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REPORT ON ORE

from the

ZEBALLOS RIVER AREA.

VANCOUVER ISLAND.

B. C.

by

J.W. Hoadley.

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Introduction and Acknowledgements.

The following report is an attempt to determine the occurrence and associations of the various minerals in the Zeballos ore by the use of polished sections.

The work was done under the supervision of Dr. H.V. Warren, to whom the writer offers this acknowledgement.

BIBLIOGRAPHY.

Lode-Gold Deposits of the Zeballos Area.
by John S. Stevenson.

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north-westerly-south-easterly trending belt of granite rocks, called by Gunning the Zeballos batholith. These range in composition from gabbro to quartz monzonite, but within the area under consideration granodiorite prevails. This belt ranges in width from approximately 2 miles, near the headwaters of Gold-valley Creek, to three-quarters of a mile, where it crosses the Zeballos River and widens out from the river towards the northwest. This body of granodiorite has intruded Mesozoic volcanics and sediments of the Vancouver group that Gunning has divided into three groups: (1) A lower assemblage of volcanic rocks called the Karmutsen volcanics, (2) a middle limestone member, the Quatsino limestone, both groups lying north-east of the granodiorite, (3) an upper volcanic group, known as the Bonanza, lying south westerly of the granodiorite.

To date the greater number of properties lie within either the granodiorite or the volcanics in the vicinity of the south-westerly contact. There are a few properties, however, in the volcanics at the distances from 2 to 3 miles from either contact.

VEINS.

Structure. The deposits constitute gold-bearing quartz sulphide veins which occupy fractures that strike north easterly. The majority of the strikes range from north 73 degrees east to north 30 degrees east. The vein-fractures may be grouped in four structural varieties as follows:

(1) Clean-cut, single fissures in the granodiorite, which are

completely filled with quartz sulphide veins, such veins may range from one quarter to six inches in width.

(2) Clean-cut fissures in either greenstone or granodiorite completely filled by quartz and abundant sulphides, but which tend to weave slightly and to have branch quartz-sulphide stringers coming in from a side.

(3) Composite fracture-zones, in either greenstone or granodiorite, that range from four inches to four feet in width. These consist mostly of crushed, leached rock, talcose gouge and varying amounts of quartz-sulphide vein matter. The vein-matter usually occurs as a single band that ranges from lenses 3 feet thick to bands of more constant widths, from 6 inches to a mere stringer; the vein material may even die out completely but it may occur farther along in the same shear.

(4) Sheeted Zones, up to 4 feet in width, that consist of joints spaced 2 to 8 inches apart and which contain either gouge-seams or one eighth to one half inch quartz-sulphide stringers.

Vein-Matter. The vein matter consists of friable quartz and sulphides. The sulphides range in places from small amounts to almost 100 per cent of the vein. The sulphides include, listed in general order of abundance; pyrite, sphalerite, arsenopyrite, galena, chalcopyrite, and pyrrhotite. The chief gangue mineral is quartz. Calcite in appreciable amounts is known in only one place.

Visible gold, though not constituting the major portion of the total amount of gold in the ore, is a rather common occurrence. Specimens of crystalline gold have been found in the Goldfield Vein; one such specimen consists of three elongated crystals of gold averaging $\frac{3}{4}$ inch in length. However, it is the gold that occurs between and along the fractures in the various sulphides aggregates that contributes mostly to the value of the ore.

MINERALOGY.

INTRODUCTION. Megascopically the ore consists of bands of sulphides in a quartz gangue. The total thickness being about 6 inches.

Two generations of mineralization are evident. The fracturing accompanying the second mineralization and the cementation of the previous sulphides by the new minerals, which developed different structural features explains the extreme friability of the ore.

As a result of microscopic examination, the following metallic minerals were determined. They are listed in their positions of relative abundance.

(1) Pyrite.
(2) Galena
(3) Sphalerite
(4) Pyrrhotite.
(5) Gold.
(6) Chalcopyrite.
(7) Unknown Yellow mineral.

Pyrite. Pyrite is the major sulphide mineral in the Zeballos River ore. It constitutes well over half of the sulphides present, i.e., as seen in the sections under observations.

It is very broken and fractured, the individual grains exhibit numerous cracks which for the most part are filled with quartz. On the smaller ones, it appears to be 2nd. generation. The major interstices between the grains of pyrite are filled with first generation quartz. (see Illustration (1) section (5)). The other sulphides and gold also fill the fractures in the pyrite.

Galena. The galena occurs in isolated massive anhedral patches. It is characterized by triangular pits.

