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THE MINERALOGY

OF

THE BEANO GROUP OF MINERAL CLAIMS

Henry D. Nicholson

Fourth Year Geological Engineering

The University of British Columbia

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ABSTRACT

The Beano Group of Mineral Claims has exposed on it an excellent example of a rich pyrometasomatic gold deposit. The mineralization was accomplished by igneous emanations probably originating in the Zeballos Batholith and channelled to the deposit by a fault.

The gold occurs in two small, easily mined, high grade bodies, and seems to be free milling. Finally, the deposits are interesting because the gold is associated with a white mineral that may be a telluride, This occurence of a telluride in a pyrometasomatic deposit would be very unusual, and might serve as an explanation for some of the other small irregular high grade deposits in the Zeballos region.

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INTRODUCTION

During the summer of 1947, the writer, while a member of the Canadian Geological Survey party in the Zeballos Area of Vancouver Island, visited the Beano Group of Mineral Claims. These claims were previously discussed briefly in a report by Mr.R.J.Maconachie[1]. The specimens

1. J.S.Stevenson & R.J.Maconachie; Zeballos Area; Ann. Rpt. to the British Columbia Minister of Mines,1938 Pt F.

studied for this report were collected by the writer and do not represent a complete suite.

The following report was written in partial fulfilment of the course of Mineralography (Geology 409) at the University of British Columbia. The writer would like to acknowledge the suggestions given him toward the investigation of the problem by Dr.H.V. Warren, Dr.R. Thompson, and Mr. J. Donnan.

LOCATION

Zeballos is 200 miles north-west of Victoria at the head of Zeballos Inlet on the west coast of Vancouver Island. The Beano Group of mineral claims is about two miles north-east of the town of Zeballos. The claims occur at an elevation of 2600 feet on the south face of Beano Mountain.

TOPOGRAPHY

The mountains of this area, although averaging only 3500 feet in elevation, are very rugged. The valley walls are close and rise steeply with abundant cliffs, demonstrating the heavy glaciation which the area has undergone. Beano Mountain is typical of this topography, rising at 30 to 40 degrees to an altitude of 4000 feet.

CLIMATE

Temperatures in this area, typical of the Pacific Coast, range from 30 to 80 degrees Fahrenheit. The rainfall is much heavier than the coastal average, but because of the rapid runoff an acute water shortage occurs in the summer.

TRANSPORTATION

Transport of ore to the ocean is a major problem in the development of these claims. An overhead tram is being constructed over the first step of the transportation, 1500 feet down the 40 degree slope from the showings to the camp. From here a rough bulldozed road has been cut to the mouth of the Little Zeballos River. To complete this route a 150 foot wharf is planned to provide loading facilities for ships.

GEOLOGY

The Zeballos area is covered by the Bonanza Volcanic Group of Triassic age, a member of the Vancouver Series. These volcanics, altered medium to basic flows and pyroclastics, have minor intercalated lenticular beds of shale, sandstone, and limestone. This volcanic series is intruded by dioritic dykes, probably related to the nearby Zeballos Batholith.

At the showings, both intrusive and extrusive rocks are well exposed. The showings occur in a 150 foot deep box-canyon which was excavated from a steep east dipping fault zone. The rocks on the east wall are dark green to purplish felsites, of an intrusive origin. On the west wall, fine grained black members of the Bonanza Group appear. In these rocks two truncated sub-parallel limestone beds outcrop, having an attitude corresponding to the regional attitude of the Vancouver Series. It seems likely that these are of sedimentary rather than igneous origin.

The important structural features of the area are the faults, fractures, and dykes resulting from the forceful intrusion of the Zeballos Batholith. Numerous diorite dykes outcrop in the immediate vicinity of the deposits. These were not responsible for the mineralization but produced favorable places for deposition. The faulting is generally restricted to a steeply east dipping system which strike regularly north-south. Together with this, a pair of pronounced, equally developed shear planes are present, dipping 40 degrees to the north-east and to the north-west.

ORE BODIES

The ore, two rust covered bodies of gold-bearing pyrrhotite, occurs partially in an altered diorite dyke, and partially in altered volcanic rocks. One body outcrops at the top of the west face of the canyon and the other, at the bottom. The showing at the bottom of the canyon is a lenticular body, four feet thick covering an area of approximately 100 square feet of the canyon wall. Because the west wall of the canyon appears to be the footwall of a fault, this body lies on the footwall surface. The other, at the rim of the canyon, is more irregular, and has not been completely delimited. This showing might be the remnant of a body also deposited on the footwall surface of the fault, and later stripped off by erosion. Both of these bodies are enveloped in irregular masses of almost pure actinolite.

