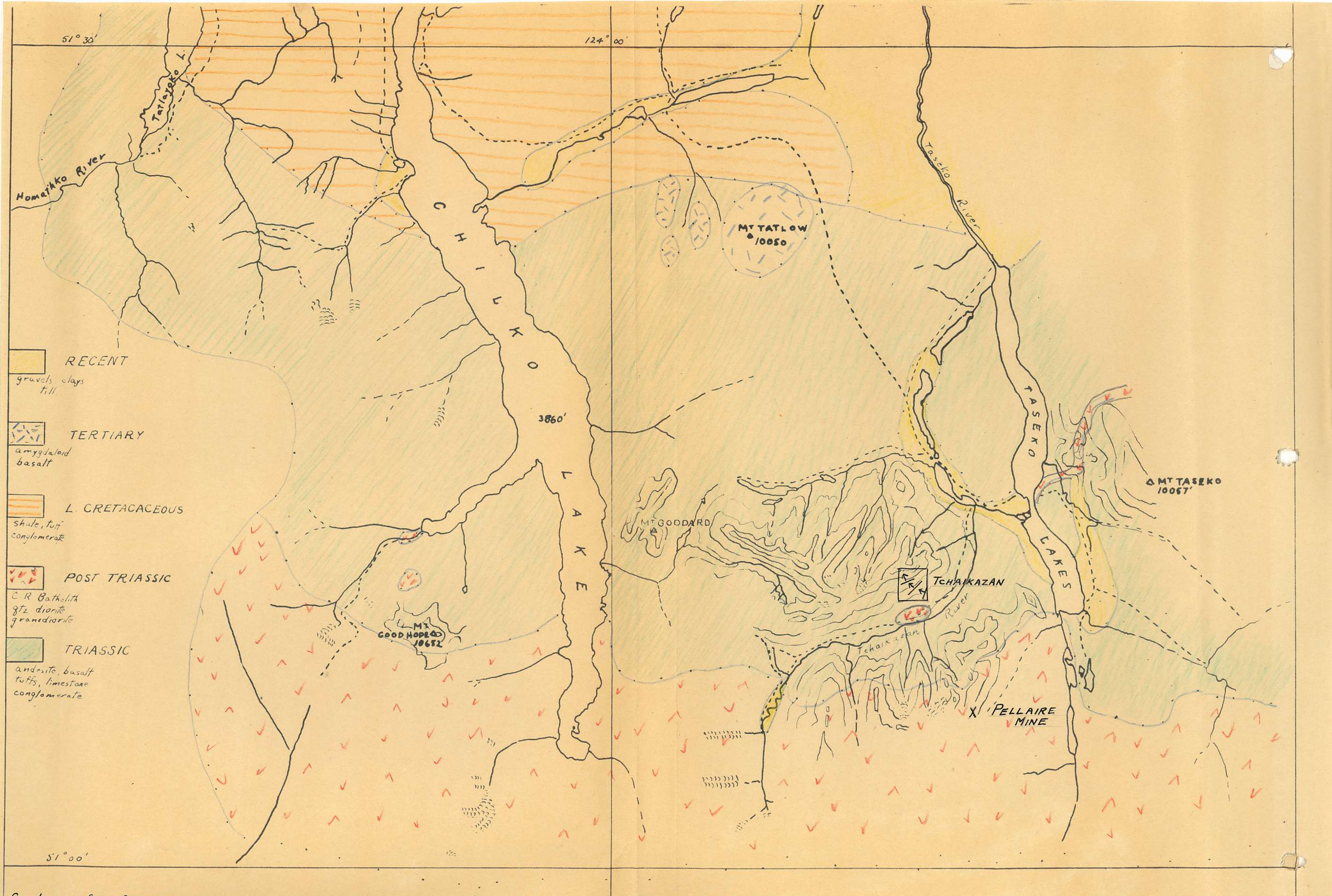
which is 140 miles Northwest of Vancouver, in the Clinton Mining Division. Access to the district is obtained directly by air or by two land routes. The first is by road, 150 miles West from Williams Lake, thence by boat and trail for 40 miles southward. The second route lies over a pack trail 50 miles Northwest from the Bridge River Mining Camp.

The claims are located on a steep mountain slope to the North of the Tchaikazan River at elevations ranging from 5000 to 8000 feet. The topography is extremely rugged. To the Southwest lies the main mass of the Coast Range Mountains, while to the Northeast lies the Interior Plateau of B.C. Mountain glaciers are numerous in the area, being remnants of the once extensive ice cap of the glacial period.

IV Geology of the Region:

Quoting from the repert by Dolmage [2]. "The geological boundaries in this region follow in a general way the physiographic boundaries and strike in a Westerly and Northwesterly direction. The whole northeastern part is occupied by Tertiary lava flows, and the southwestern part by the granites of the Coast Range batholith. The intervening part about 30 miles wide is occupied by Mesozoic sedimentary and volcanic rocks. The northern half of this strip of Mesozoic is composed entirely of sedimentary rocks in which lower Cretaceous fossils were found, whereas the southern half is occupied by volcanic and sedimentary rocks from which Triassic fossils were recovered."

In the vicinity of the property the rocks are composed of



Geology after DOLMAGE

silicified tuffs and conglomerates of Triassic age (see map facing this page). Their strikes are slightly north of west and they dip steeply north. To the south in the Tchaikazan River Valley there is a small stock-like outlier of the granodiorites and quartz diorites of the main batholith.

Three veins have been located to date. The first, called Charlie Vein is six inches wide striking almost northeast and dipping northwesterly at 60 degrees into the mountain. The Big Vein strikes easterly and dips 40 degrees to the north. It has an average width of two feet. The Zinc Vein, so called for its sphalerite content is eight inches wide, strikes 30 degrees northeast and dips 30 degrees to the northwest.

V Mineralogy:

The following minerals are present in the ore; pyrite, chalcopyrite, arsenopyrite, tetrahedrite, sphalerite, galena, altaite, hessite, wehrlite, gold, limonite, malachite, azurite, quartz and carbonate. Minute quantities of a light creamy soft mineral were observed in one or two sections. This may be a gold telluride.

In addition to the above, Jones [5] and Shepherd [7] report hematite and possibly magnetite and anglesite, while they located two others which may be tellurides. It is believed by the writer after an examination of their polished sections that the unidentified white inclusions in galena are the lead telluride, altaite.

A description of the minerals follows:

1. Pyrite FeS_2

The pyrite is usually finely disseminated throughout the quartz gangue. It occurs in irregular masses but often the form is euhedral to subhedral in cubes and pyritohedrons. Much of the pyrite is altered to limonite, leaving only the original outline with remnants of pyrite in it. In none of the sections was pyrite noticed in contact with other sulphides, with the exception of the sphalerite in the Zinc Vein.

2. Chalcopyrite $CuFeS_2$

It is found in abundance in the Big Vein, closely associated with tetrahedrite. The form is massive rather than disseminated. All specimens of chalcopyrite show more or less alteration along cracks and boundaries to limonite, and also to the secondary copper minerals, malachite and azurite.