Relationships:

(a) The contacts between the galena and pyrite are almost always irregualr. They are never mutual, the two being separated by stringers of second generation quartz. In this way the galena fills some of the fractures in the pyrite.

(b) Gold and Galena:-The contacts between these two are mutual, no sharp irregularities occurring along the boundaries. It was noticed that the gold occurrence seemed to be closely associated with the galena. Where there was no galena there was little gold.

(c) Galena and Sphalerite: Here again the boundaries are mutual and therefore, there is no encroachment of the one upon the other.

(d) Galena and Quartz: The contact between the second generation quartz and the galena is mutual. The quartz fills all the irregularities in the galena.

3. Sphalerite. This mineral only occurs in relatively minor amounts in the specimen of ore examined although its relationships with the gold seem to be quite important. It appears mainly in the quartz and practically always contains numerous inclusions of chalcopyrite. For the most part it is quite broken but this is not true of it all. In section 4, illustration (2), sphalerite is shown filling a crack in pyrite surrounded by second generation quartz.

4. Pyrrhotite. Small amounts of pyrrhotite occur in all sections. Section 3 exhibits the most. It is usually in small grains in the quartz, In a number of illustrations, it appears to be closely associated with the gold and sphalerite. Since it is most abundant in section No. 3, which does not exhibit any gold, it might be concluded that its presence is of small importance. In section 4, illustration (3), it fills cracks in Pyrite.

5. Gold.

Ways in which it occurs:

(a) Sec. (1) Illust. (1) In contacts between galena and pyrite.

(b) Sec. (1) Illust. (7) In quartz in contact with sphalerite

(c) Sec. (4) Illust. (1) As inclusions in pyrite.

(d) Sec. 2 Illust. (3) In fractures in pyrite.

(e) Sec.1 Illust. (2) Between pyrite and sphalerite in quartz.

(f) Sec. 2 Illust. (2) Between galena and quartz.

The gold in the Zeballos ore occurs mostly in large pieces, but small grains do occur. Quite often contacts between the gold and galena, and gold and sphalerite, are very smooth, rounded and intimate. The gold fills fractures in the pyrite- but contact with it is very irregular, separated by quartz.

Contact between the gold and the pyrrhotite is irregular and poor.

The most important minerals with respect to occurence of gold seem to be pyrite and galena. The gold often occurs between these two and is very seldom found where galena is absent. Where this obtains, it may be, that galena is very close in direction of the third dimension.

6. Chalcopyrite. This mineral only occurs in very small amounts. Usually as small inclusives in sphalerite.

7. Unknown Yellow mineral. This mineral occurs in the gold in small amounts and also in the pyrrhotite, as inclusions.

DESCRIPTIONS OF ILLUSTRATIONS.

Section (1) Illustration (3).

Shows relative relationship between the gold and sphalerite.

Section (1) Illustration (2).

Relationship between the gold, galena, and pyrite.

Section (4) Illustration (2).

Shows the quartz filling the fractures in the pyrite, and sphalerite, surrounded with second generation quartz in the fracture.

Section 4 Illustration (3).

Shows the two generations of quartz, and relationship between pyrrhotite and pyrite.

Section (2) Illustration (1).

Relationship between gold and pyrite.

Section 2 Illustration (2).

Shows gold between galena and pyrite.

Section 2 Illustration (3).

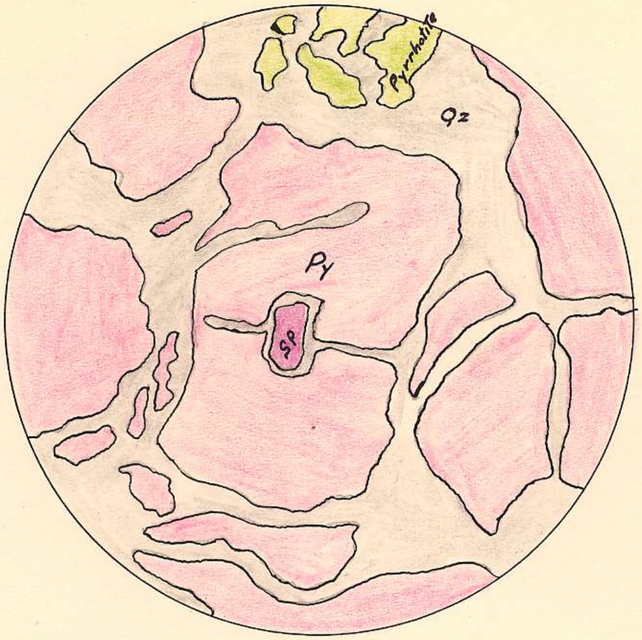
Shows gold and quartz filling the fractures in the pyrite.

