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DETERMINATION OF MINERALS IN ORE SPECIMENS FROM THE KOOTENAY BELLE GOLD MINES.

(Geology 9.)

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CONTENTS

INTRODUCTION

The object of this study is to determine the identities of ore minerals with the aid of the microscope, not just for the sake of placing the ore in a mineral classification, but for the purpose of gathering information on the mineral association of gold, so that the factors which govern the occurance of gold in lode deposits may be learned. The results of these studies can be used to advantage in the milling of gold ore, as the results tell the size of the gold particles, the minerals with which gold is associated, and the chemical state which gold is in, such as native gold, gold tellurides, or gold-silver alloy. These results suggest methods that should be used for recovery of gold without the expense involved of running expensive chemical analysis.

This report deals with the occurance and associations of gold in the ore.

The Kootenay Belle Gold Mine is located in the Salmo District of Southern British Columbia. The mine is situated on the southern slope of Sheep Creek, some ten miles from Salmo, and thirty-six miles from Nelson.

The mine was located in 1898, when the old time prospectors were following up the placer gold in the Salmo River. From 1904 to 1911, $105,000.00 of gold was produced. The mine was shut down for a number of years, because of high operating costs. From 1934 to the present year, the mine

has paid all operating expenses, and made a profit as well. In 1938 there was a production of gold and silver valued at $400,000.00.

GEOLOGY OF SALMO DISTRICT[1]

Jurassic	Nelson batholith	Granites, diorites, &c monzonites, syenites
Triassic		Flows, argillite & limestone
Pre-Cambrian		
Windermere-	)Pend-d'Orielle	Quartzite (Zinc)
	(Reno	Quartzite (Gold)
	)Quartzite Range	Quartzite (Gold)
	(Three Sisters	Grit & Conglomerate
	)	
	(Horsethief Creek	Argillite and limestone
	)	
	(Irene Volcanics	Massive Greenstone

The salmo area in general lies south of the southern contact of the Nelson batholith. Lode deposits occur in sedimentary rocks between outlying stocks of granite south of the main contact. The sediments are folded into north and south trending anticlines and synolines.

The brittler formations (quartzites) maintained openings upon fracturing, which were favorable for the passage and deposition of ore bearing solutions from the batholith and stocks. The non-brittle rocks such as argillite did not maintain openings upon fracturing. The argillite acted as an impermeable barrier to the solutions and tended to precipitate lead and zinc in limestone.

Hence, there are two types of deposits:

(1) Zinc and Lead-zinc (limestone replacement) in Pend-d'Oreille.

(2) Gold (fissure veins) in Reno and Quartzite Range.

[1] Memoir 172 G.S.C. - Dr. J.F. Walker.

GEOLOGY OF KOOTENAY BELLE GOLD MINE[2]

The deposits are fissure veins in the Reno and Quartzite Range quartzites. These pre-Cambrian sediments are intruded by outlying stocks of granite.

The structure of the sedimentary beds is an asymetrical folded anticline, Strike North and South- Dip steeply to the East. The fissures which occur in the Western limb of the anticline, strike East and West.

It is a mesothermal type of gold vein deposit. The primary ore is a quartz gangue, with gold, silver, galena, sphalerite and pyrite as ore minerals. There is no secondary enrichment, but there is some residual enrichment.

In the primary ore, it was found:

(1) Gold is associated more with sphalerite than with either pyrite alone or with pyrite and galena.

(2) Where pyrite occurs alone, values are not high.

(3) Gold does not occur free in the primary ore.

(4) Only a trace of gold found in sections of veins which do not exhibit evidence of original sulphide mineralization.

[2] The Miner July 1935 - Vere. McDowall

MINERALS IN ORE SPECIMENS

The minerals identified were as follows: (in order of abundance)- quartz, sphalerite, galena, pyrite, carbonate pyrrhotite, chalcopyrite, gold and electrum.
There were two minerals occuring in minor amounts, which were not identified.
Quartz, sphalerite, and galena form large bulk of ore.

QUARTZ

Milky quartz was the first gangue to form, because it is veined with all the other sulphides. Pyrite forms regular layers in quartz indicating old fractures which were healed by pyrite and a later quartz solution. Galena and sphalerite veins the quartz also, but their margin with quartz suggested that quartz was being dissolved while they were being precipitated.

There were at least two generations of quartz, a primary one before any sulphide, then a second one after fracturing of pyrite. No quartz was deposited when sphalerite and galena were deposited.