MINERALOGY

The gold values of the deposit are typical of the Zeballos deposits, ie., very high and irregular. Samples running up to three and one half ounces were taken by Mr. Maconachie in his investigation of the claims. These values varied markedly within the massive pyrrhotite itself.

Massive pyrrhotite and chalcopyrite constitute the visible sulphides in the deposit. These, along with actinolite and calcite, were the only minerals seen in the first six polished sections. In order to locate some gold, Dr. Warren suggested an assay be made on the remaining specimens. As a result, two sections were made of a piece of pyrrhotite running three ounces. In one of these sections, a fifty micron grain of gold showed associated with an unidentified mineral. On the strength of this, the four super-polished sections, labelled "Beano Group" were made.

The hand polished sections (Beano Group numbers five to eleven) show the overall relations of the non-metallics to the metallic minerals but do not show any gold. The four superpolished sections reveal a great deal of gold, and its mode of occurence with associated minerals. The minerals in all four sections are very similar, and will be discussed individually.

Pyrrhotite:

Pyrrhotite makes up over 95% of the metallics in all the sections. It is massive, coarse grained, and in some sections, especially section 3, shows marked pleochroism. The pleochroic pyrrhotite occurs as needle-like inclusions in larger grains of pyrrhotite,and resembles pseudomorphs of actinolite inclusions. The pyrrhotite contains actinolite fragments(section 6) similar in shape and arrangement to the above pleochroic pyrrhotite grains, but no definite proof of the pseudomorphic relation can be offered.

Chalcopyrite:

The chalcopyrite occurs along the grain boundaries of the pyrrhotite. It is coarse grained and very pale. Under high magnification it blends in color with the pyrrhotite.

Gold:

The gold has replaced the pyrrhotite and chalcopyrite, and occurs associated with an unidentified white mineral. The average size of the gold particles is twenty microns. Sketches at the back of the report show the relation of the gold and enclosing minerals.

Unidentified White Mineral (Tetradymite?):

Etch tests on this mineral indicate it to be tetradymite, but because the particles were small, microchemical tests failed to show either bismuth or tellurium. The mineral is galena-white, anisotropic, has a hardness of "B", and shows in one case a good cleavage. The quantity of this mineral is about ten times that of gold. It occurs associated with gold, and also by itself in massive pyrrhotite.

Non-metallic Minerals:

Actinolite occurs as masses enveloping the bodies of pyrrhotite, and as needle-like inclusions in the chalcopyrite and pyrrhotite.

A medium grey isotropic non-metallic mineral veins the metallics in the superpolished sections. These veins are refractured and a second lighter grey mineral appears as a line in the enechelon fractures of the older veins.

Cutting all minerals are veins of calcite.

PARAGENESIS:

The sequence of events leading to the deposition of the ore bodies began after the dykes from the Zeballos Batholith had been formed, probably after the end of the major intrusion. At that time the area suffered a period of intense hydrothermal alteration demonstrated by the widespread development of epidote and calcite, and locally the development of albite and actinolite. Two bodies of almost pure actinolite are exposed at the showings, replacing the volcanics and a diorite dyke. The actinolite is developed in long radiating fibrous crystals peculiar to static metamorphism.[1]

1. Personal communication: Dr. K. D. Watson, Geology Dept., U.B.C.

The sulphides in this deposit were probably introduced at the same time as the actinolite; but, because of their lower freezing temperature, were concentrated into massive bodies, and surrounded by crystalling actinolite, producing features making them appear younger. Furthermore, the postponed cooling of the sulphides indicate proper conditions for the development of the large crystals of actinolite existed. The chalcopyrite and pyrrhotite are equally fractured in all these sections, and both contain inclusions of actinolite. Moreover, the chalcopyrite occurs in blebs and stringers along the grain boundaries of the pyrrhotite as if from exsolution. Considering these three relations, it seems probable that the sulphides formed similtaneously.

Following the deposition of the sulphides, fracturing took place in them, after which the gold and associated unidentified white mineral were deposited. This sequence is demonstrated in Plate 1 where the fractures in the pyrrhotite do not cut thru the gold or the white mineral. The gold and unknown mineral appear to be contemporaneous, and replacing the sulphides. In most cases these minerals are seen adjacent to fractures, although some unsupported nuclei were noted (Sections 1&4).

The deposition of these minerals was followed by renewed fracturing and, in addition, veining by a medium grey non-metallic mineral. Slight refracturing of these veinlets has lead to a later deposition of a light grey mineral in small enechelon fractures in the older veinlets. Finally, the deposit has been further fractured and calcite has been introduced.

CONLUSIONS

1. The deposit is an excellent example of the pyrometasomatic class. The mineralogy and sequence of deposition both support this conclusion.[1] The minerals were probably derived from the nearby Zeballos Batholith. The major control for the deposit seems to be the steeply east dipping fault whose footwall forms the west face of the canyon. The solutions were probably chanelled by the fault to the showings where they encountered an unknown control, perhaps the altered diorite dyke or the limestone, causing deposition. There seems to have been only one period of mineralization as the sequence of deposition indicates gradual cooling.