Section 4 Illustration (1).

Shows first and second generation quartz. It also shows gold in fractures in the pyrite and, enclosed in it.

Section (1) Illustration (1).

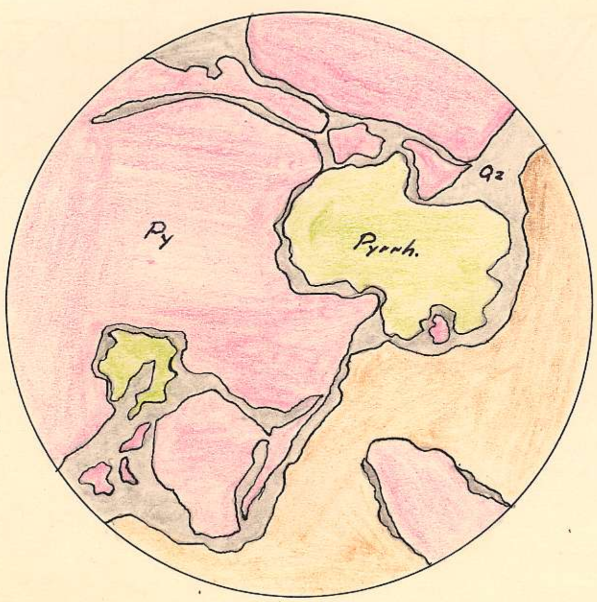
Shows the relationship between the sphalerite, galena, pyrite and gold.



MAG. 40 x.

Section (4).

Illustration (2).



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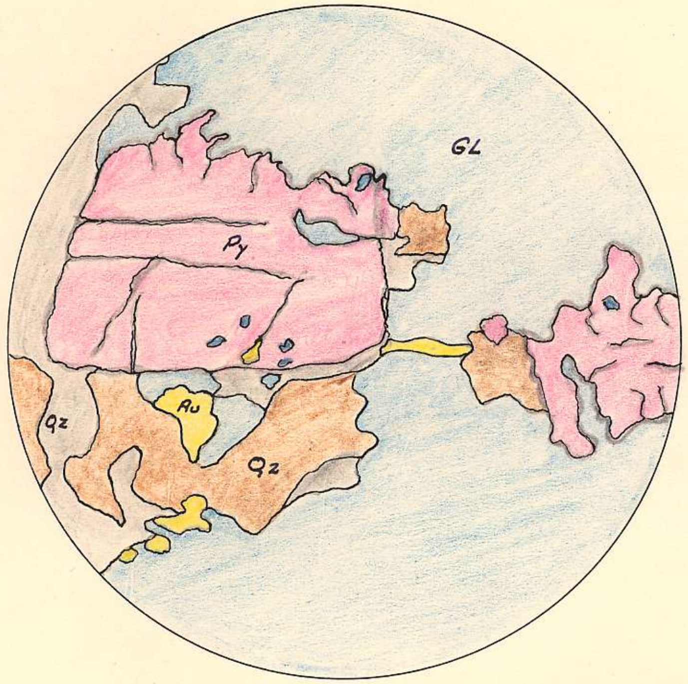
Section 4.

Illustration 3.



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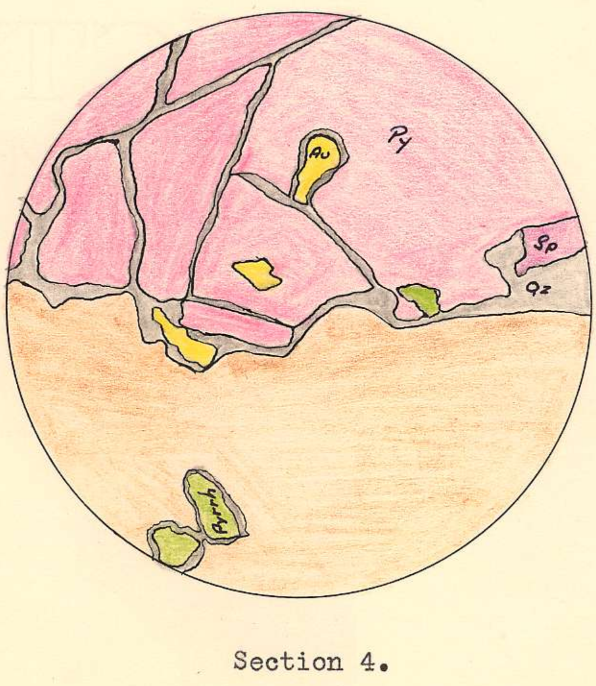
Section 2.