PYRITE

There were two types of pyrite observed, but they both have probably been deposited at the same time. The first type (Fig. 1) is later than the primary quartz but has been fractured and healed by a second generation of quartz. The second type (Fig. 2) is not fractured, but its margins have the appearance of being dissolved. These 'corroded'

margins are filled with sphalerite, galena, quartz and gold, indicating it was earlier than the sphalerite.

Therewas not any gold observed in the pyrite.

SPHALERITE

It is intimately mixed with galena, and was deposited at the same time. Blebs of pyrrhotite, chalcopyrite, gold and electrum are found in it. Both galena and sphalerite are later than quartz and pyrite.

GALENA

Its occurance is similar to sphalerite, although electrum seems to occur more frequently in galena than in sphalerite.

In one case (Fig. 3) galena and gold were found to be veining sphalerite indicating that they were deposited later than the sphalerite. This can be explained as follows: galena and sphalerite were deposited at the same time; later they were subjected to an increase in pressure; this would fracture the sphalerite, and galena would tend to flow along the numerous cleavage planes of the sphalerite.

PYRRHOTITE

It occurs as small blebs in sphalerite and galena. When there is a deficiency of sulphur in a solution, pyrrhotite is the mineral which appears instead of pyrite. Gold is often in contact with pyrrhotite.

GOLD

It occurs in small blebs in the sphalerite and galena, also it was found in a carbonate gangue in quartz specimen. No gold was found in the pyrite itself or in quartz alone.

ELECTRUM

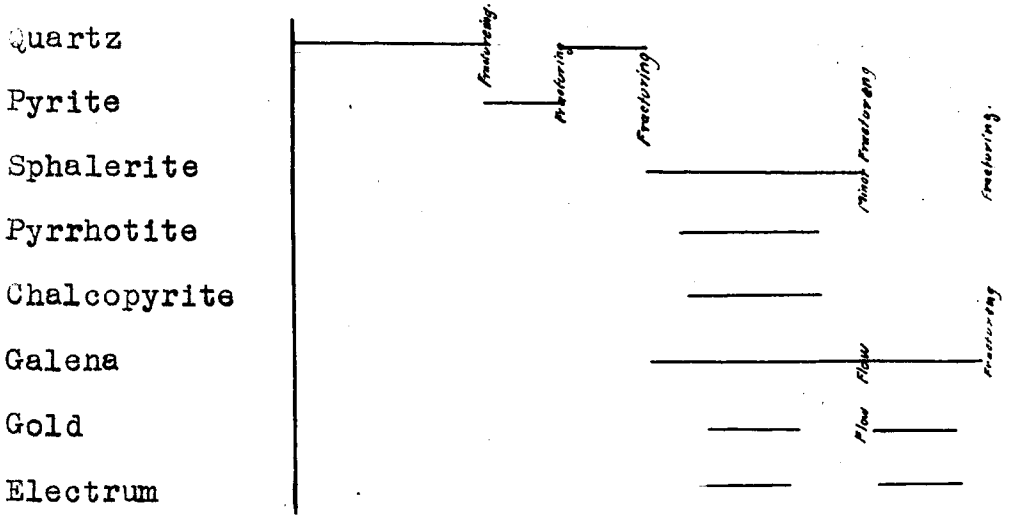
It occurs in sphalerite and galena, but favors the later mineral more often.

UNKNOWN MINERALS

(a) A dark yellow mineral associated with gold (Fig.3).

(b) A pale yellowish white mineral later than any of the sulphides (Fig.6).

