Only fair presentation - Wordy.
Needs careful checking.

2nd. 23/35

A REPORT ON THE MINERALOGY OF

THE SILVER GIANT MINE
and
ADJACENT CLAIMS

A Report Submitted to
The Department of Geology, University of British Columbia, in
Partial Fulfillment of the Requirements in Geology 409.

April 5th, 1952

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ABSTRACT

This suite of ores was obtained from Dr. R.M. Thompson, as a project for partial fulfillment of the requirements in the course Geology 409. It is understood by the writer that the hand specimens were each selected for their apparent different mineralogical characteristics, from various parts of the Giant crown-granted claim and adjacent claims in the giant group.

It was expressed by Dr. R.M. Thompson and Dr. H. V. Warren that a grey copper mineral might be present in this suite. It was thought that this opinion was based on the megoscopic evidence of azurite and malachite occuring together in the barite matrix. This mineral was extensively sought.

A composite mill tailing of this ore was also obtained with the suite of ores. Information was given that a good percentage (approximately 50%) of the zinc in the original head sample of the mill was lost in the tailing. Associations of the zinc mineral were noted throughout the suite of ore to give some indication of why this loss might occur. Time did not permit the writer to superpan the tailings and make sections of the mineralized 'tip'.

ACKNOWLEDGEMENTS

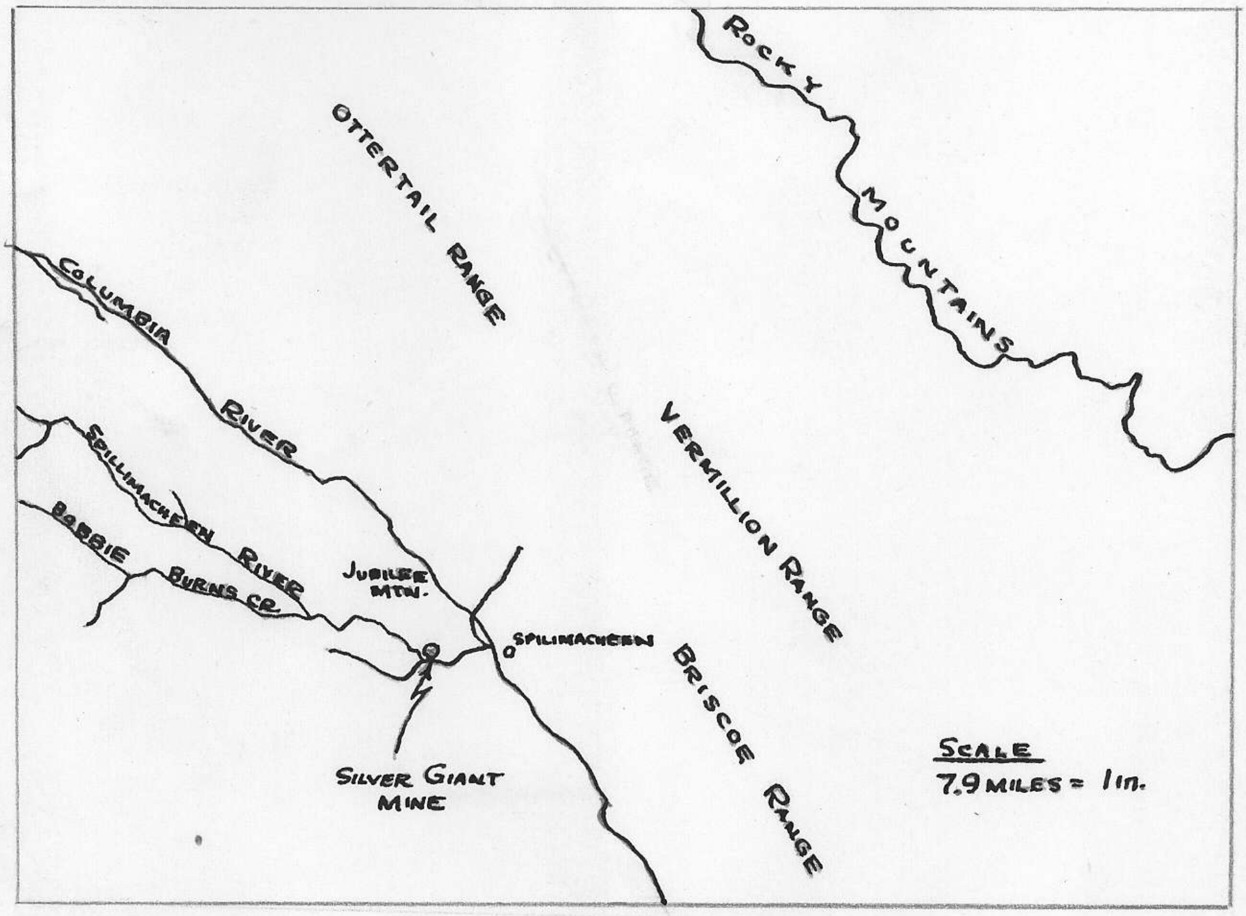
This mineralographic study was carried out in the Department of Geology at the University of British Columbia, under the supervision of Dr. H. V. Warren, Dr. R. M. Thompson, and Mr. J. McDougal. The cooperation, advice and suggestions given by these members of the instructional staff was greatly appreciated.

