A MICROSCOPIC EXAMINATION OF PRIVATEER GOLD ORE

GEOLOGY "9" ESSAY

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INTRODUCTION:--

This report is the result of the a study of polished sections of ore from the Privateer Mine. They were prepared and examined in fulfillment of the Geology Nine Course at the University of B. C. The General Information contained in this paper was obtained from articles published recently by the company that owns the mine.

GENERAL INFORMATION:--

(A.) Location:

The Privateer Gold Mine is situated in the Zeballos district on the west coast of Vancouver Island, B. C.

It may be reached by airplane from Vancouver, the journey lasting one and a half hours. Steamers also serve the district, the trip from Victoria taking about two days.

(B.) History:

The history of the mine is a short one. Claims were staked on the property in 1933 for the first time. In 1936 the Privateer vein was discovered.

The first ore taken out was shipped in sacks to the smelter at Tacoma. This method of treatment was carried out over a period of sixteen months during 1937 and 1938. The transportation and treatment costs were exceedingly high. The ore however was very rich in gold and the money obtained from it paid not only transportation costs but also all the costs of development. As a result a seventy-five ton mill was erected and started producing in the Fall of 1938.

The monthly production of the mine is around $110,000 per month and the mill heads average about 1.5 oz. gold.

(C.) General Geology:

Briefly the geology of the area is as follows:- A series of volcanics and sediments of the Vancouver Group, of Triassic or lower Jurassic age, is present, and is intruded by a large body of granodiorite.

The Privateer vein strikes approximately at right angles to the southern contact between the volcanics and the granodiorite. The vein on the surface of the ground lies almost entirely in volcanic formations but under the surface, in the mine workings it crosses several small intrusive tongues of granodiorite, probably offshoots from the main mass. The vein does not cut this main intrusive mass as far as it has been traced.

On the 900 level a fault is encountered. Beyond it lies a shear zone in which the vein peters out. This fault is older than the mineralization period.

(D.) Mining:

The mine consists of five adits covering a vertical range of 620 feet. The lowest level (1100) is being used for the main haulage way.

Drifting, raising and shrinkage stoping are the methods used to mine the ore.

(E.) Ore Treatment:

Following is a list of the ore treatments and milling practice in the order in which they occur.

1. Sorting and Picking
2. Single stage crushing to minus $\frac{3}{4}$ inch mesh.
3. Closed circuit, single stage grinding in cyanide solution with jig concentration of free gold. Grind-80% minus 200 mesh.
4. Blanketing of classifier overflow as a safety factor.
5. Agitation, two stage thickening and double filtration to provide a minimum of 48 hours treatment by cyanidation.
6. Batch amalgamation with two-speed barrel, of the accumulated jig and blanket concentrates.

EXAMINATION OF POLISHED SECTIONS:--

(A.) Mineralogy:

The following minerals were identified in the ore:--pyrite, pyrrhotite, sphalerite, arsenopyrite, galena, chalcopyrite, gold, white quartz, calcite.

Pyrite:

Pyrite is the most abundant metallic mineral in the ore, being found in all sections studied. It occurs in large irregular masses, much fractured. The fractures are frequently healed with quartz and less often with later metallic minerals. Much of the pyrite has been replaced by pyrrhotite.

Arsenopyrite:

Usually occurs closely associated with the pyrite, but in much smaller amounts. The contacts between these two minerals are mostly even and smooth, suggesting contemporaneous deposition. crystal form

Pyrrhotite:

A few sections show a large amount of this mineral. In these cases it is almost always present as irregular masses surrounded by a narrow rim of pyrite. This would suggest replacement of pyrite by pyrrhotite.

Sphalerite:

A small amount of this mineral is found filling fractures in pyrite and also replacing some pyrrhotite. Much of the sphalerite contains minute inclusions of chalcopyrite. An interesting feature of this is that often these small dots tend to line up like beads on a string. Those who have studied this more closely say that these inclusions lie in cleavage cracks in the sphalerite. Perhaps this will account for a pattern, roughly hexagonal which was seen in one section of sphalerite.

Galena:

It is present in relatively small amounts being almost absent in the eleventh and tenth levels, but quite abundant in sections of ore from the ninth level. It was recognized by its dead white-grey color and its triangular pits caused by cubic cleavage. The galena fills fractures in pyrite and also occurs as irregular masses scattered through the ore.