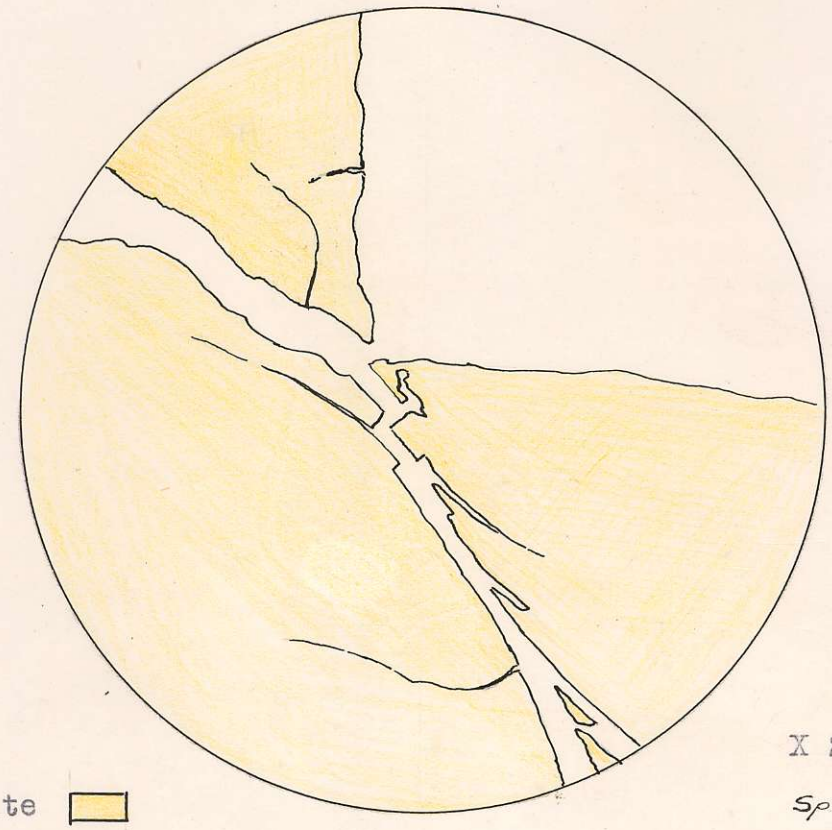
PARAGENESIS OF MINERALS



The first mineral to form was quartz. It was fractured and pyrite was deposited in well defined bands in the quartz. A second period of fracturing occured. A second generation of quartz healed fractures in the pyrite. A third period of fracturing occured. This time the solutions which came in, dissolved quartz and pyrite (sharp edges of fractures obliterated by corrodedmargins) and healed fractures with sphalerite, galena, pyrrhotite, chalcopyrite, gold and electrum. Later there was an increase of pressure which

fractured the brittle sphalerite and caused the galena and gold to flow into the fractures.

Fig. 1.



X 250

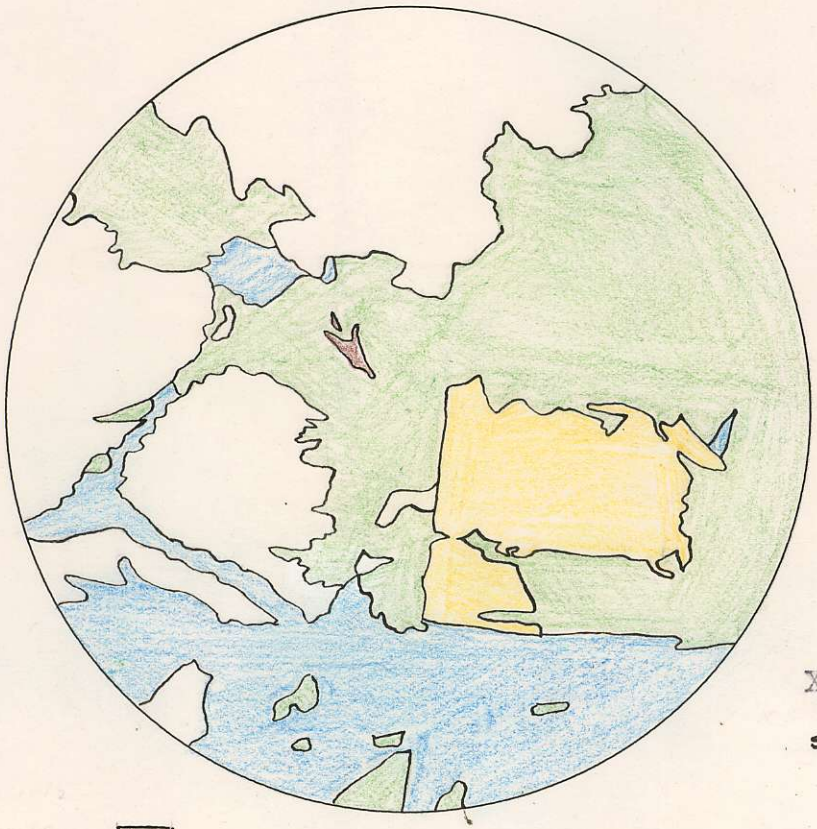
Spec. K1

Pyrite

Quartz

Pyrite fractured and filled with quartz indicating quartz later than pyrite.