The writer is also indebted to Mr. J. A. Donnan for his excellent instruction in the technique of mounting and polishing sections; and to Mr. W. W. Deans, and Mr. E. Dodson for their efforts in cutting sections in preparation for mounting.

INTRODUCTION *

Location

The Silver Giant Mine is located in the Spillimacheen River Valley on the west side of Jubilee Mountain and approximately eight miles by road from Spillimacheen. (See Map Inset)



* Minixter of Mines, B. C. Annual Report, 1923, Page 195; 1927, Page 261; 1930 Page 232; 1949 PageA200.

Introduction - continued

History of the Property

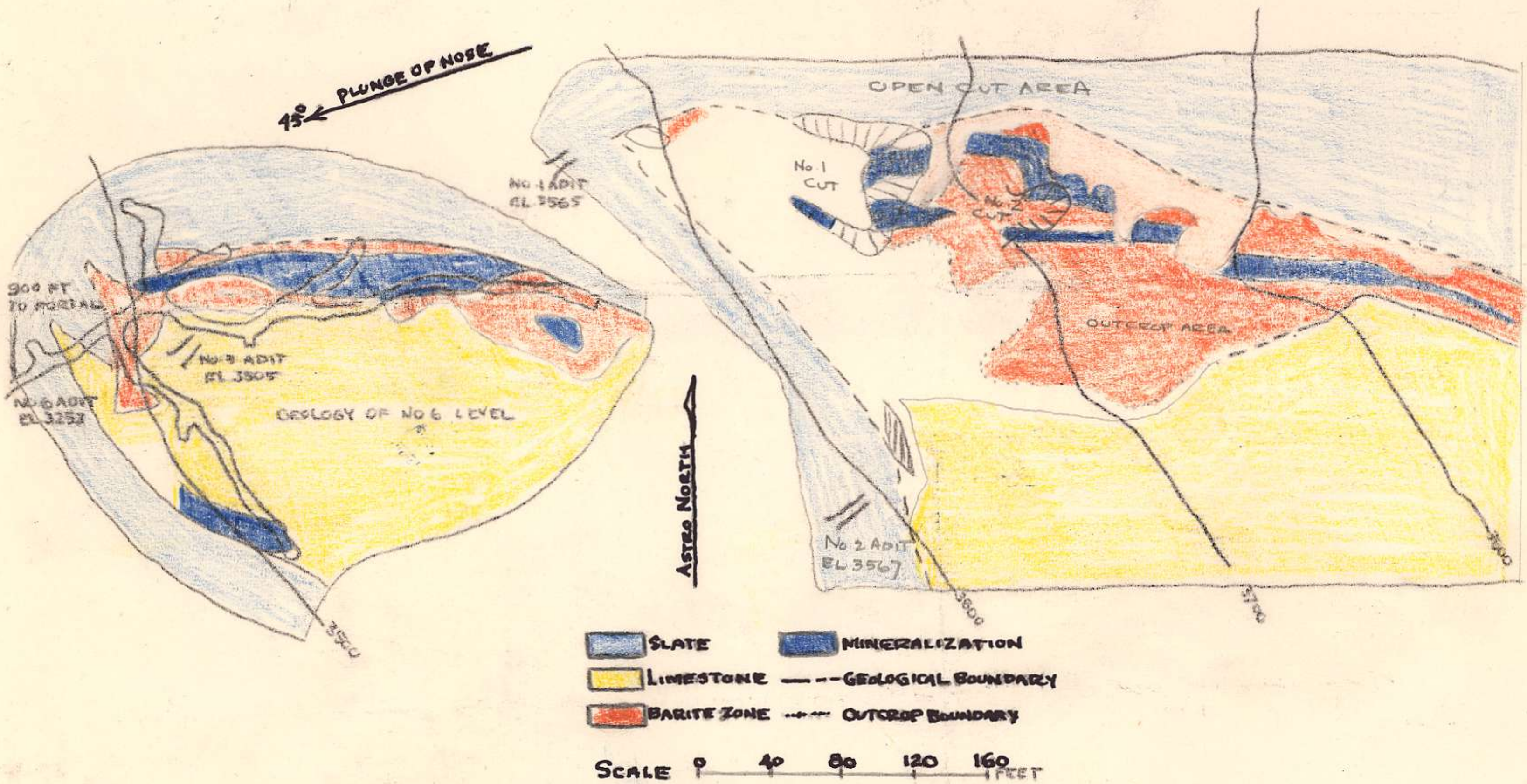
The original discovery of this property was made on the surface showings of the Giant Crown-granted claim prior to 1890. Little work was done on this ore body until 1907 when a concentrating plant of 40 tons capacity was erected. In 1908,500 tons of ore was mined and presumably concentrated. In 1916, 77 tons of ore was shipped and it is assumed that this was by lessees.