3. Tetrahedrite $3Cu_2S\ Sb_2S_3 + Ag$

Found in massive amounts in the Big Vein. In the hand specimens it is seen in association with pyrite and chalcopyrite. These hand specimens are usually covered with a dusty brown coating of limonite, and also with the green and blue stains of the secondary copper minerals. Like chalcopyrite, the tetrahedrite in polished sections shows alteration along fractures and boundaries. In some places it has been completely replaced. Inclusions of sphalerite and arsenopyrite are common in the tetrahedrite.

4. Arsenopyrite FeAsS

This mineral has been noticed so far only in euhedral rhombs and diamonds in tetrahedrite. The grains average 10 to 20 microns in size but have been observed up to 50 microns.

5. Sphalerite ZnS

It is found in the Zinc Vein in massive amounts, and also in the Big Vein as inclusions in tetrahedrite. These inclusions are rounded and irregular in shape and occasionally they contain minute blebs of a yellow-green mineral, probably chalcopyrite.

6. Galena PbS

It is abundant in the high grade ore from the Charlie Vein, although nowhere was it found in contact with the other sulphides. The characteristic triangular cleavage pits are well developed in galena. Associated intimately with it are the tellurides and gold. Most of the galena shows oxidation along its boundaries to a dark gray earthy mineral probably a secondary compound of lead.

7. Altaite PbTe

Found intimately associated with galena and other tellurides. In the hand specimen when fresh it has a high metallic lustre but tarnishes in a relatively short time to a bronze yellow. In polished section it is silvery white and exhibits smooth contacts with galena and hessite. Sometimes altaite occurs as inclusions in galena and vice versa. Triangular cleavage pits are observed in altaite although they are not as common or as well developed as those in galena.

Altaite is very soft (hardness 2) and takes an exceptionally smooth polish. Like the galena it is altered around boundaries and along fractures to a dark gray secondary mineral.

8. Hessite Ag_2Te

Found with altaite and galena and gold, in masses ranging up to one millimetre across. In the hand specimen it has a silvery lustre when fresh with an indistinct cleavage, but it weathers rapidly to a secondary, earthy, yellow-gray mass. Because of this property, hessite may be easily passed by in the field without recognition. In polished sections it appears slightly darker in color than galena and decidedly grayer than altaite. Often hessite does not attain the smooth polish of the other two, usually showing a pitting and roughness on its surface. In polarized light hessite has a peculiar orange and blue mottled effect, due to confused twinning. This must be seen to be appreciated as a word description is not adequate.

9. Wehrlite $Bi_2Te_3 + Ag$

This rare telluride of bismuth has been found in only a few localities in the world. In the Tchaikazan ores it is associated with galena and the other tellurides. It contains inclusions of hessite.

It is described by Dana [1] as being tin-white to steel-gray, foliated, with a specific gravity of 8.41 ± 0.03 and a hardness from 1 to 2. Resembling tetradymite, it may carry in addition up to 4.37 percent silver.

In polished section wehrlite is a silver white mineral, strongly anisotropic with two extinctions per revolution from a dark blue-gray to light blue-gray, and a hardness of B. Occasionally it shows wavy parallel streaks through it of a darker material resembling a secondary weathering product. Similar streaks were seen also in a tetradymite sample from Whitesail Lake, B.C.

10. Gold Au

Although one small piece of gold (5 microns) was observed in tetrahedrite, the largest part is closely associated with galena and with the tellurides. It is a bright yellow color, usually exhibiting the peculiar roughness characteristic of it in polished section. While some of the gold appears in the weathered products of the tellurides and galena, much of it is embedded in the fresh minerals. Especially is it noticeable as streaks and seams in hessite. In size the gold varies from a few microns up to pieces of 200 microns. None of the gold observed by the writer is considered to be anything but primary.

11. Limonite $Fe_2 O_3 nH_2O$

This mineral is observed both in hand specimens and polished sections as the product of weathering of the sulphide minerals. It is easily recognized by its mode of occurrence as a gray sub metallic material replacing sulphides along cracks and cleavages. It has a deep red-orange internal reflection, seen in strong polarized light.

12. <u>Malachite</u> $Cu\ CO_3\ Cu\ (OH)_2$

<u>Azurite</u> $2CuCO_3\ Cu\ (OH)_2$

Both of these minerals are recognizable in hand specimens by their characteristic green and blue stains on specimens of the primary copper minerals. In polished sections they are plainly seen replacing tetrahedrite and chalcopyrite. Under polarized light they exhibit blue or green internal reflections

13. <u>Unidentified Minerals</u>.

Two minute specks were observed in association with tellurides, of a bright creamy mineral. It is suspected that this may be one of the gold-silver tellurides, but the small size of the specks made it impossible to prove anything.

VI Identification of Minerals:

Familiarity with the following minerals enabled the writer to identify them megascopically by their physical properties; pyrite, chalcopyrite, sphalerite, limonite, malachite, azurite, quartz and carbonate. Other minerals were identified microscopically and chemically.

1. <u>Arsenopyrite</u>:

The determination rests chiefly on the color, polarization effects, hardness and form.

<u>Color:</u> Tin white.

<u>Hardness:</u> E, can't be scratched by a needle.

<u>Polarization effect:</u> Strongly anisotropic from blue to light brown, to gray. Two extinctions per revolution.

<u>Form:</u> Prismatic and diamond shapes.

<u>Etch reactions:</u> HNO_3 - Neg.

HCl - Neg.

KCN - Neg.

$FeCl_3$ - Neg.

KOH - Neg.

$HgCl_2$ - Neg.

The above reactions differ from those of Short [8] in that he observes a positive reaction with HNO_3

2. <u>Tetrahedrite:</u>

<u>Color:</u> Gray - white.

<u>Hardness:</u> D, can be scratched by a needle with pressure.

<u>Polarization effect:</u> Isotropic or nearly so.

<u>Etch reactions:</u> HNO_3 - Slight brown tarnish on edge of drop.

HCl - Neg.

KCN - Iridescent stain; erases

$FeCl_3$ - Neg.

KOH - Slight brown tarnish.

$HgCl_2$ - Neg.

<u>Microchemical reactions:</u> Gives a good test for both copper and antimony.

3. <u>Galena:</u>

<u>Color:</u> White when seen alone in the field of view. In contrast with altaite it assumes a mauve tint.

<u>Hardness:</u> B, easily scratched.

<u>Polarization effects:</u> Isotropic.

Form: Rows of triangular pits common, due to cubic cleavage.

Etch Reactions: HNO_3 - Iridescent tarnish without effervescence.

HCl - Slight tarnish

KCN - Neg.

$FeCl_3$ - Neg. Some specimens tarnish slightly.

KOH - Neg.

$HgCl_2$ - Neg. Sometimes gives a slight iridescence.