An interesting feature of some of the galena is fracturing along cleavage traces. The fractures are filled with later gangue minerals. From tests made on it the most of the filler is calcite but a small amount of late quartz may be present.

Chalcopyrite:

It occurs in two ways:-

1. In small inclusions in sphalerite.
2. In small irregular grains and masses, filling cavities and fractures in the other sulphides, especially pyrite.

Gold:

Of the twelve sections examined, two of them revealed gold. In the first specimen, from the 908 stope there appeared three small round specks of gold in dense pyrite. These were not filling fractures or anything similar but seem to be surrounded by clean unaltered pyrite.

In the second section, from the 908 stope the gold occurred in much larger masses than before and in different associations. This time it was in quartz gangue associated closely with two other sulphides, pyrite and arsenopyrite.

The gold in the dense pyrite had an average size of less than 75 microns (minus 200 mesh).

The gold in the quartz was much coarser, averaging about 125 microns (between 100 and 150 mesh).

Assays, run by the author, on the ore from the stope from which the polished sections were made, showed the following results.

(a.) gold- 8.16 oz. per ton.

(b.) gold- 5.32 oz. per ton.

A possible explanation for the scarcity of gold in the majority of the sections which are supposed to have been taken from high grade pieces of ore, is that much of the gold may have been plucked out during the polishing process. The ore is very friable and a good section is difficult to obtain.

Quartz:

This is by far the most abundant mineral in the ore. It occurs as a groundmass for all the later minerals and its deposition seems to have been continuous throughout the whole period of mineralization.

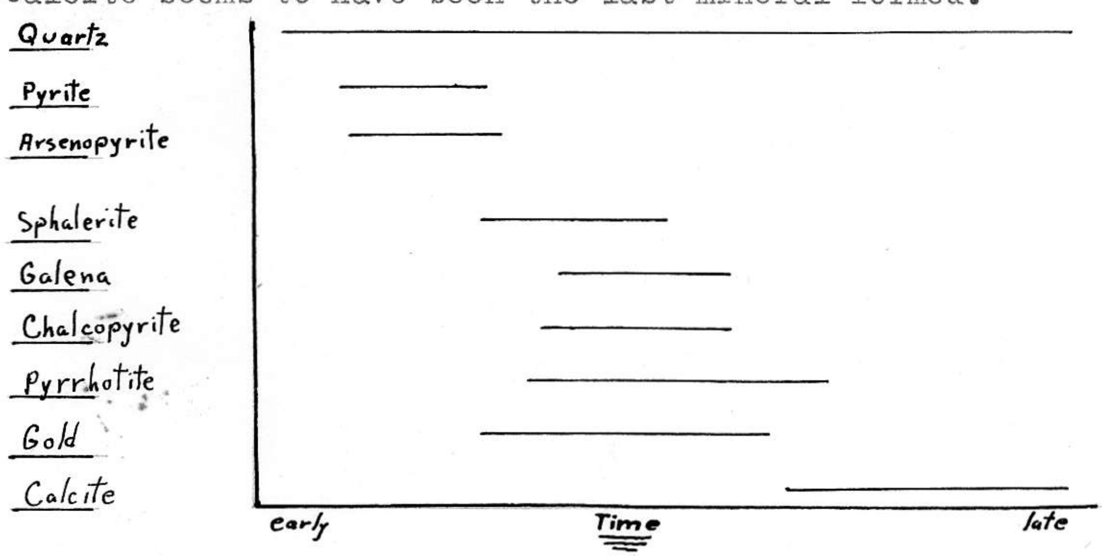
The ore shows a banded appearance due to the accumulation of the sulphides in thin layers, separated by wider layers of quartz and calcite.

Calcite:

This is a common mineral in the quartz and also veins some of the later minerals like galena. This habit shows that the calcite was deposited late in the series.

(B.) Paragenesis:

Quartz was deposited continuously during the whole period of mineralization. Pyrite and arsenopyrite were formed very early in the sequence, being mostly contemporaneous. Sphalerite was deposited a short time after the arsenopyrite. Galena and chalcopyrite came in at a later period, both contemporaneous. Pyrrhotite followed, by replacing the pyrite. Possibly it was introduced simultaneously with the galena and sphalerite. The gold in the sections was definitely post pyrite in age. Calcite seems to have been the last mineral formed.