In 1926, Pacific Mines Ltd., optioned the property. During 1926 and 1927 diamond drilling, driving of No. 5 level and driving of a raise from No. 3 to No. 5 level was accomplished. In 1929, No. 6 level was driven and in 1930 diamond drilling below the No. 6. level was carried on.

In 1947 Silver Giant Mines acquired the property. During this and the following year, 1,677 tons of ore was shipped.

Siscoe Gold Mines, Limited, obtained an option in the latter part of 1948 and sampling, diamond drilling, drifting, and crosscutting was carried on till March 1949 when the option was dropped.

Hedley Mascot assumed operating control in the summer of 1950



SilverGiant—geology of open cut area & No 6 level

Geology - continued

General Geology

The ore deposit is in Jubilee limestone and occurs close to the Jubilee Limestone-McKay slates contact. It is on the western portion of a major syncline with the mine structure in itself quite complex.

Exposed in bluffs on the west side of the mountain is the light coloured, almost massive Jubilee limestone. Intense deformation is evident in the adjoining slates and it is assumed that this deformation is the cause of bedding being destroyed other than locally.

Structural Geology

The mine structure is a plunging, overturned anticlinal nose in which the slate is wrapped around the limestone. The magnitude of the anticline is unknown and practically no slate outcrops occur in the immediate vicinity of this mine.

There is a reversal of the plunge of the nose not far north of the mine from 45° in a direction of S. 75 west at variance with 15° in a direction N.W. to a plunge in the S.E. direction.

Geology - continued

Structural Geology - contd.

The structural setting is complex with probably more than one period of deformation.

Replacements of the limestone by barite, accompanied by silica in both the anticlinal nose and along the limestone slate contact carrys the mineralization.

Economic Geology

Fine grained galina with rather low, erratic, silver values is the predominant ore mineral. Small amounts of sphalerite, pyrite, chalcopyrite, bornite and locally of a grey copper arsenic mineral occur. The galena occurs as streaks and clusters in the ore.

Six samples channelled across average or selected mineralization to indicate possible variations in metal relationships are as follows:

Level	Width	Au	Ag	Pb	Zn	Cu	Remarks
3	5	TR	0.6	0.6	6.3	TR	Patchy Sphalerite
3	5	.01	2.4	9.1	TR	TR	Better average Pb's
5	3	.02	0.3	48.3	0	TR	Abundant Pb's
5	3	.01	4.9	0.5	40.0	TR	Abundant $ZnFeS_2$
6	5	TR	19.7	8.5	TR	0.2	Average ore Little Copper stain
6	3	TR	1.3	0.7	TR	0.9	Abundant Cu stain

MINERALOGY

(A) Megascopic Examinations of the Hand Specimens.
(*Hand specimens same No. as Polished Sections)

Specimen No. 1.