4. Altaite:

Color: Silver-white. Much brighter than galena.

Hardness: B, easily scratched, and slightly sectile.

Polarization effects: Isotropic

Form: Some development of triangular cleavage, though not so pronounced as in galena.

Etch reactions: HNO_3 - Effervescence, gray tarnish showing crystal form.

HCl - Iridescent tarnish

KCN - Neg.

$FeCl_3$ - Iridescent tarnish forms immediately

KOH - Slightly iridescent

$HgCl_2$ - Neg.

Note: An unidentified mineral suspected of being a telluride was analysed by Thompson and proved to be galena. This started an investigation by the writer into the difference in color between galena and altaite. Short [8] does not recognize any difference whereas Stillwell [9] and Farnham [3] notice a distinct contrast between the two. After much trial and error the writer agrees with the latter. In fact he would add that well polished galena in the same field as altaite has a distinct mauve tint.

5. Hessite:

Color: Gray-white. It is slightly darker than galena and against altaite it is quite gray.

Hardness: B, easily scratched with a needle.

Polarization effects: Blue to orange-red mottling, showing a confused twinning. This is the quickest and surest means of identification.

Etch reactions:

HNO_3 - Instantly tarnishes iridescent.

HCl - Brown to iridescent tarnish erasing when buffed.

KCN - etches and tarnishes to a dark mottling.

$FeCl_3$ - Strong iridescent tarnish, erasing when buffed.

KOH - Neg.

$HgCl_2$ - Slight iridescent tarnish.

6. Wehrlite:

Color: Almost silver-white, like altaite.

Hardness: B or C, easily scratched.

Polarization colors: Distinctly anisotropic, dark blue-gray to light blue-gray.

Form: Flaky cleavage.

Etch reactions:

HNO_3	-	Strong effervescence, turns black
HCl	-	Brown tarnish
KCN	-	Neg.
$FeCl_3$	-	Instant iridescent tarnish.
KOH	-	Neg.
$HgCl_2$	-	Brown iridescent tarnish.

Note: The above reactions correspond exactly with those of tetradymite. This mineral was identified as such in the hand specimen by Dr. Warren who noted its foliated cleavage flakes. The X-ray analysis by Thompson gave a pattern for wehrlite, rather than tetradymite.

VII A Study With the Superpanner:

A picked sample of massive ore from the Big Vein, containing tetrahedrite and chalcopyrite was used in this work. It was crushed, pulverized and screened into four sized products. These in turn were concentrated on the Superpanner and a tip of comparatively clean sulphides obtained from each. Assay results of the tips are as follows:

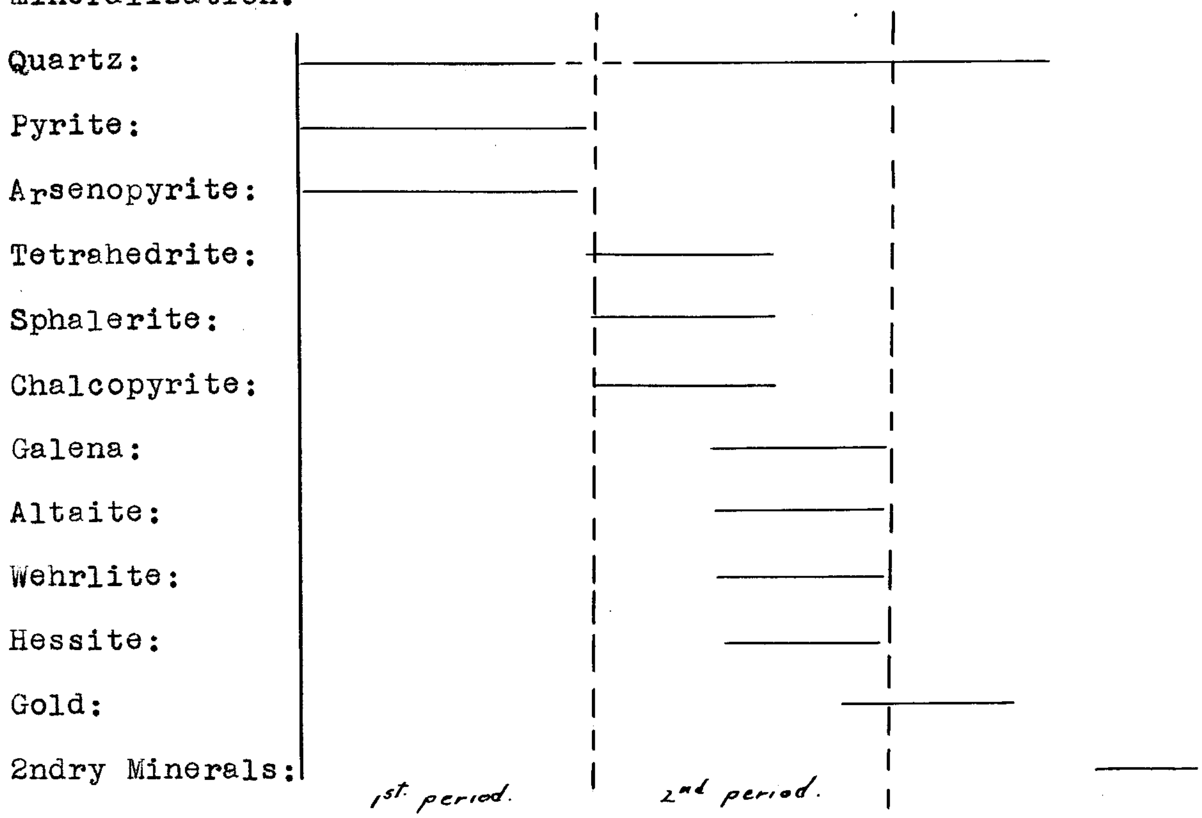
	Au (oz)	Ag (oz)
+ 70 Mesh	0.24	307.0
70 "	0.24	306.0
100 "	0.32	333.8
150 "	0.28	332.6

A field sample of tetrahedrite, upon assay, gave 255 oz of silver and ~~low~~ 0.24 oz. gold. It appears from the results shown, that pure tetrahedrite does carry ~~minute~~ small amounts of gold and some silver. The approximate constancy of silver values seem to indicate a chemical combination of silver and tetrahedrite, rather than a separate silver-bearing mineral. As one piece of gold , 5 microns in size was seen in a polished section of tetrahedrite (plate XI), the conclusion is drawn that it is present as tiny particles of free gold, mechanically combined with the ore.

Two polished sections of materials in the tips show tetrahedrite, chalcopyrite, and some pyrite. Inclusions of sphalerite and arsenopyrite are common in the tetrahedrite. Secondary copper carbonates and limonite are seen replacing the primary minerals. The smooth contacts between,and the interpenetration of tetrahedrite and chalcopyrite suggest contemporaneous formation.

VIII Paragenesis of the Ore:

None of the specimens studied show a complete assemblage of the minerals in intimate contact. For this reason it is difficult to determine the exact order of their deposition. The chart shown below gives what is probably the sequence of mineralization.