Fig. 2.



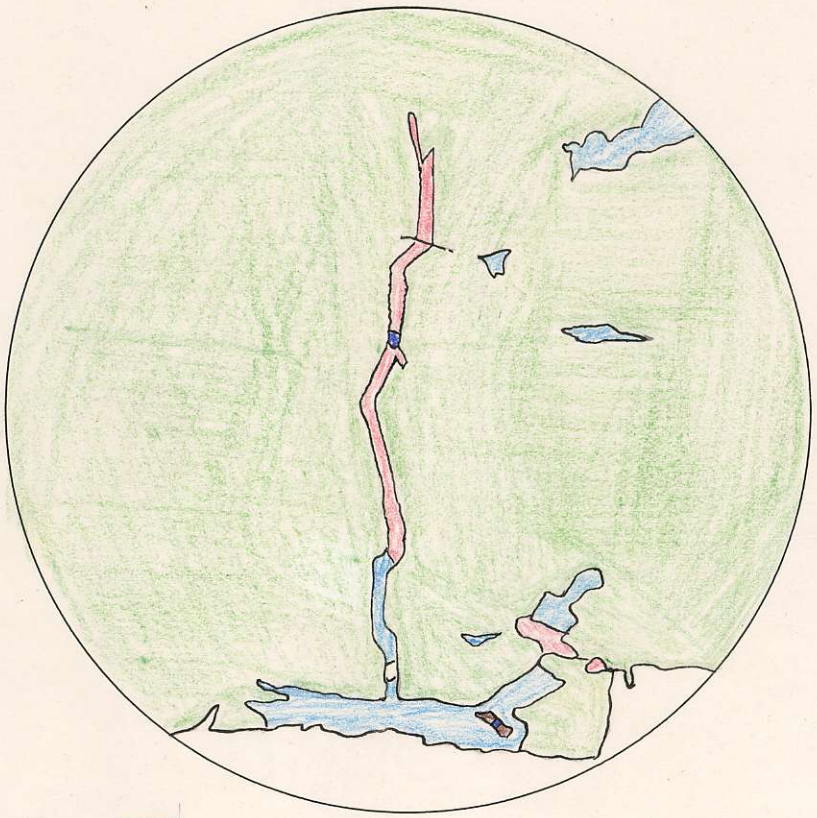
X 50

Spec. K7

Quartz
Pyrite
Galena
Sphalerite
Pyrrhotite

Illustrating second type of pyrite.

Fig. 3.



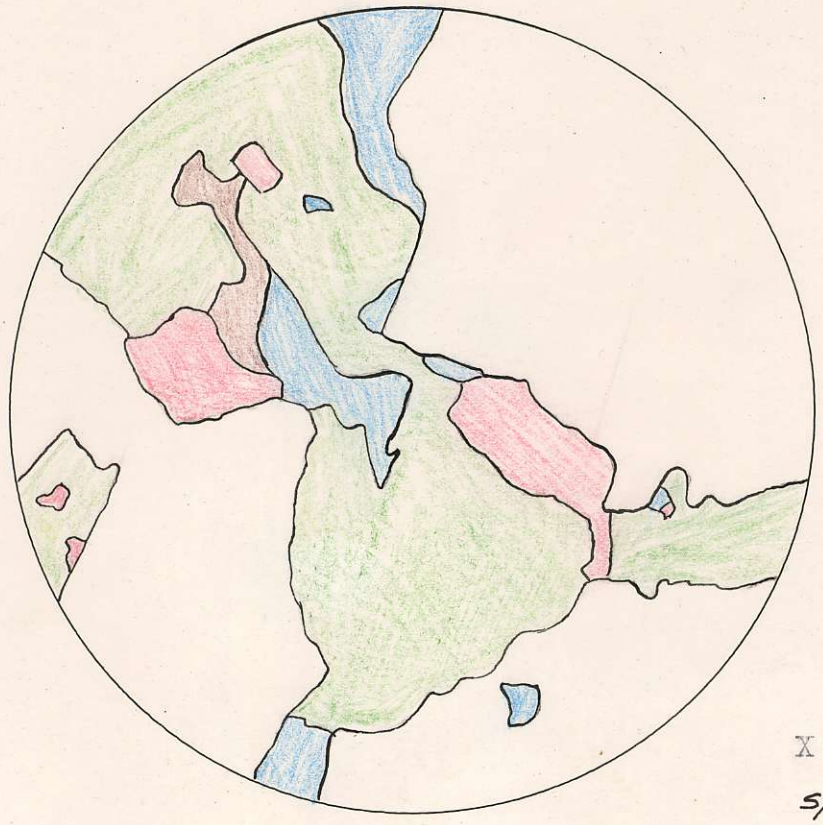
X 250

Spec K7

Sphalerite
Galena
Gold
Quartz
Pyrrhotite
Unknown

Gold and Galena veining sphalerite.
An unidentified mineral is associated with gold in vein.