This specimen consists of a very fine grained galena in a dark silicified gangue enclosed by a barren carbonate gangue. Composition is approximately 5% galena, 35% silica and 60% carbonate gangue.

Specimen No. 2.

Specimen No. 2. is essentially the same as Specimen No. 1. with the galena being somewhat coarser grained and more abundant. The approximate composition of this specimen is 10% galena, 30% silica and 60% carbonate gangue.

Specimen No. 3.

This specimen showed evidence of bornite and pyrite occuring in fractures and associated with a silicious gangue. The barren carbonate was also present separate from the mineralization. This specimen contained approximately 3% bornite, 0.5% pyrite, 31.5% silica, 65% carbonate gangue.

Specimen No. 4.

Fine, worm like, dark silica veins are noted to traverse the main barite gangue

Mineralogy - continued

constituent. The copper minerals, azurite and malachite occur as blebs from 1 to 3 mm in size in the barite. Composition is approximately 1% azurite and malachite, 1% silica, and 98% barite.

Specimen No. 5.

This specimen is composed mainly of a light brown sphalerite associated with quartz. A barren carbonate also occurs here separate from this mineralization. Composition is approximately 80% sphalerite, 5% silica and 15% carbonate gangue.

Specimen No. 6.

This specimen is composed mainly of steel galena with carbonate and silicious inclusions. Evidence is present of the galena veining the carbonate gangue where the latter is abundant. Composition is approximately 94.% galena, 1% silica and 5 % carbonate gangue mineral.

Specimen No. 7.

This specimen is almost all fine grained pyrite with angular to rounded silicious inclusions of approximately 1-10 mm in size. Composition is approximately 98% pyrite, 2% silica.

Mineralogy - continued

Specimen No. 8.

Specimen No. 8 is composed of light colored quartz fissured by chalcopyrite and dark colored quartz. There is also a very fine grained mineral resembling galena in the fractures occuring with the chalcopyrite. The surface of this specimen shows oxidized chalcopyrite. Approximate composition is 79% quartz, 20% chalcopyrite and 1% galena.

Specimen No. 9.

This specimen is composed of pyrite and quartz. The quartz occurs mainly as elongated, rounded to angular, inclusions in the pyrite. There is some evidence of what apperas to be fracture filling of the quartz by the pyrite.

Specimen No. 10.

Moderately fine crystalline sphalerite occuring in masses in carbonate gangue is evident here. There is also moderately fine crystalline galena occuring as blebs in the carbonate gangue present in small amounts. Approximate composition is 40% sphalerite, 1% galena, and 59% carbonate gangue.

Specimen No. 11

This specimen shows a silicious galena bearing material traversing a carbonate gangue. Composition is approximately 95% barren carbonate gangue, 40% silica, and 1% galena.

Mineralogy - continued

(B) Microscopic Examinations of the Polished Sections.

Pyrite- Polished Sections Nos. 3, 7, 8b, & 9.

Pyrite occurs in masses with light colored quartz inclusions and in association with dark silicious material fracture filling the light colored quartz. It is generally much fractured with fillings of quartz, calcopyrite, sphalerite and galena in these fractures.

Chalcopyrite - Polished Sections Nos. 8a, & 8b.

Chalcopyrite occurs as fracture fillings in pyrite and as fracture fillings and replacements, associated with dark silicious gangue, in light colored quartz. Poor evidence is noted of possible contemparaneous deposition of chalcopyrite and sphalerite.

Sphalerite - Polished Sections Nos. 5, 8b, & 10

Sphalerite occurs as massive areas with dark silicious inclusions and generally showing a rim of silica in microscopic contact across the boundary from carbonate gangue. When in contact with chalcopyrite the sphalerite shows only mutual boundary characteristics. It also is found fracture filling in pyrite.

The massive sphalerite shows no chalcopyrite inclusions and has brownish red to yellow internal reflection. The sphalerite in contact with the chalcopyrite is also isotropic but does not show internal reflection and is generally of a lighter grey in color.

Mineralogy - continued

Bornite - Polished Section No. 3.
Bornite is usually associated with chalcopyrite, and thus is found in dark silicious gangue transversing light colored quartz. The illustrations show hypogene replacement of the chalcopyrite by bornite.