An examination of the chart gives rise to the following inferences:

1. There are two definite periods of mineralization of metallic minerals, the first containing pyrite and arsenopyrite and the second including the remaining minerals.

2. The second period may be further subdivided into an earlier crystallization of tetrahedrite, sphalerite and chalcopyrite followed by a later one of galena and the tellurides. There is most likely considerable overlapping in this period, so that no sharp line may be drawn between the subdivisions.

3. The smooth contacts between, and the inclusions of each mineral in the others seem to show that tetrahedrite,

chalcopyrite and sphalerite are approximately contemporaneous, while the same is true of galena and the tellurides.

4. Gold is definitely later than all the minerals as it is found deposited in, and veining galena and tellurides.

5. In places quartz may be seen cutting through other quartz. This occurrence is probably not indicative of separate periods of crystallization but rather one long-continued deposition with some fractures in the early quartz being filled by the later, still fluid quartz. It seems certain that quartz overlaps all the metallic minerals in the order of deposition.

IX Summary:

The mineralization of the precious metal deposits in the Chilko Lake region is of a different order than that of known British Columbia mining camps. The difference seems to lie in the association of commercial values in gold and silver with the tellurides, although the pure tetrahedrite does carry some values. Random samples of galena nearly always show a gold-silver ratio of one tb ten. This constancy may be accounted for by assuming that the hessite carries gold in chemical combination; in other words the hessite is auriferous. Assays showing a departure from the ratio may be explained by the presence of free gold in the ore, and of this there is positive evidence.

The gold observed to date is all primary. Some of it may be called residual where the tellurides have been weathered away, but it is still considered as primary and not secondary gold.

Although tetradymite has not been identified, the presence of wehrlite is almost a sure indication that there is tetradymite in the ore.

The whole study indicates the importance of developing an ability to judge the shade of color of ore minerals, in order to simplify and speed up the work. Of the telluride minerals, this is especially true, but it is not always possible to do so

X Suggestions for Further Work:

1. Carefully selected specimens of the high grade ore still on hand, if mounted and studied may reveal more of the creamy unidentified mineral and make possible its determination.

2. As little work has been done yet on the Zinc Vein ore it is thought that a more detailed study of it would be of benefit in understanding the deposit.

3. Preliminary work on the ores of the Pellaire mine having revealed a similarity to the Tchaikazan property, it is thought that more study is warranted on a selected suite of ore from Pellaire.

4. Prospecting for telluride minerals might benefit if research is carried out on the secondary products of weathering of these minerals.

