A MICROSCOPIC EXAMINATION OF ORE FROM THE MAMIE MINE, HUDSON BAY MOUNTAIN, B.C.

A Geology 9 Thesis
Submitted by
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A MICROSCOPIC EXAMINATION OF ORE FROM THE MAMIE MINE

Introduction:

The ore specimens were collected by the writer on September 20, 1938, with the advice of Dr. E. D. Kindle of the Geological Survey of Canada. The map of the mine which accompanies the report was drawn from a sketch map made while surveying, and is not to be considered accurate. Description of the vein is taken from brief notes made at the same time by the writer.

Location of the Mine:

The Mamie mine is situated on the southwest slope of Hudson Bay Mountain at an elevation of 4200 to 4700 feet. It lies about one-half mile north of the Duthie mine, which was formerly the largest producer in the district. It is reached from Smithers by twelve miles of good road which is maintained by the Provincial Government to the Duthie mine; thence by one mile of good pack trail.

History of the Mine:[1]

"The Mamie mine was first staked and owned by

[1] From a report by R. H. B. Jones, Geological Survey of Canada, Summary Report of 1925, Part A.

J. Aldrich, probably about 1905. In 1919, it was bonded to J. F. Duthie of Seattle. In 1923, the Federal Mining and Smelting Company obtained Mr. Duthie's holdings, which included the Mamie. Extensive development work was continued until June, 1924, since which time the property has been idle."

General Geology of the District:[1]

"Hudson Bay Mountain has been an outstanding

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1 Condensed from "Mineral Resources, Prince Rupert to Prince George, B. C." by F. A. Kerr, 1936.

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center of prospecting and mining for many years. There are probably at least one hundred known deposits that contain one or more of the following metals in important quantities: gold, silver, lead, zinc, and copper.

"Around the outer part of the main mountain there are three areas of Lower Cretaceous or Skeena sediments. Erosion has removed most of it and has cut into the core, which as now exposed is made up mainly of massive volcanic rocks (of Jurassic or Hazelton age). In the center of these there is believed to be an inner granitic core, represented at the surface by small stocks on the northern peak and at other places by dykes.

"It is believed that the granitic rock in the center was intruded under great force and caused doming of the rocks, as well as minor deformations, much fracturing, induration, and alteration. After the granitic rock had started to solidify, but before much cooling had set in, mineralizing solutions were given off and tended to seek out fractures, shear zones, and bedding planes. Mineralization continued over a considerable period of time and changed in character so that at different times different minerals were deposited. Cooling and subsequent contraction and settling during this time tended to close some fractures and open others and, therefore, the solutions continually changed their courses and deposited different minerals in different places.

"Similarities in the character of the mineral deposits seem to show that all, except certain tetradymite-gold deposits, were formed by mineralizing solutions from the same magmatic source. So far as the writer was able to discern, they do not show any zonal arrangement. Silver-lead (low temperature) deposits are found at all elevations from the lowest to the highest (Duthie to Silver Lake) and pyrrhotite-chalcopyrite and arsenopyrite-gold (high temperature) deposits have a similar range (Lake Kathlyn to Iron King). Evidence from individual deposits such as Duthie and others on the southwestern slope does not seem to support the common belief that better gold values will be found at depth or toward the core of the mountain."

Geology of the Mamie Mine:[1]

"The country rock consists of andesitic flows

[1] R. H. B. Jones, op. cit.

and breccias, varying in color from dark grey to purple." The breccias frequently are green also due to the presence of epidote, which is secondary after the hornblende.

"A sheared and brecciated zone strikes north 70 degrees east and dips steeply southeast. Mineralization occurs in this shear zone. The Mamie vein belongs to the same system as the Duthie (Henderson), King Tut, Coronado and Victory veins which all have a northeast trend."

Detail of the Mamie Vein:

The northern limit of the vein is in Henderson Creek, although the fracture continues some distance to the northeast. Here the vein is 12 inches wide, but is poorly mineralized and pinches rapidly. From 300 to 1200 feet southeast of this point, the vein is exposed by open cuts, and varies from 1 foot to 7 feet in width, and carries up to 30% sulphides, which are mainly arsenopyrite with sphalerite, and subordinate chalcopyrite.