Azurite and Malachite - Polished Sections No. 4.
Azurite and Malachite occur as blebs along fractures in a barite matrix. The azurite shows an anomalous network of light to dark grey anisotrapism under crossed nicols. Most azurite blebs were tested micro-chemically for Antimony with negative results.

Minerals 'X' & 'Y' Polished Section No. 6.
Check. Minerals 'X' & 'Y' occur as pink to grey blebs in galena. Anisotropic colors are from purple to grey to light greenish yellow color. Not enough evidence for paragenises.

Galena - Polished Sections 1,2,6,8,10,11.
Galena occurs in practically all specimens and evidence indicates more than one period of deposition. It is generally the last mineral to have been deposited. and is found replacing chalcopyrite, traversing bornite, fissuring pyrite, veining and replacing sphalerite. Galena is found also to have inclusions of different minerals in different sections as shown by the illustrations.

Mineralogy - continued

Galena - contd.

It is found in much the same way as sphalerite in that it is generally associated with dark silicious gangue and intruding and replacing carbonate gangue or as massive galena rimmed by silica in miscroscopic contact across the boundary from the carbonate gangue. Galena is also found in silica traversing barite gangue.

Discussion of Evidence in Illustrations

Polished Section No. 2.

(a) The illustrations showing sphalerite in galena was included not because it showed evidence of paragenesis but because of the difficulty encountered in identifying these indlusions. There was no internal reflection from this sphalerite and microchem tests were run for antimony and copper which proved negative. Two microchem tests were run for zinc with one probabbe and one fairly definite positive test.

(b) The illustration showing inclusions of Mineral 'Z' in galena caused much work to be done on this section. The galena was readily identified by trangular pits and isotropism, along with its galena white color. The inclusions were strongly anisotropic mauve to light

Discussion of Evidence in Illustrations - continued

green. The etch tests showed only HNO_3as positive for these inclusions. While the etch tests were in progress, sections of the galena had been partially etched and upon checking anisotropism a very false white to brown to black coloration was noted for the lightly etched galena. This false result lent itself to the idea that this galena might perhaps be in the group containing Sb and Bi minerals described on pages 116 & 117 of Short*. Microchem tests for Bi showed orange hexagons on one test to black hexagons on another (CeCl-Ki test). The cesium chloride test was made alone and no hexagons were present but thin colorless rhombs were abundant. It was thought this mineral might be Bismuthinite. The inclusions were then tested for Ag (possibly Polybasite and the results showed a fine grained black precipitate that was yellow under reflected light and dissolved in 1:7 HNO_3. This indicated a possible Bi test and upon another sample, test for Bi showed orange hexagons once more. The polished section was then re-lapped to do further work and the false anisotropism on the galena disappeared. A test for lead showed this element present.

No further confirmation was made on the mineral 'z' inclusions and it is thought that X-ray diffraction will be the only method by which proof of this mineral's composition may be established.

* Microscopic Determination of The Ore Minerals by M.N. Short

Discussion of Evidence in Illustrations - continued

Polished Section No. 6.

(a) There was only a very little of the mineral 'x' present in this section and limited results were obtained. This mineral was anisotropic mauve to grey to greenish yellow. The etch tests showed that the KCN stained the inclusion brown; other reagents were either negative or doubtful because of the masking of some tests by the reaction on the galena matrix. Only one microchem test (Potassium Mercuric Thiocyanate) was preformed and nothing definite could be concluded from this test. Because of this above evidence and the assumption that the accompanying inclusion 'y' might be Enargite then it would be possible that the mineral 'x' might also be the grey colored Enargite.

(b) There is an abundance of the mineral 'y' but only very minute blebs are present in the galena. This mineral was anisotropic mauve to greenish yellow. The reagents were all doubtfull to negative except KCN which turned the specimen brown. The microchem tests run showed the presence of copper. It was thought that this mineral might be enargite.

Polished Section No. 8.

(A) (a,b,c,) All three minerals shown in the illustrations are readily identified. The chalcopyrite is found generally in a skin, or in

Discussion of Evidence in Illustrations - continued

Polished Section No. 8-continued

angular inclusions, at the boundary between bornite and gangue or bornite and galena. There is also much interfingering of the bornite with the chalcopyrite. It is thought that the evidence shown is sufficient to state the paragenetic sequence of chalcopyrite being replaced by bornite. There is not too much galena present in this polished section but here too the paragenesis on the basis of the illustrations shows galena later than either of the other two minerals and replacing chalcopyrite preferentially to the bornite.