PHOTOMICROGRAPHS

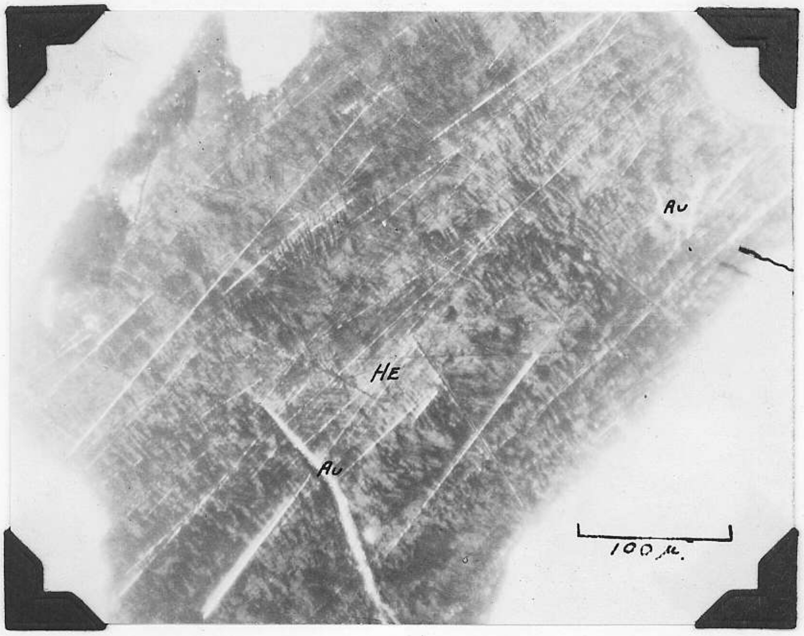


PLATE I

Hessite (He) showing confused twinning
Gold (Au) x 200

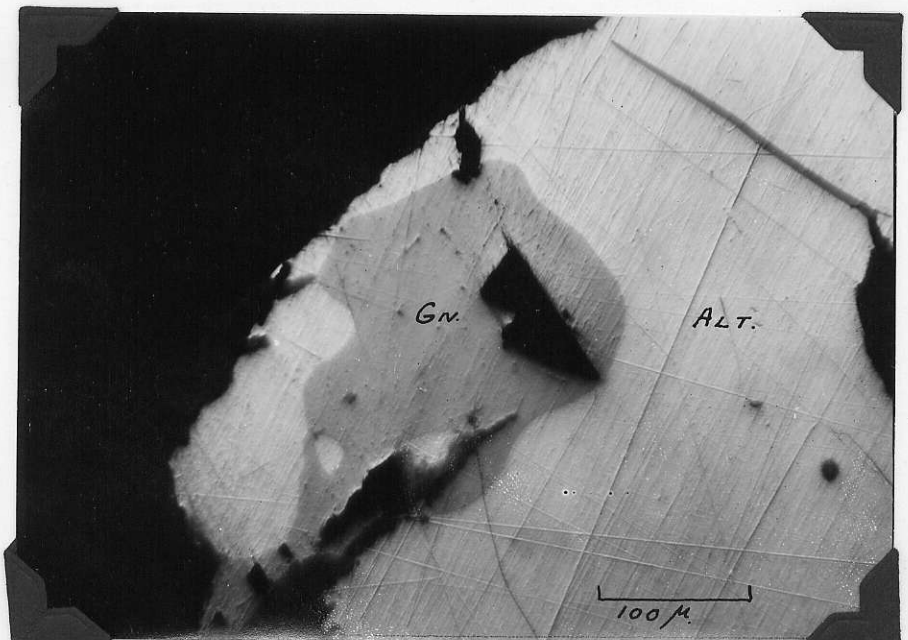


PLATE II

Altaite (Alt) and Galena (Gn)
x 200

PHOTOMICROGRAPHS

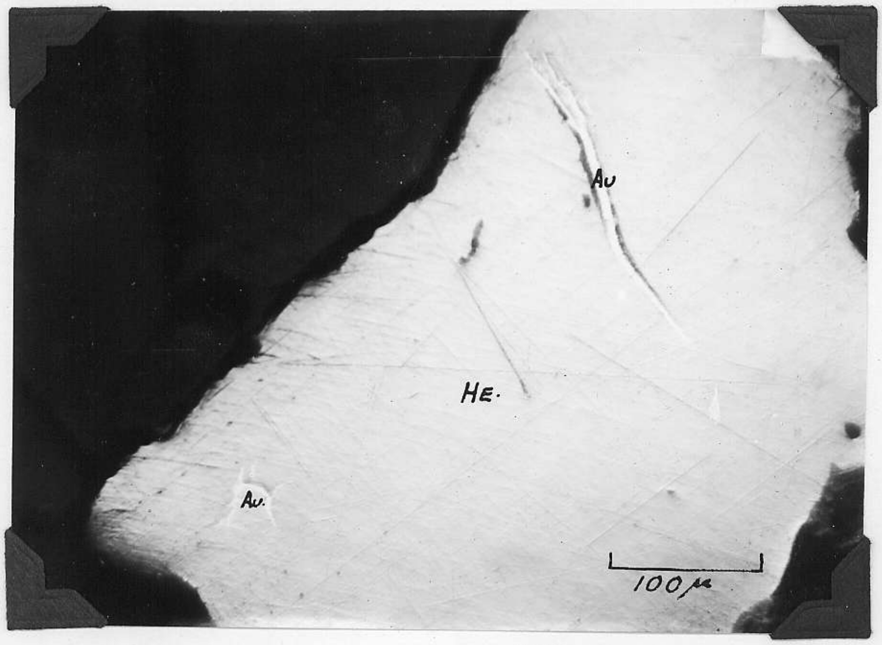


PLATE III

Hessite (He) and Primary Gold (Au)
x 200

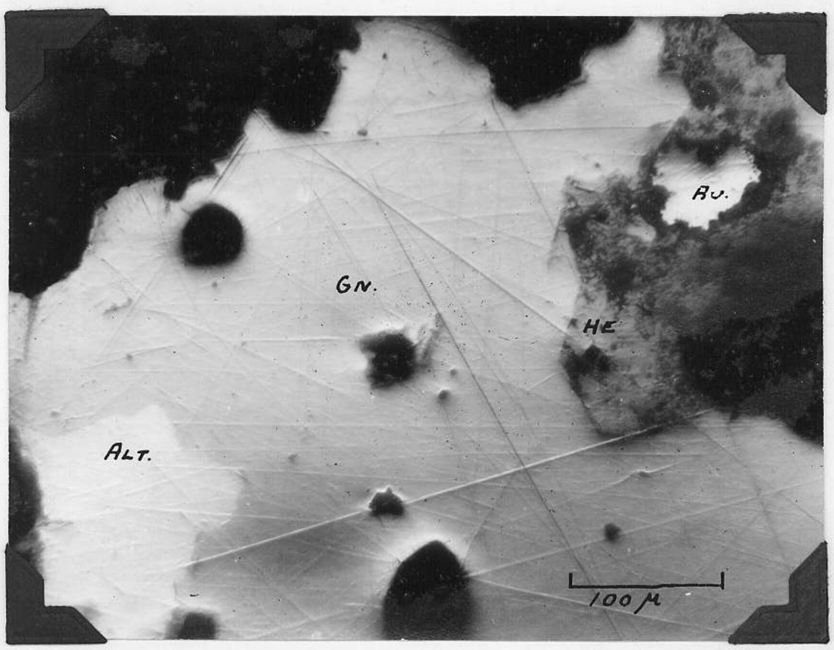


PLATE IV

Weathering of Hessite (He) in fresh Galena (gn) and Altaite (Alt). Gold (Au) in the Hessite
x 200