CONCLUSIONS:--

From the study of the ore and the two sections containing gold we can say that the gold occurs in two ways.

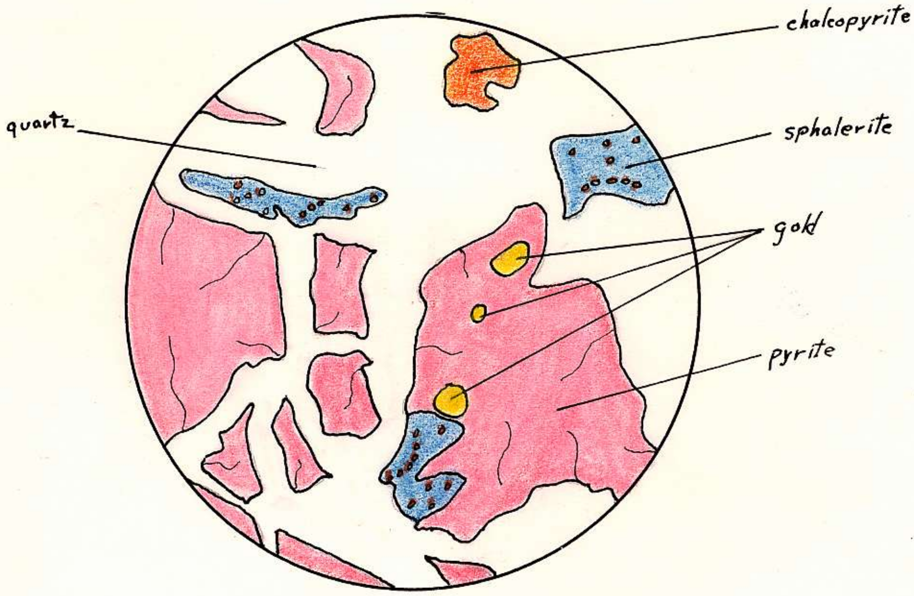
(a.) In quartz associated with pyrite and other sulphides, (average size - 100-150 mesh).

(b.) In dense pyrite as small blebs, (average size - minus 200 mesh).

According to the Dominion Ore Testing Laboratories the gold occurs in three ways.

1. As above in (a.), about 66%.
2. As above in (b.), about 2%.
3. In friable galena, or pyrite cleavage planes, about 28%.

No. 2 - 908 Stope.

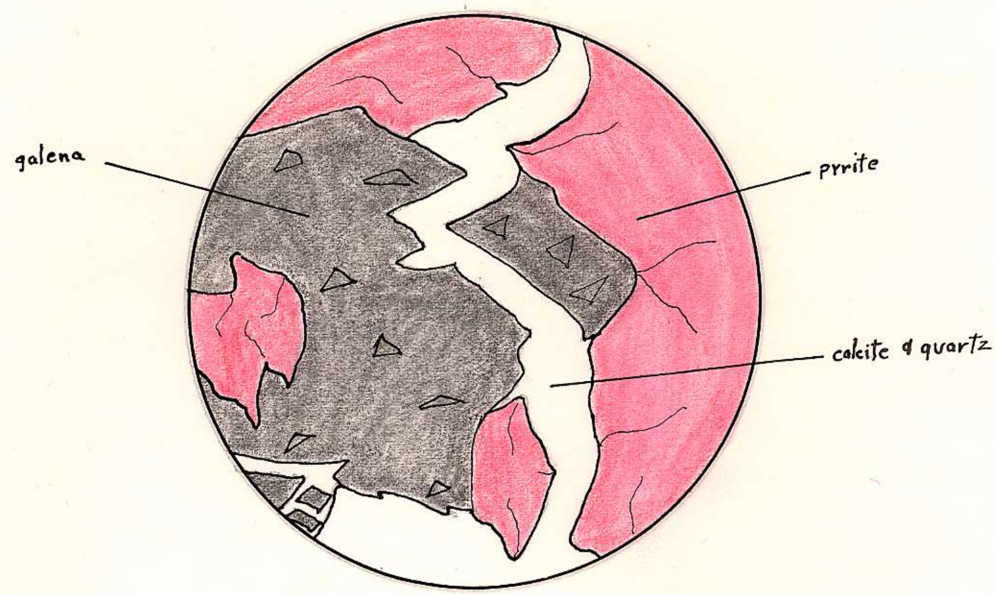


NOTE.