In the upper drift, the vein is up to 4 feet wide. Where it narrows, it carries up to 80% sulphides. These consist mainly of arsenopyrite which occurs as a replacement of the breccia in stringers and pockets. The quantity of sphalerite varies consideraby along the vein.

In the lower drift, mineralization for the most part is sparse. The vein varies from 2 inches to 3 feet, but tends to be poorly mineralized at its greatest width. Arsenopyrite usually predominates where the vein is wide, and sphalerite where it is narrow.

A third tunnel was driven in from Henderson Creek on the east to crosscut the vein, but it was abandoned before the objective had been reached.

Concerning the values in the ore, R. H. B. Jones states: "Mineralization in the lower tunnel is poor. A number of stringers carry ore minerals, and in places cross-cuts show a general zone of mineralization which is probably too low grade to be classed as ore. The best values appear to be in and above the upper tunnel."

Description of the Polished Sections:

(a) Megascopic Examination of the Hand Specimens:

Specimen 1.

Collected from the vein about 130 feet from the mouth of the upper tunnel which is at an elevation of 4400 feet. The width of the fault zone at this point is 4 feet, replaced by stringers and irregular pockets consisting of up to 80% arsenopyrite and sphalerite. Two hand specimens were obtained, both containing about 40% arsenopyrite, 30% sphalerite, 1% chalcopyrite and 29% quartz and breccia.

Specimen 2.

Collected from the face of the upper tunnel. At this point the vein is 4 feet wide and consists of 5 to 30% sulphides. One large hand specimen was obtained, and this contains about 15% arsenopyrite, 10% sphalerite, less than 1% chalcopyrite, and 75% quartz and brecciated andesite.

Specimen 3.

This was collected from the sparsely mineralized vein, about one foot wide, at Henderson Creek at an elevation of 4626 feet. Two hand specimens were taken. Both are sparsely mineralized, sphalerite and arsenopyrite being about equal in quantity, and together comprising about 5% of the samples. In one specimen, between the breccia particles there are cavities which are partly filled by vuggy quartz and sphalerite, apparently deposited in the order named.

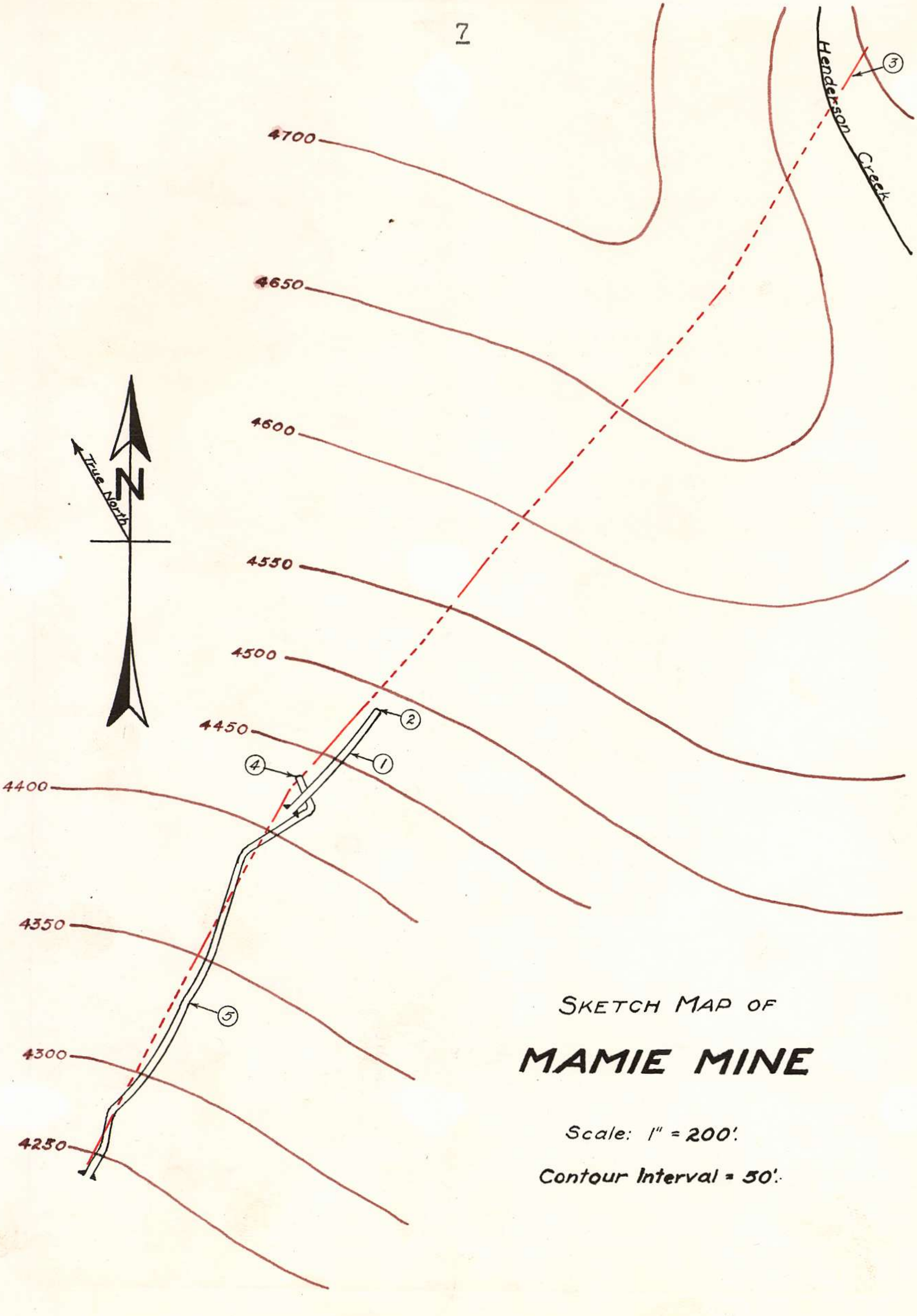
Specimen 4.