(B) (a) Since both polished sections were cut from the same hand specimen it may be concluded from 'a,b,c,' that the galena was later that the chalcopyrite and replacing it. This illustration however shows sphalerite with straight boundarys adjacent to the chalcopyrite. It is thought that this might be evidence of cortemporaneous deposition of the chalcopyrite and sphalerite.

(B) (b) This illustration shows highly fractured pyrite with chalcopyrite fracture filling the pyrite.

Polished Section No. 9.

This illustration shows fissuring of a fractured pyrite by quartz. There is some evidence of possible replacement of pyrite by the quartz.

Discussion of Evidence in Illustrations - continued

Polished Section No. 10.

The pyrargyrite noted was determined from its red internal reflection, anisotropic color light grey to dark grey.

Polished Section No. 11.

This section is interesting because of its deviation from the known evidence of this deposit being a silica rich barite replacement of limestone. This is definite evidence of the carbonate gangue later than the quartz, sphalerite, and galena. It is thought that this might be an overlapping in the deposit however it could be a second period of carbonate deposition.

This deposit is placed in the mesothermal temperature ragne (350 - 175 C.) of the hydrothermal origin classification, for the following reasons;

(1) The gangue constituents are quartz, limestone and barite.

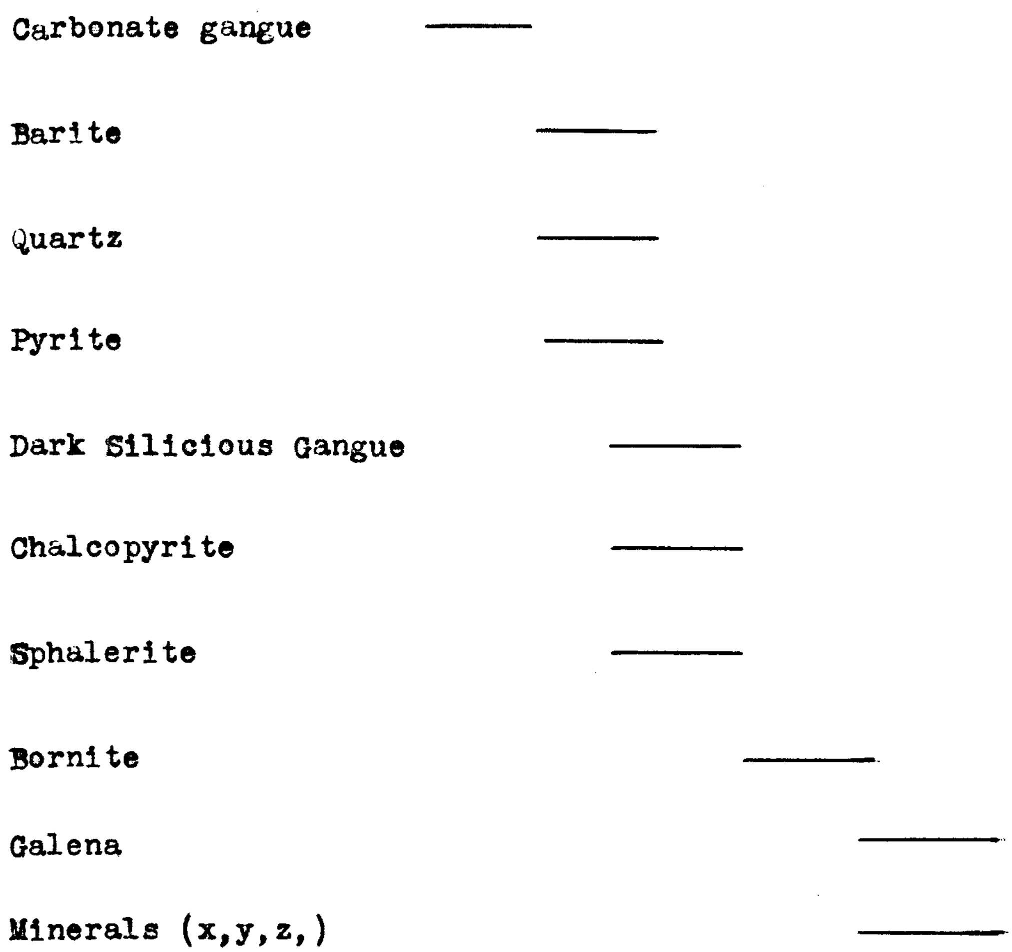
(2) The absence of the high temperature forming minerals (sulphides and oxides).