1. Gold occurs in dense pyrite.

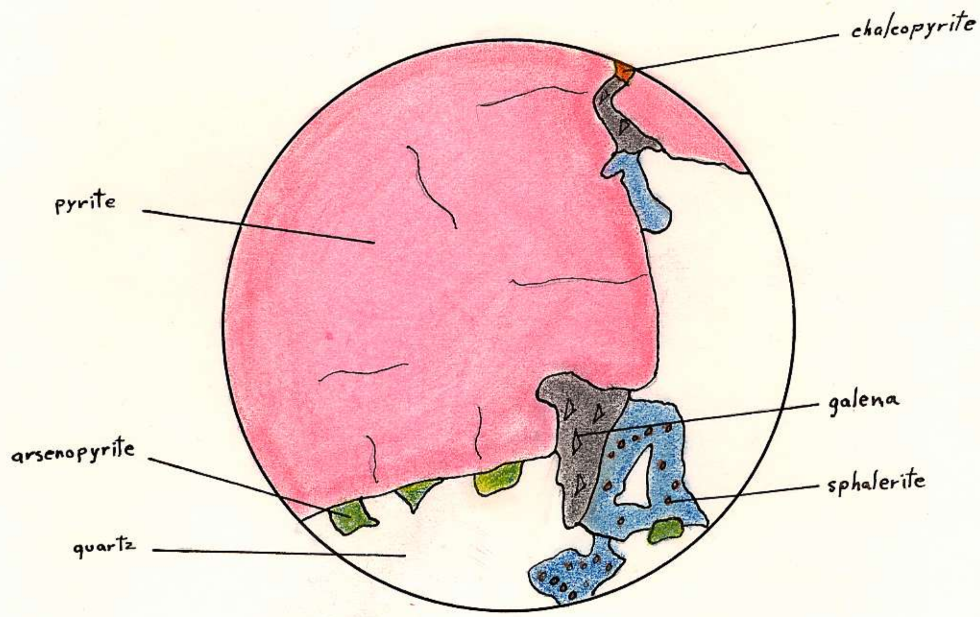
2. Size of gold less than 75 microns.

No. 2---908 Stope.



NOTE.
1. Intrusion of late quartz into cleavage fractures in galena.

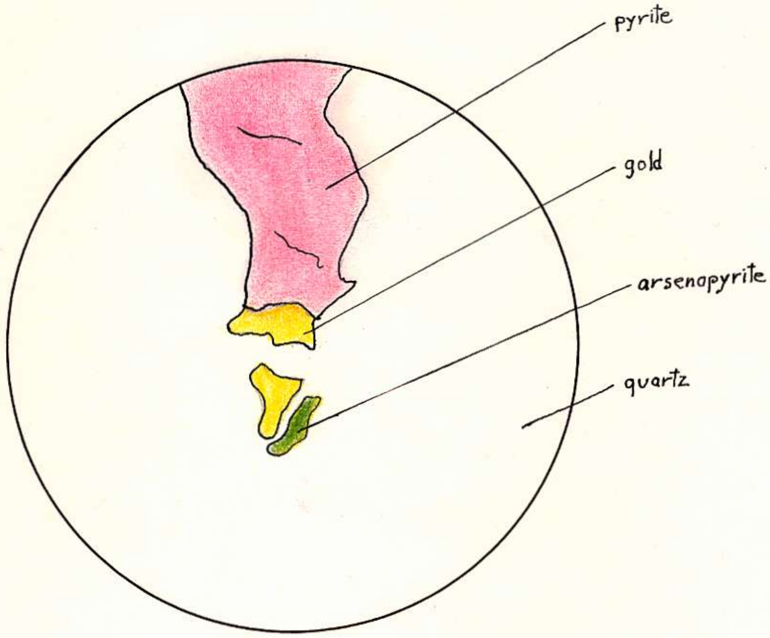
No. 1 / 908 Stope.