Collected near the face of the lower tunnel. Here the vein has split and at this point is about 4 inches wide. Two specimens were obtained, both consisting of about 40% arsenopyrite, 2% sphalerite, and 58% quartz and andesite breccia. No chalcopyrite is visible. One specimen contains a small amount of pyrite, but this is not distributed throughout the sample. Both specimens show clearly replacement of the breccia by arsenopyrite, the matrix consisting almost entirely of sulphides. The elevation of this lower tunnel is 4244 feet.

Specimen 5.

This consists of samples of sphalerite collected along the vein in the lower tunnel. The material was taken from the narrow stringers which consist of almost pure zincblende. It is rather finely divided and for the most part is highly weathered, and so is for assay purposes only.

The approximate position of the samples is indicated on the map on the following page.



SKETCH MAP OF

MAMIE MINE

Scale: 1" = 200'.

Contour Interval = 50'.

(b) Microscopic Examination of the Polished Sections:

Specimen 1a.

Quartz matrix, containing crystals of arsenopyrite and also a very few of chalcopyrite. There are two well-formed crystals of pyrite isolated in the quartz matrix. Small fragments of sphalerite and one very minute spec of chalcopyrite can be seen in the arsenopyrite.

Specimen 1b.

Quartz matrix, containing arsenopyrite, sphalerite and chalcopyrite, which were deposited in the order named. There is also a quartz mosaic throughout, indicating a second deposition of quartz. Three small groups of pyrite crystals were identified with the chalcopyrite.

Specimen 2a.

Milky quartz matrix, in which arsenopyrite was deposited first. Sphalerite and chalcopyrite followed, and were deposited together. There is a quartz mosaic extending throuughout the whole.

Specimen 2b.

Chalcopyrite found included in finely divided form in the sphalerite, and somewhat coarser in the arsenopyrite. In one place, sphalerite was included in the chalcopyrite. Arsenopyrite was the first-formed mineral, and was followed by sphalerite. Chalcopyrite was contemporaneous with the sphalerite.

Specimen 3a.

Milky quartz matrix, in which arsenopyrite is the main mineral, and is cut by tiny fingers of quartz and sphalerite. The sphalerite followed the arsenopyrite and includes some fragments of the latter mineral. Quartz stringers in sphalerite are not apparent. No chalcopyrite was found in the section.