Fig. 4.



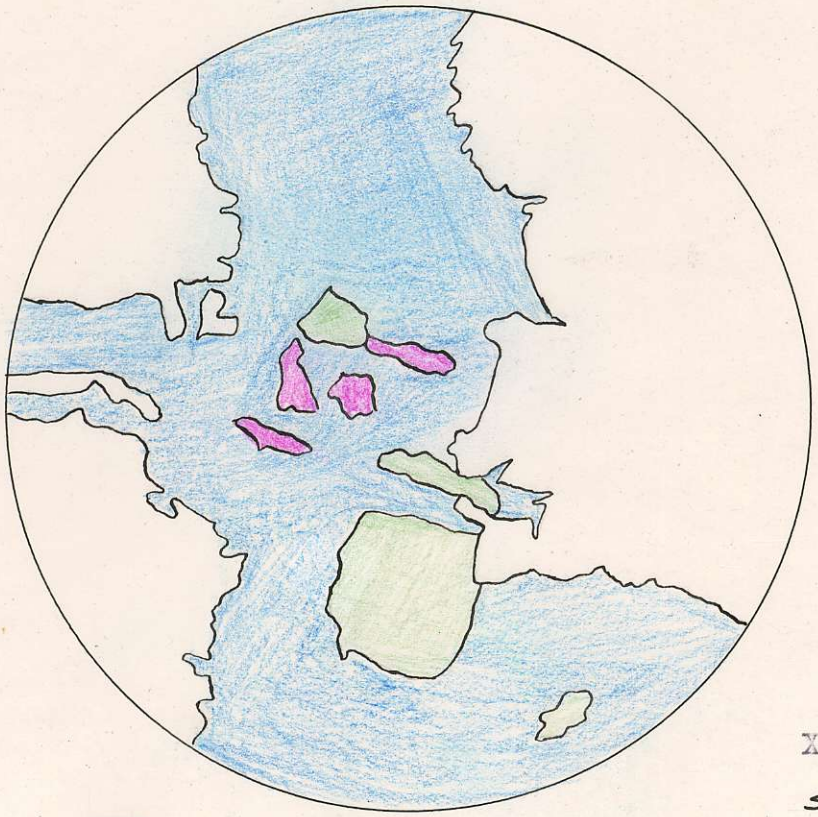
X 250

Spec K7

Sphalerite
Gold
Quartz
Galena
Pyrrhotite

Shows gold associated with sphalerite, pyrrhotite, galena.

Fig. 5.