2. Judging from the fractured condition of the sulphides, the gold is probably free milling. Furthermore, assays made by Mr, Maconachie show the gold to be fairly pure with less than one part of silver in fifty parts of gold.

1. Lecture by Dr.H.C.Gunning,Geology Dept.,U.B.C.

3. If the unknown mineral be a telluride, as its character and tests indicate it to be, this is an unusual occurence of a telluride.[1]

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1. Dana: Textbook of Mineralogy, 4th Edit., 1943, pp412.

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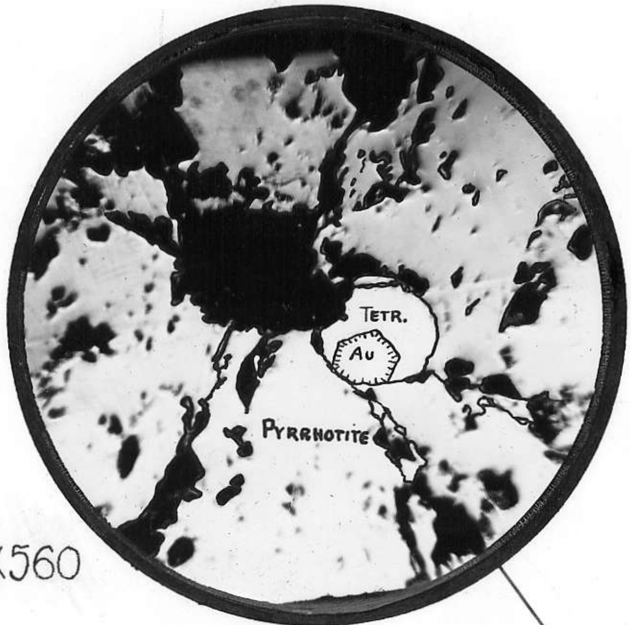
4. Other ore bodies may exist along this foot-wall, but judging from the irregularity of the two exposed bodies and the general properties of pyrometasomatic deposits as a whole, a great deal of drilling would be necessary for their complete developement. If the owners have started this operation on a hope that a little drill-will increase their reserves, this problem of exploration will be their hardest.

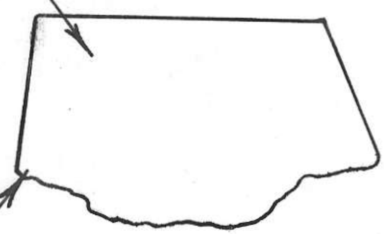


X560

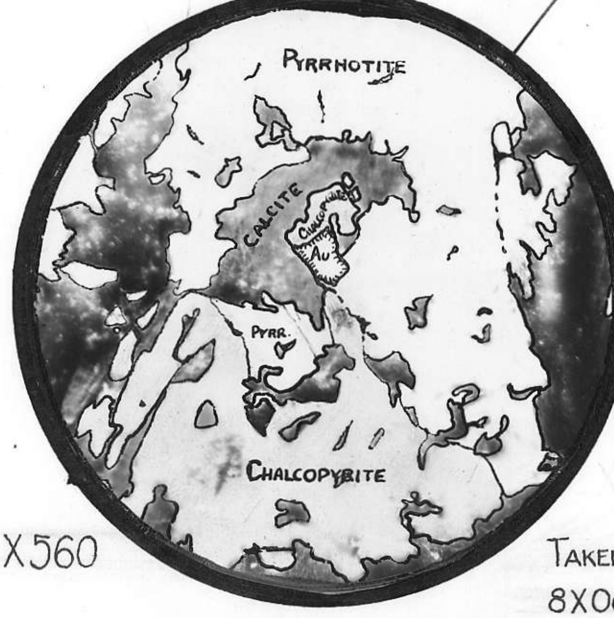
0 10 20 30 40 50 60 70 80μ

TAKEN ON LEITZ MICROSCOPE N° 337061
8X OCULAR: .215 mm. OBJECTIVE: EXPOSURE 6 SEC.

Plate 1: Photograph showing gold and the unidentified white mineral (Tetradymite?) replacing pyrrhotite. Notice that the fractures do not cut the gold or tetradymite.



Location of photographs on the 'superpolished' section Beano Group - 4.



X560

0 10 20 30 40 50 60 70 80μ

Plate 2: This section shows gold replacing chalcopyrite and pyrrhotite.

TAKEN ON LEITZ MICROSCOPE N° 337061
8X OCULAR: .215 mm OBJECTIVE: EXPOSURE: 5 SEC.