Specimen 3b.

Sparsely mineralized. Arsenopyrite and sphalerite, the latter containing a very little chalcopyrite, are scattered throughout a quartz matrix. In one spot a few isolated well-formed crystals of pyrite were found. The pyrite and arsenopyrite were first formed, and were followed by sphalerite and chalcopyrite.

Specimen 4a.

Arsenopyrite, which was deposited first in the milky quartz matrix, was followed by sphalerite and chalcopyrite, which were introduced contemporaneously. The whole is filled with a mosaic of quartz.

Specimen 4b.

Mostly arsenopyrite, in which are a few masses of sphalerite, which in turn contain numerous tiny fragments of arsenopyrite. No chalcopyrite is present in the section. The whole lies in a matrix of quartz. The arsenopyrite was followed by sphalerite.

Chips were taken from the four ore specimens and the sphalerite, and one assay ton of each was bucked. Assays of one half assay ton each were run with the following results:

	Gold Assay
Specimen 1	0.30 oz/ton
Specimen 2	0.68 "
Specimen 3	0.36 "
Specimen 4	0.26 "
Specimen 5 (Sphalerite).............	0.12 "

Section 2b was now examined meticulously under 540 diameters, and in one place three minute particles of what appeared to be gold were found. Since oil immersion had been used, the section was cleaned with xyoline and acetone, but no definite reaction with KCN was observed. Dr. Warren, however, agrees with me that the surface was not sufficiently cleaned, and that the mineral is probably gold. Considering the size of the particles, this is quite feasible.

Assuming that the particles are gold, the precious mineral has been carried in with the late quartz as the concluding feature of the mineralization.

Under high power very small particles of an unidentified anisotropic mineral were observed. This may be pyrrhotite which F.A. Kerr reports having seen megascopically. No tetrahedrite, mentioned in R.H.B. Jones' report was found in either the hand specimens or the polished sections.

<u>Note</u>: The "Ellis Thompson" etch tests were conducted for the arsenopyrite group. The mineral in question was shown to be arsenopyrite, and this conclusion was verified by observation under the polarizing microscope.

<u>Paragenisis of the Ore</u>:

The andesite tuffs and breccias of which the country rock of the Mamie mine consists, were fractured during Post-Jurassic time by the intrusion of the granitic core of the mountain. Mineralizing solutions followed the fracture and resulted in the deposition of the minerals in the following order: quartz, arsenopyrite, pyrite, sphalerite and chalcopyrite, and quartz.

There was some overlap in the deposition of sphalerite and chalcopyrite, and the introduction of quartz apparently took place at the beginning and conclusion of mineralization.

This is shown graphically below:

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Quartz          ———           —
Arsenopyrite       ——
Pyrite               —
Sphalerite             ——
Chalcopyrite             —
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Plate 1. Section 1b.

X 50

Arsenopyrite

Pyrite

Chalcopyrite

Quartz

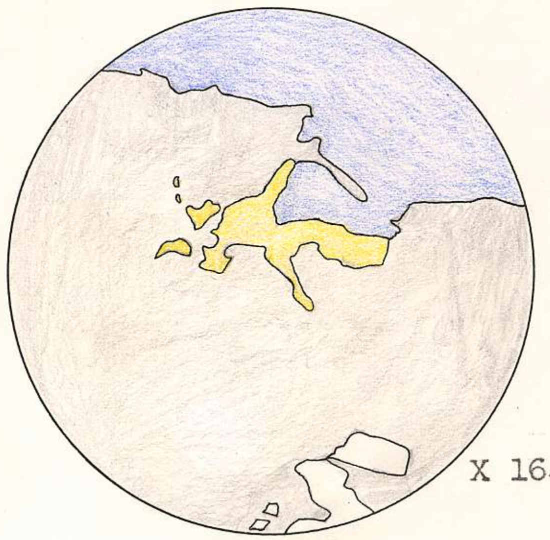
Remarks: The arsenopyrite was deposited first.

Pyrite, chalcopyrite, and quartz followed in order.

The quartz shown is late quartz

The pyrite has been shattered.

Plate 2. Section 2a.