PHOTOMICROGRAPHS

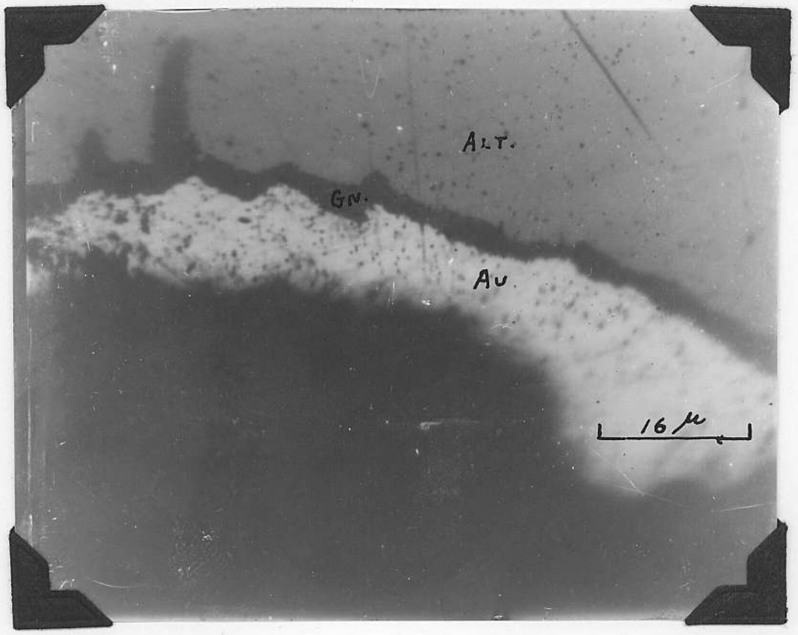


PLATE V

Gold (Au), Galena (Gn) Altaite (Alt)
x 1250

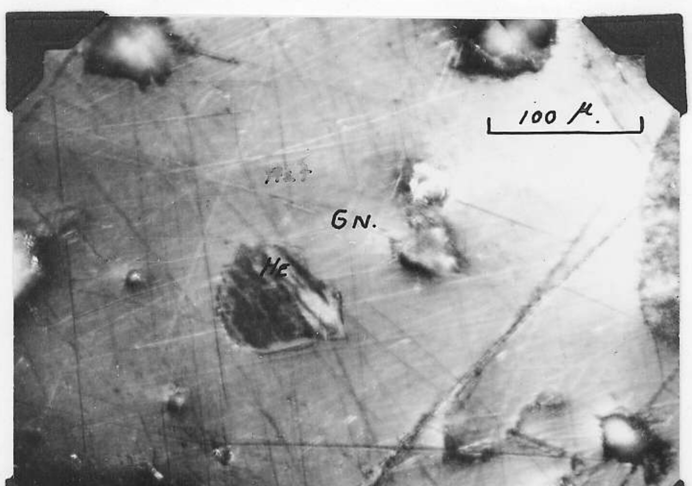


PLATE VI

Twinning in Hessite (He) Galena (Gn)
x 200

PHOTOMICROGRAPHS

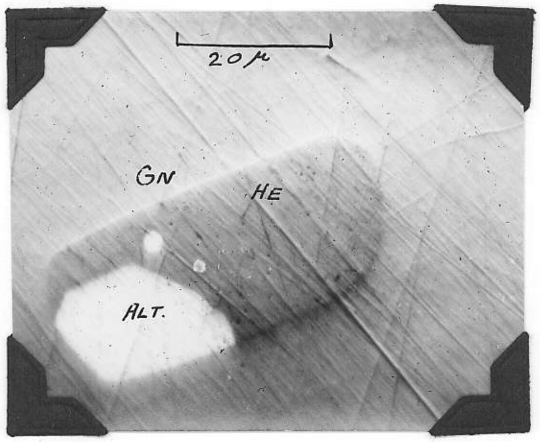


PLATE VII

Galena, Altaite, Hessite,
x 1000

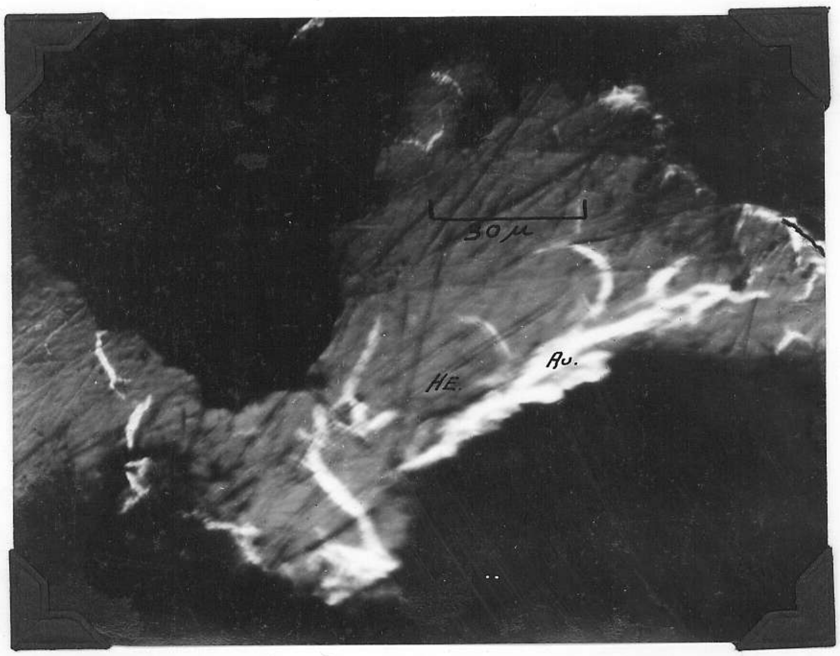


PLATE VIII

Primary Gold (Au) veining Hessite (He)
x 700

PHOTOMICROGRAPHS

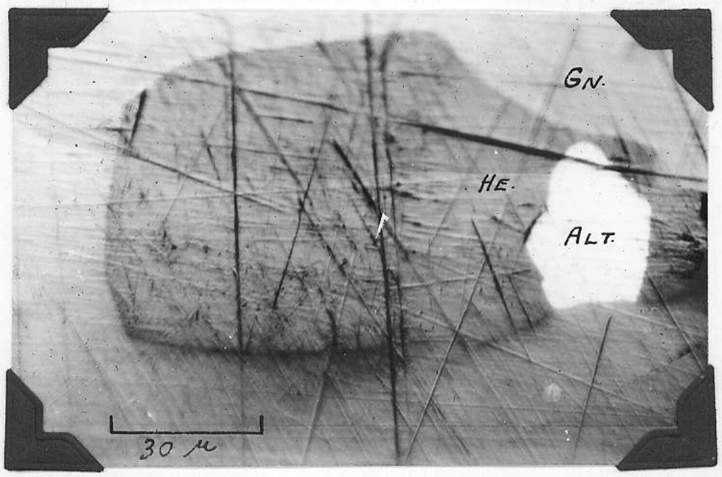


PLATE IX

Galena, Altaite, Hessite
x 700

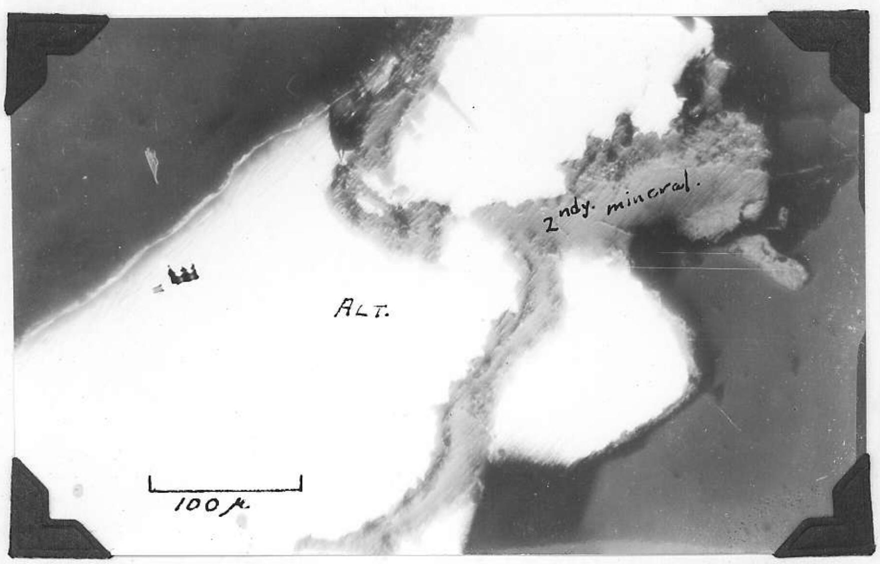


PLATE X

Alteration of Altaite (Alt) to secondary mineral
x 200

PHOTOMICROGRAPHS

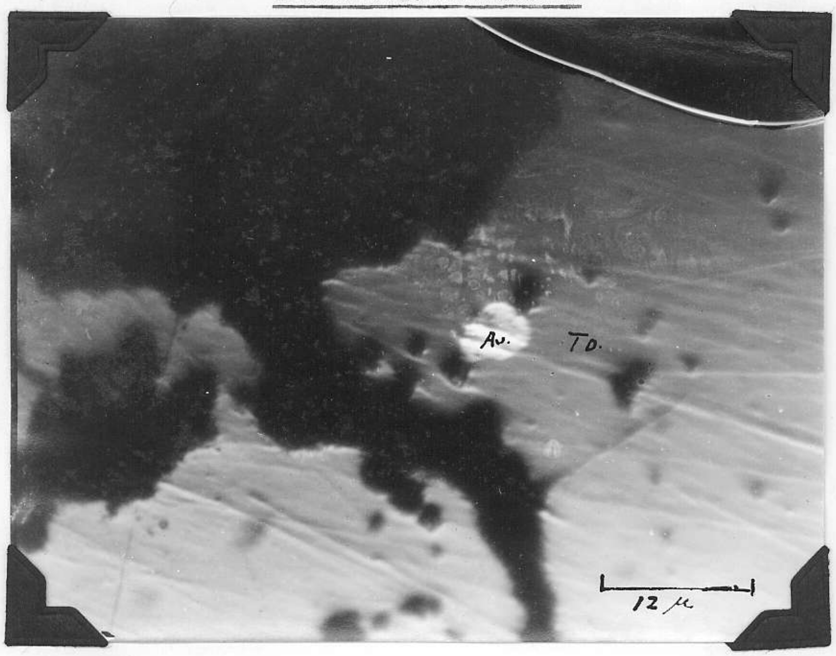


PLATE XI

Gold (Au) in Tetrahedrite (Td) with Sphalerite
x 1600

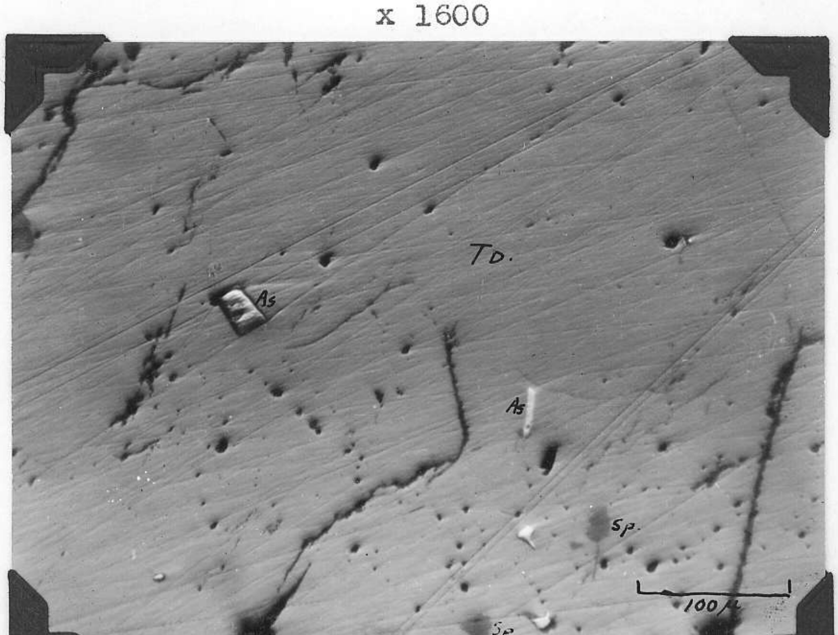