Illustration 3.



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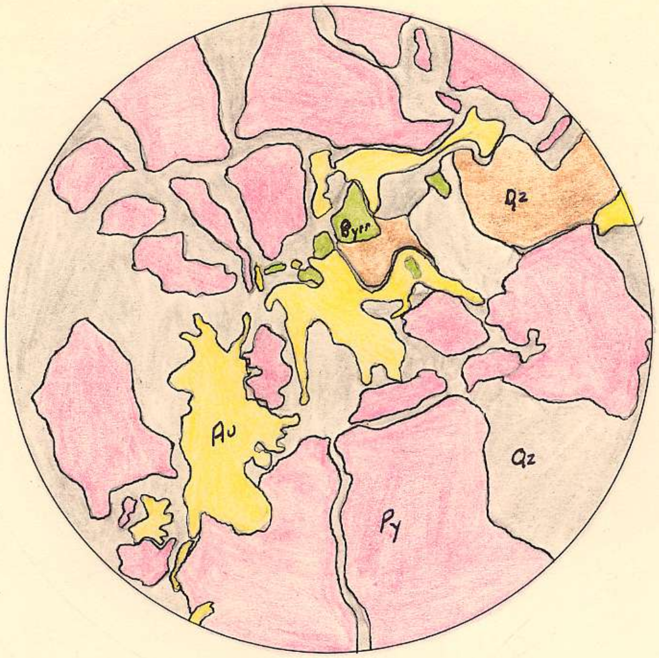
Section 4.

Illustration (1).



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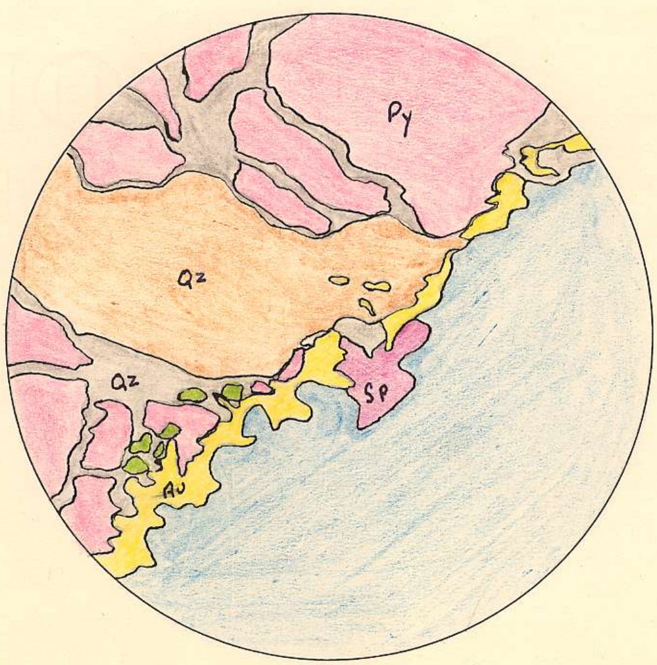
Section 2.

Illustration (1).



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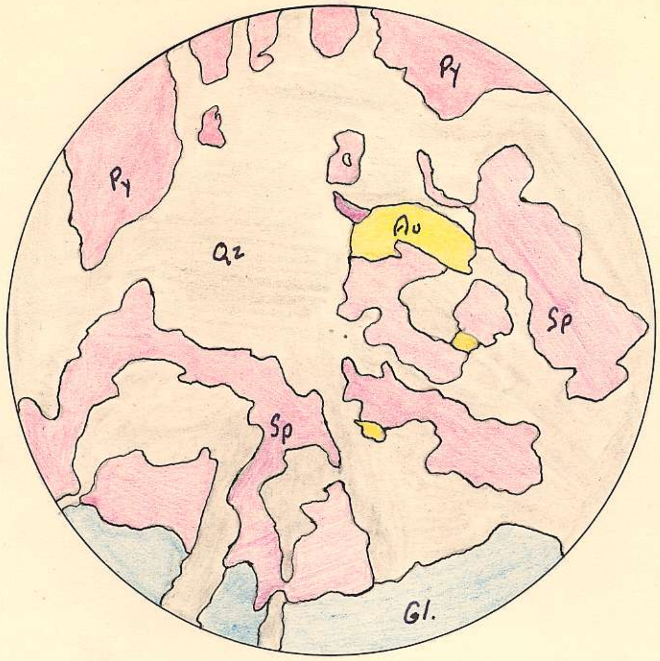