X 165

Arsenopyrite

Sphalerite

Chalcopyrite

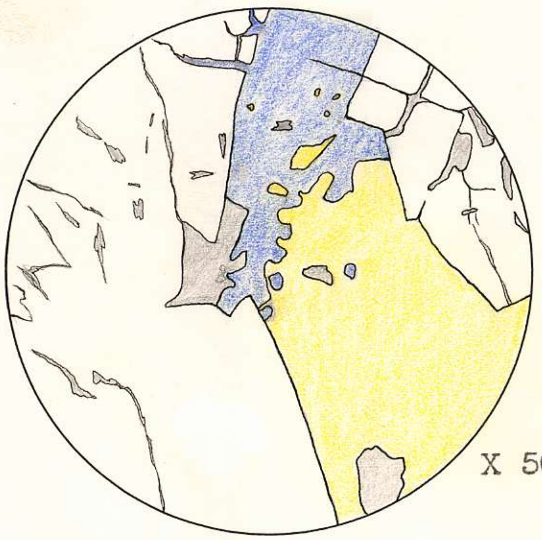
Quartz

Remarks: The quartz was first formed.

Arsenopyrite was deposited next.

Chalcopyrite and sphalerite were deposited together,as shown by the smooth contact.

Plate 3. Section 2b.



X 50

Arsenopyrite

Sphalerite

Chalcopyrite

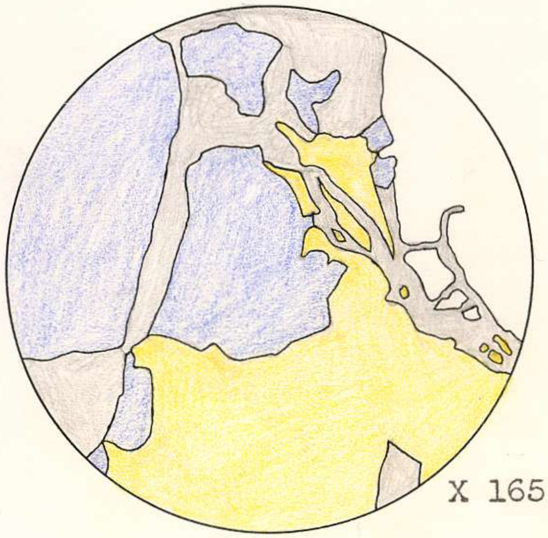
Quartz

Remarks: Arsenopyrite was deposited first.

Sphalerite and chalcopyrite were contemporaneous.

The quartz shown is late quartz and followed all other minerals.

Plate 4. Section 4a.



Arsenopyrite ☐

Sphalerite ☐

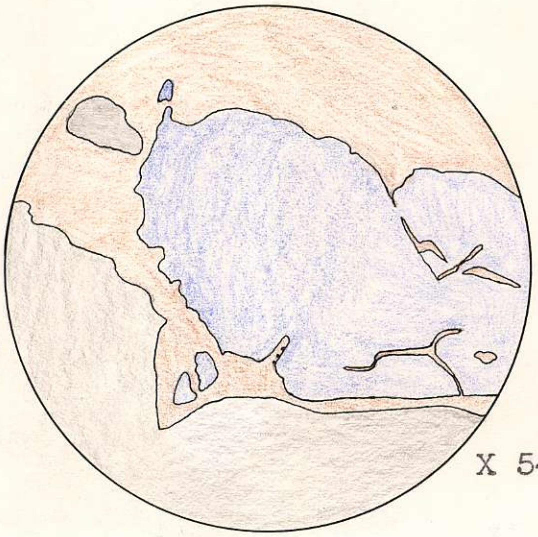
Chalcopyrite ☐

Quartz ☐

Remarks: The arsenopyrite was deposited first.

Sphalerite and chalcopyrite followed and were veined by late quartz.

Plate 5. Section 2b.



X 540

Milky Quartz

Sphalerite

Late Quartz

Gold (?)

Remarks: The milky quartz and sphalerite were cut by late quartz which carries the gold.

Conclusions:

F.A. Kerr and R.H.B. Jones agree that the ore decreases in value at depth. This is borne out by the assays made by the writer. On the whole it is very unlikely that there is sufficient ore to permit profitable operation.