PLATE XII

Arsenopyrite (As) and Sphalerite (Sp) in Tetrahedrite (Td)
x 200

PHOTOMICROGRAPHS

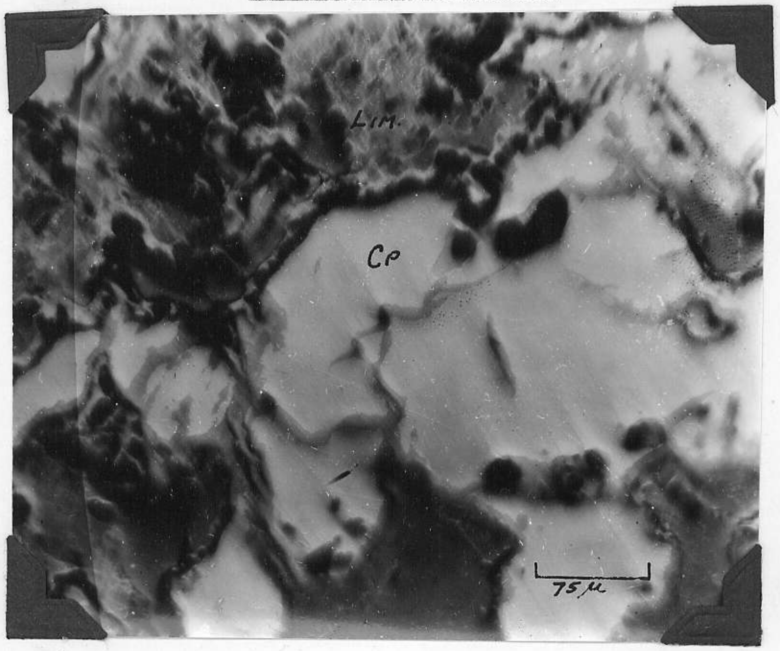


PLATE XIII

Alteration of Chalcopyrite (Cp) to Limonite (Lim)
x 200

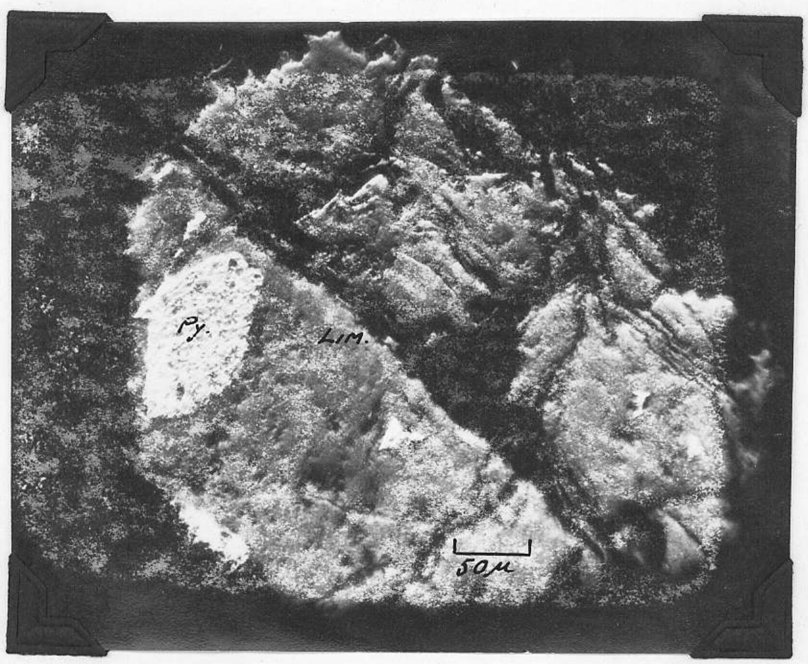


PLATE XIV

Alteration of Pyrite (Py) to Limonite (Lim)
x 200

XII Index of Polished Sections:

Sections are labelled with the word "TCHAIKZAN", and any one of the following:

High Grade:

#1	)	
#2	)	
#3	)	
#4	)	Galena
#5	)	Altaite
#6	)	Hessite
#7	)	Wehrlite
#8	)	Gold
#9	)	
#10	)	

Big Vein:

#1	)	Tetrahedrite, arsenopyrite, chalco-
#2	)	pyrite, sphalerite and 2ndy minerals
#3	)	
#4	)	Chapcopyrite, pyrite
#C1	)	
#C2	)	Concentrates of tetrahedrite

Charlie Vein:

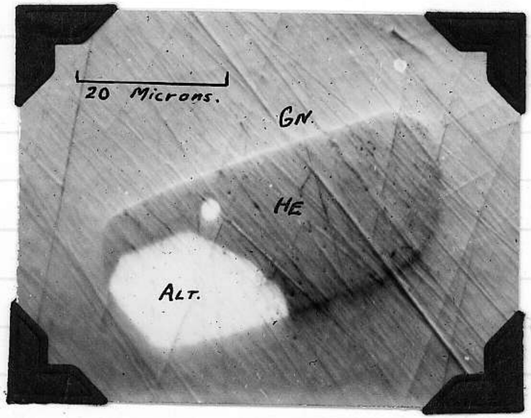
#2	Pyrite in quartz.