(3) The lack of colloidal material.

(4) Replacement as the predominant texture.

PARAGENESIS

The proposed genetic sequence is outlined graphically below.



CONCLUSIONS

The sequence of mineralization has been attempted under paragenesis.

Tetrahedrite was not found by the writer but it is supposed that this mineral would be present if possibly more sections had been made of the portion of the ore body with barite as its main constituent where the copper staining of this gangue mineral was noted.

No good evidence has been found of possible reasons for the loss of zinc in this ore to the tailings and it is thought that depression of the sphalerite in the galena circuit might be necessary because of the copper minerals present. If this is the case the reason for zinc loss to the tailing might be because of this depression. This hypothesis however, is without founding and would have to be determined by examining the tailings and the zinc mineral found there, along with an analysis of the flotation circuit and the amounts of reagents.

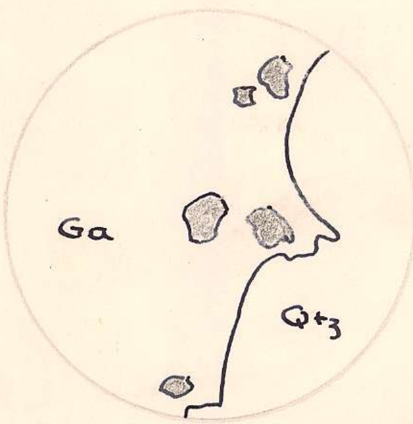
The associations of the minerals noted throughout the polished sections, would seem to indicate that a fine grind with a good percentage -200 mesh would be necessary to liberate the minerals from each other. Unless a fine grind can be made it is thought that the galena concentrate would carry both zinc and copper because of the associations of these elements with the galena.

LEGEND FOR ILLUSTRATIONS

Bornite	
Chalcopyrite	
Sphalerite	
Pyrite	
Galena	Ga.
Minerals - X	
Y	
Z	
All Gangue Minerals	G

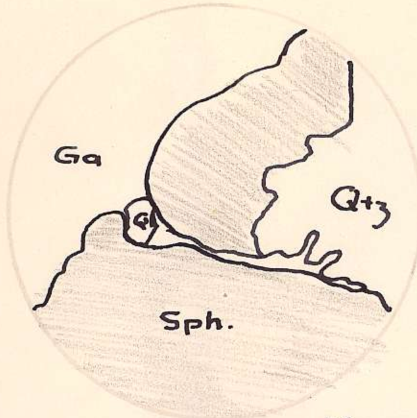
POLISHED SECTION No. 2 (B)

SHOWING MINERAL "Z" IN GALENA (MAG x 120)



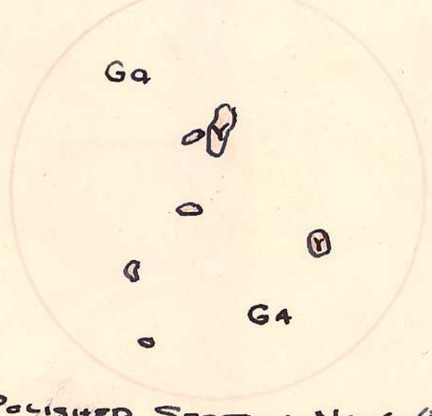
POLISHED SECTION No. 2 (A)

SHOWING SPHALERITE IN GALENA. (MAG x 120)



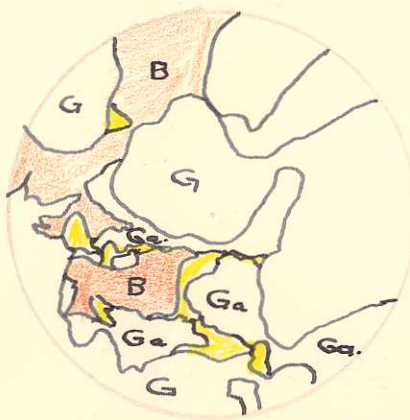
POLISHED SECTION No. 5.
SHOWING EVIDENCE OF GALENA LATER THAN SPHALERITE, veining & replacing it.
MAG x120