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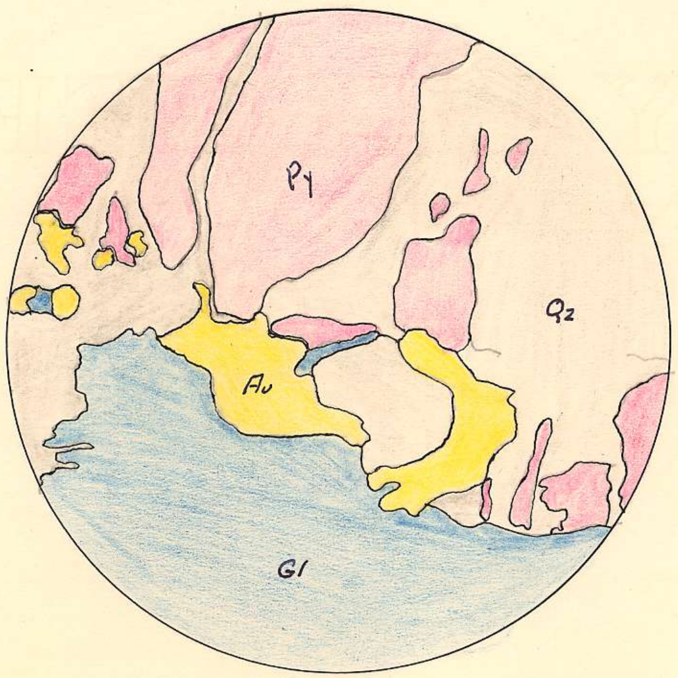
Section (1)

Illustration (3).



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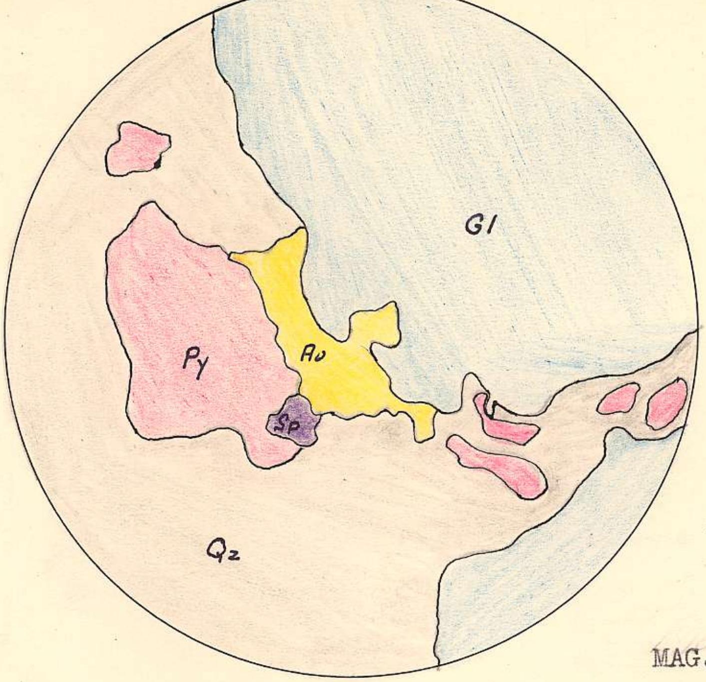
Section (1)

Illustration (2).



MAG. 40 x.

Section (1).

Illustration (1).

PARAGENESIS.

The following is an attempt to arrange the various minerals in their order of deposition.

There appears to have been at least two, if not more, periods of mineralization in this ore.

(1) First Fissuring.

(2) Intrusion of first generation qaurtz and pyrite (pyrrhotite) ?

(3) Refracturing.

(4) Intrusion of second generation quartz accompanied by galena, sphalerite, and gold.

CONCLUSIONS.

It was concluded that the pyrite was the first mineral to be deposited since it is badly fractured and the fractures are healed with second generation quartz. Possibly the pyrite and first generation quartz may have come in together. Then the pyrite was refractured and allowed the second generation quartz to vein it. The boundaries between the gold galena, sphalerite, are such that they are believed to be contemporaneous.

The fact that these three vein the pyrite, shows that they are of later deposition.

From the microscopic study of the ore, it would seem that the occurrence of the gold is associated mainly with the galena, and perhaps, to some extent, with the sphalerite.

The gold is of the mezothermal zone of deposition and is primary; thus it may be expected to go to depth along with the galena and sphalerite.

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