Zinc Vein:

#2	Sphalerite, pyrite in quartz

TCHAIKAZAN

PLATE IX.



obj.	$\frac{1}{10}$ m.m. o.e.
occ.	8 x
magn.	1000
microscope	S.M.
illumination	direct
plates	Wr. M.
filter	# 2
bellows	40 cm.
exposure	60 sec.
section	High Grade 10
log	9.10, 19.0

CONTRAST BETWEEN

GALENA (GN)
HESSITE (HE)
ALTAITE (ALT.)

CANADIAN TELLURIDE LOCALITIES

~~TABLE~~

LOCALITY	TELLURIDES
Yukon Territory	
Upper Burwash Creek, Kluane District..	#Altaite #Hessite #Tellurbismuth #Hedleyite
Dublin Gulch, Mayo District............	#Tetradymite
Selwyn River, Selkirk District.........	#Tetradymite
East Fork and Discovery Fork of Nansen Creek, Carmacks District.....	#Tetradymite
Buffalo Hump Group, Mt. Stevens, Wheaton River District..............	#Hessite Sylvanite
Gold Reef Claim, Wheaton River District............................	Sylvanite Hessite Petzite
British Columbia	
Engineer Mines, Taku Arm, Tagish Lake, Atlin Mining Division.............	Calaverite
Harrison Group, Lindquist Lake, Omineca Mining Division.............	#Tetradymite ✓
Glacier Gulch, Hudson Bay Mountain, Omineca Mining Division.............	#Joseite ("tetradymite") ✓ Calaverite
Hunter Group Claims, Khutze Inlet, Skeena Mining Division..............	#Tellurbismuth ✓
Con West property, Taseko Lake, Clinton Mining Division.............	#Hessite ✓ # altaite
Pellaire Gold Mines property, Taseko Lake, Clinton Mining Division.......	#Hessite ✓
Windpass Mine, Chu Chua, Kamloops Mining Division.....................	#Joseite ✓
Valdez Island, Nanaimo Mining Division.	Gold tellurides
Marble Bay Mine, Texada Island Nanaimo Mining Division.............	#Hessite #Wehrlite
Hessite Wehrlite Little Billie mine.	
Ashloo Mine, near Squamish, Howe Sound, Vancouver Mining Division...........	#Tellurbismuth

Nickel Plate Mine, near Hedley, Osoyoos Mining Division	Tetradymite
Good Hope Claim, near Hedley, Osoyoos Mining Division	#Joseite # Hedleyite
Hedley-Yuniman Gold Fields Ltd., Bradshaw Creek, Osoyoos Mining Division	#Tellurbismuth
Calumet Claim, Kruger Mountain, Osoyoos Lake, Osoyoos Mining Division	Hessite Petzite
White Elephant Claim, Okanagan Lake, Vernon Mining Division	#Tetradymite #Wehrlite
Boundary District (Greenwood)	#Hessite
Long Lake Camp, Greenwood Mining Division	
(a). Jewel Mine	Rich tellurides
(b). Lakeview Claims	#Altaite #Hessite Tellurium
(c). North Star Claim	#Hessite
(d). Enterprise Claim	Petzite
(e). Rhoderic Dhu Claim	Altaite Tetradymite
Jumbo Mine, Rossland, Trail Creek Mining Division	#Tetradymite
Olive Mabel Claim, Gainor Creek, Lardeau Mining Division	Nagyagite
Liddel Creek, Kaslo River, Ainsworth Mining Division	Altaite #Tetradymite Hessite
Pay Roll Mine, near Cranbrook, Fort Steele Mining Division	Altaite

<u>Manitoba</u>

Copper Lake	#Altaite

Ontario

Moss (Huronian, Ardeen) Mine, Moss Township........................	#Altaite #Hessite #Petzite #Tellurbismuth Coloradoite Nagyagite
Gold Creek, Pine Portage Bay, Lake of the Woods....................	Hessite
Three Ladies Mine, Lake of the Woods...	Altaite
Bigstone Bay, Lake of the Woods........	Hessite Tetradymite Calaverite
Gold Shore Mine, Red Lake..............	Tetradymite
Jackson-Manion Mine, District of Kenora.	Petzite
Straw Lake, near Fort Frances...........	Tetradymite
Chambers-Ferland Group, near Schreiber..	Altaite Tetradymite
McKellar Longworth Mine, Schreiber.....	#Tetradymite
Anderson Farm, Deloro Township.........	Petzite
Mayo, Hull, and Cartwright properties, near Painkiller Lake, Beatty Township...........................	#Wehrlite ("tetradymite") Calaverite
Ashley Mine, Bannockburn Township......	#Altaite Krennerite
Miller Independence and Boston McRae Mines, Boston Creek, Pacaud Township...........................	#Calaverite #Tellurbismuth ("tetradymite")
Hollinger Mine, Porcupine District.....	#Petzite #Hessite Tetradymite
Dome Mine, Porcupine District..........	#Altaite Calaverite Sylvanite
Powell Claim, Deloro Township..........	#Hessite
Labine-Smith Claim, Maisonville Township...........................	Petzite

Kirkland Lake Camp.

(a). Kirkland Lake Mine..................#Altaite
Calaverite

(b). Teck-Hughes Mine...................#Altaite
Coloradoite
Calaverite

(c). Sylvanite Mine.....................#Altaite
#Petzite
Coloradoite
Calaverite

(d). Tough-Oakes Mine...................#Altaite
#Coloradoite
#Petzite
#Calaverite
#Melonite
Hessite
Tetradymite

(e). Wright Hargreaves Mine............ #Altaite
#Coloradoite
#Calaverite
#Melonite
Petzite

(f). Lake Shore Mine.................. #Altaite
#Calaverite
#Coloradoite

(g). Macassa Mine..................... #Altaite
#Calaverite

(h). Bidgood Mine...................... #Calaverite

Upper Canada Mine, Gauthier Township... #Petzite

Mikado Mine, Rickard Township.......... Tetradymite

Quebec

Opasatica District...................... Petzite

Robb-Montbray Mine, Montbray Township,
Abitibi County.........................#Altaite
#Iron ditelluride
#Melonite
#Montbrayite ("krennerite")
#Petzite
#Tellurbismuth ("tetradymite")
Coloradoite

Lamaque Mine, Bourlamaque Township..... #Calaverite
#Tellurbismuth
#Tetradymite

Eureka Mine, Tiblemont Township.........	Tetradymite
Stadacona Mine, Rouyn..................	#Petzite
McWatters Mine, Rouyn Township.........	Hessite Tetradymite
Horne Mine, Noranda....................	#Altaite #Calaverite #Petzite #Tellurbismuth Hessite Krennerite Sylvanite Tetradymite Rickardite? Undetermined pink telluride

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