X 250

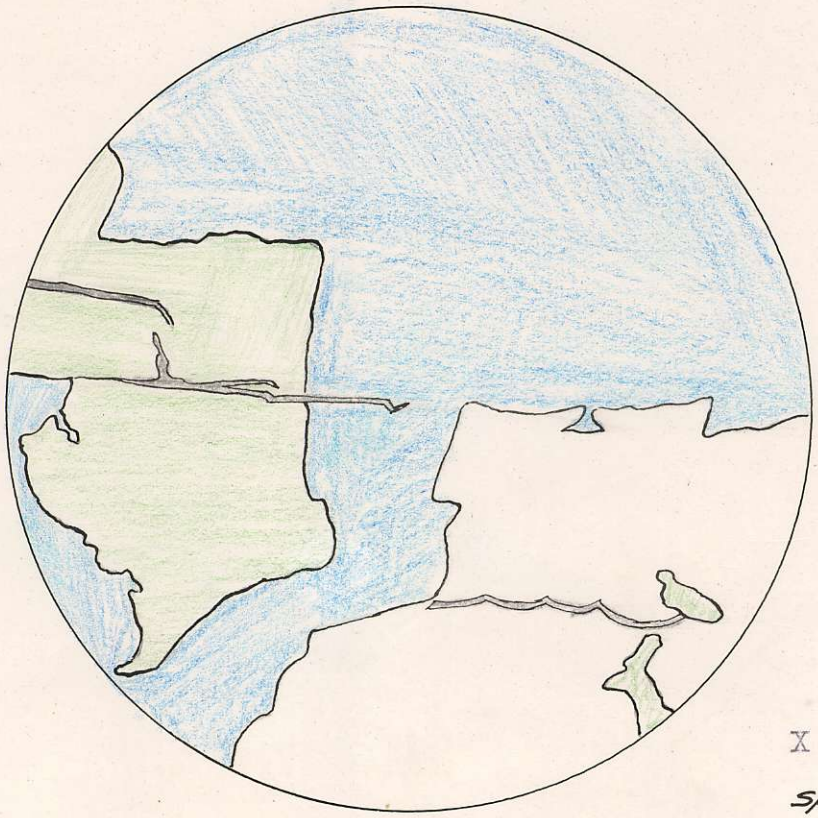
Spec. K4

Quartz
Galena
Sphalerite
Electrum

Shows electrum in galena and associated with sphalerite.

Electrum in galena associated with Sphalerite.

Fig. 6.



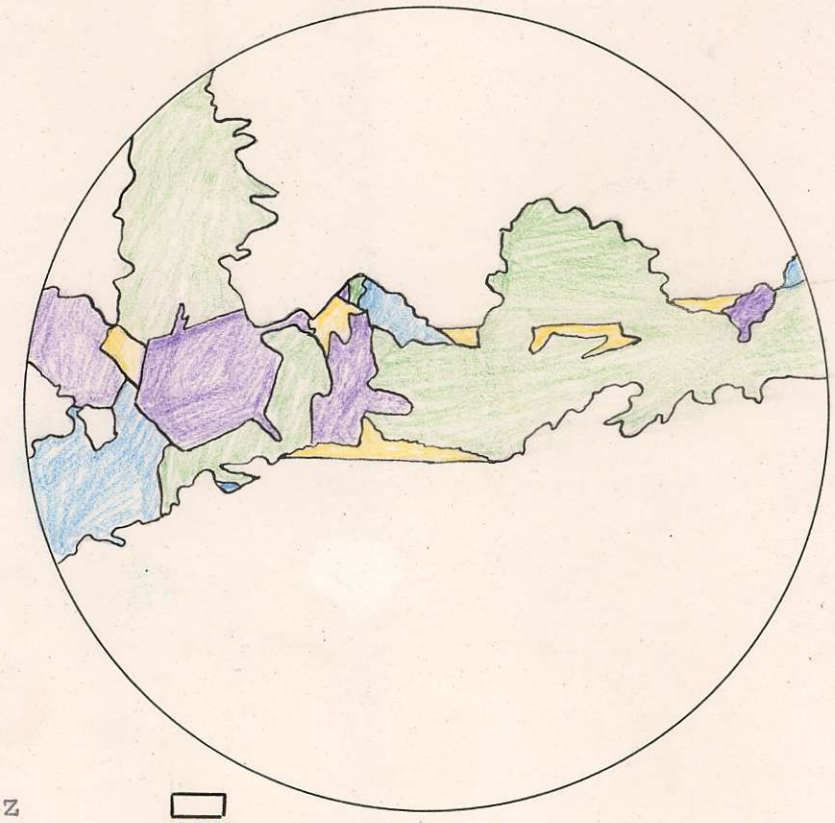
X 250

Spec K7

Quartz
Galena
Sphalerite
Unknown

Unidentified mineral veining galena, sphalerite and quartz.

Fig. 7.



X 50

Spec K8

Quartz
Pyrite
Sphalerite
Galena
Chalcopyrite

Late sulphides veining quartz.
Notice where pyrite is in contact with quartz the boundaries are straight but where galena, sphalerite or chalcopyrite are in contact with quartz, the boundaries have a corroded appearance. This suggests that pyrite and quartz were earlier than the other sulphides.

CONCLUSIONS

This study showed that gold was associated with sphalerite and galena in the primary ore. Gold was not observed to occur in quartz or in pyrite itself.

To summarize the paragenesis, silica and iron rich solutions were the first to deposit their lode of metals. Next a lead-zinc sulphide and gold-silver rich solution s which were deficient in silica and iron, deposited the minerals with which they were saturated and dissolved those in which they were deficient.

Silver occurs as an alloy of gold, and never as a sulphide in this deposit.