NOTE.

1. Galena & chalcopyrite veining pyrite.
2. Contemporaneous deposition of pyrite and arsenopyrite.
3. Probable contemporaneous deposition of galena & sphalerite.

No. 3-908 Stope



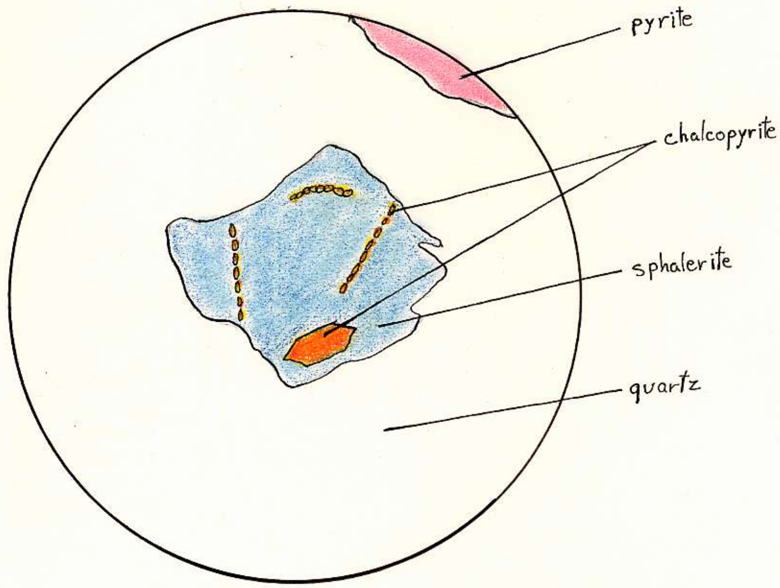
NOTE

1. Association of gold.

2. Size of gold about 125 microns.

3. Assays. (8.16 oz. gold)
(5.32 oz. gold)

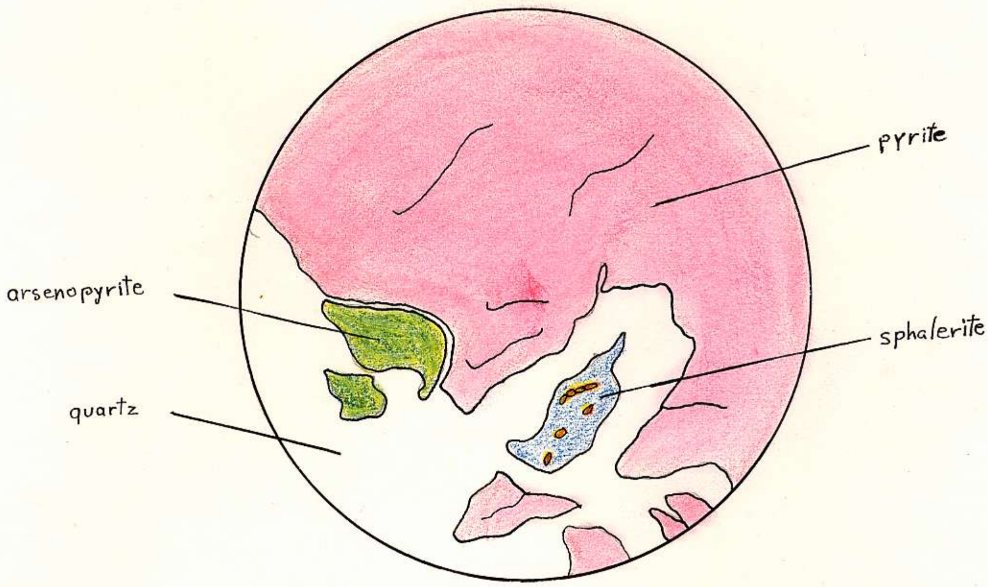
No. 3 - 908 Stope.



NOTE.

1. Presence of minute inclusions of chalcopyrite in sphalerite.
2. Arrangement of the inclusions in lines, & the hexagonal shape of the grain suggest that they were deposited in cleavage fractures in sphalerite.