POLISHED SECTION No. 6 (A)
MINERAL X IN GALENA
MAG x120



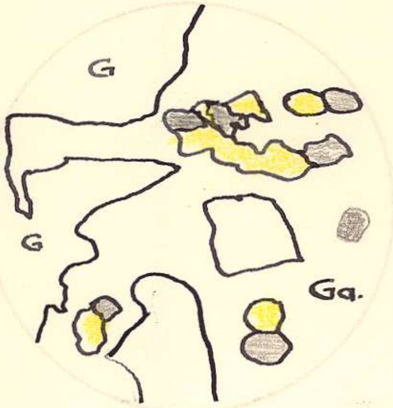
POLISHED SECTION No. 6. (B)
MINERAL Y IN GALENA (MAG x120)

POLISHED SECTION No. 8.A. (A)
SHOWING EVIDENCE OF BORNITE VEINING
& REPLACING CHALCOPYRITE (MAG x 120)



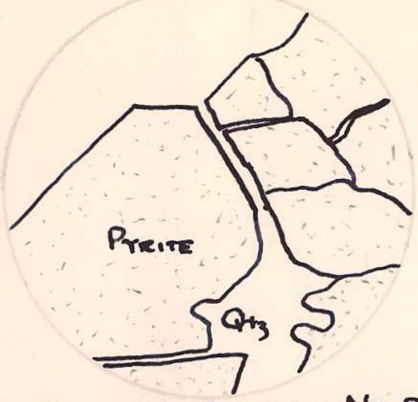
POLISHED SECTION No. 8A (B)
SHOWING EVIDENCE OF BORNITE
REPLACING CHALCOPYRITE (MAG x 120)

POLISHED SECTION No. 8A. (C)
SHOWING EVIDENCE OF GALENA LATER
THAN BORNITE & REPLACING CHALCOPYRITE PREFERENTIALLY
TO BORNITE. (MAG x 120)

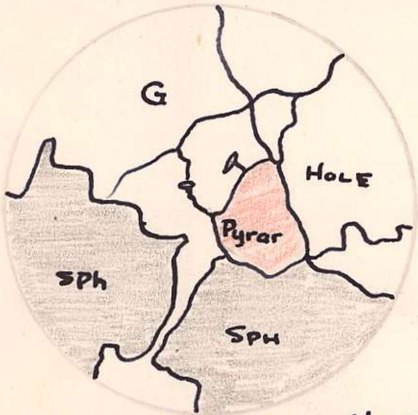


POLISHED SECTION No. 8B (A)
SHOWING POSSIBLE CONTEMPERANEOUS
DEPOSITION OF CHALCOPYRITE & SPHALERITE
REPLACED BY GALENA (MAG x 120)

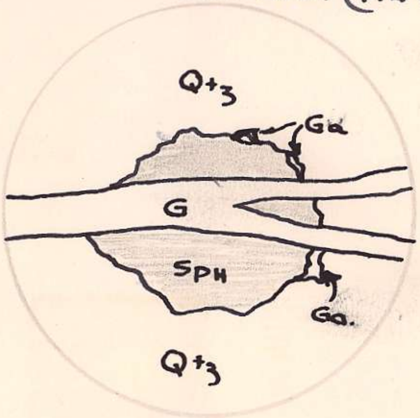
POLISHED SECTION No. 8B (B)
SHOWING CHALCOPYRITE LATER THAN
PYRITE & FILLING FRACTURES IN PYRITE
MAG x 120



POLISHED SECTION No. 9.
SHOWING EVIDENCE OF QUARTZ LATER THAN, FISSURING & POSSIBLY REPLACING PYRITE (MAG x120)



POLISHED SECTION No. 10
SHOWING EVIDENCE OF PYRARGYRITE LATER THAN & REPLACING SILICIOUS GANGUE. (MAG x120)



POLISHED SECTION No. 11
SHOWING EVIDENCE OF CARBONATE GANGUE LATER THAN SPHALERITE & GALENA IN A QUARTZ HOST (MAG x120)

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