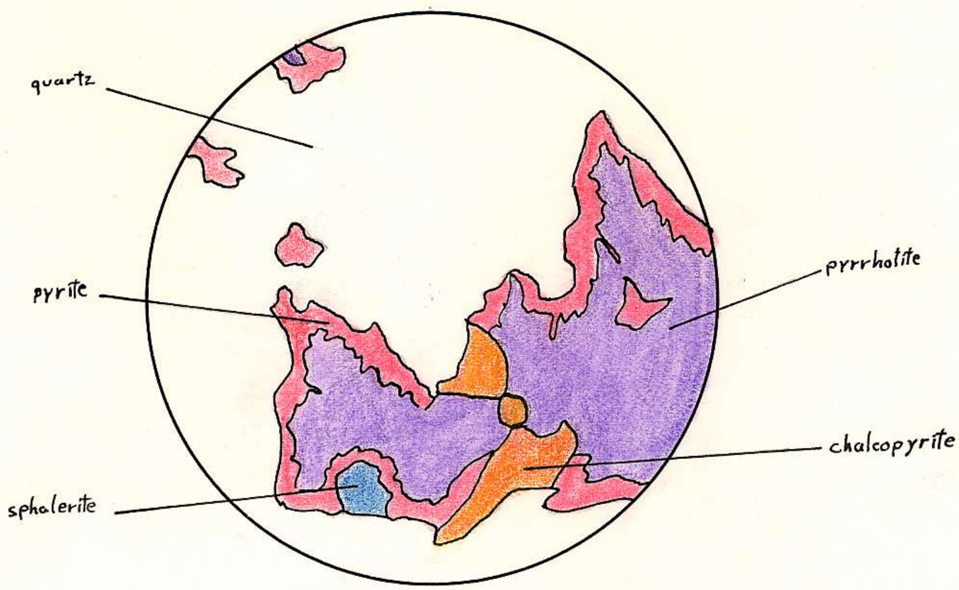
No. 4 - 1160 Level.



NOTE.

1. There appears to be contemporaneous deposition of pyrite & arsenopyrite.
2. Inclusions of chalcopyrite in sphalerite.

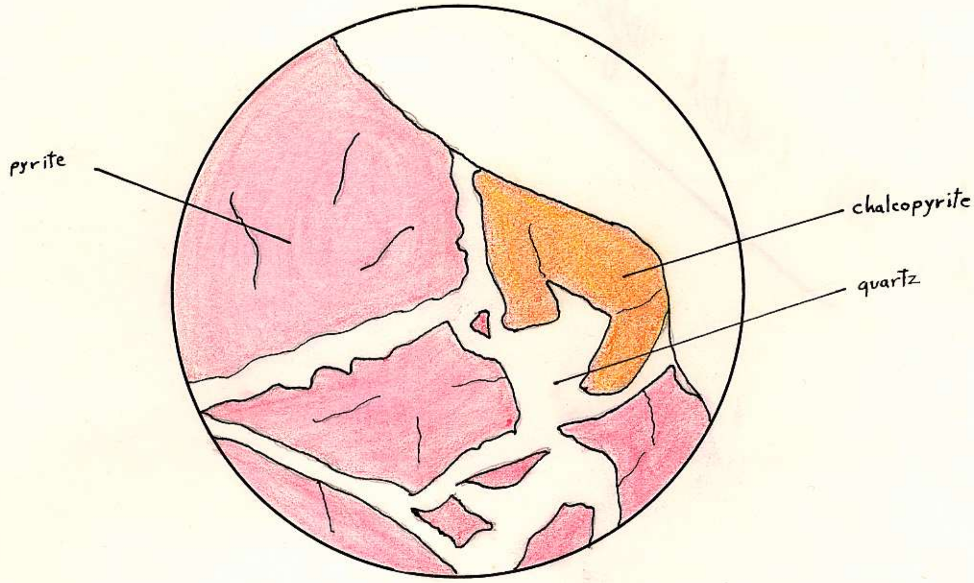
No. 2 - 1100 Level.



NOTE.

1. Almost complete replacement of pyrite by pyrrhotite.
2. Chalcopyrite later than pyrite.

No. 4 - 1100 Level.



NOTE.
1.Fractures in pyrite healed by late quartz & chalcopyrite.

75%

A difficult one, tackled honestly but without any particular initiative. No credit references