Poor spelling - in common with other 4th year
I feel that this man is capable of a
better effort in all respects
60-65%



Geology 409 Report

# Discription and Mineralogy of the 'Lavidiere Property, Atlin District, British Columbia.

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History

The property was first staked about 1905 by the three Lavidiere brothers who did intermittent development work inthe property during the winters until about 1930. The property was abandoned in the late 1930's upon the death of one of the owners. It was staked again about 1947 by Wm. Musselbe, Niel Forbes, Fred Baker and Harper Reed. Only the necessary assessment work has been done dy the present owners. The deposit was examined in some detail by D.D. Cairnes of the G.S.C.[1] Although the property has been examined by representatives of several mining companies, it has never been under option as far as is known.

Descrition of Property

The Lavidiere Property consists of a number of mineral claims located about two miles from Atlin Lake on the west side of Hoboe Creek which flows north into Atlin Lake. Hoboe Creek does not flow into the main body of Atlin Lake but flows into the south end of the western arm of the lake. This arm of Atlin Lake is called Torres Channel on the older maps. The sorce of Hoboe Creek is an arm of Lewellyn Glacier which has retreated to a point about 8 to 10 miles from the lake. The valley of Hoboe Creek is a typical wide glaciated valley with steep sides. It is being rapidly silted up with glacial debris and local interruption of drainage by beavers has flooded much of the valley floor. The property is on a contact between the Mt. Stevens Group of early Paleozoic sedimentary rocks and a granitic intrusive which is a part of the Coast Range Batholith. The Mt. Stevens Group contains

1 D.D. Cairnes, Portions of Atlin District, B. C. with special reference to lode mining, G.S. Can. Mem. 37, 1913, No. 28627-A. 129 pp. and map.

numerous light colored limestone beds and the mineralized contact described occurs in one of these members. The contact strikes north-south just at the foot of the valley wall. The igneous rock makes up the valley wall and the limestone which was on the valley side of the contact, has been almost entirely removed by erosion. The contact is steep and seems to dip east under the floor of the valley. The contact is heavily mineralized where it can be seen over a distance of about one-half a mile. The mineralized zone is of variable width and at some places is entirely absent. The mineralization appears to be in the limestone although it is mostly massive and no trace of the limestone remains. However, some disseminated magnetite is seen in the limestone around the borders of the more massive mineralized zones.

The massive mineralization is chiefly magnetite in a serpentine gangue. Erythrite stains the surface at several places near the northern end of the porperty. The erythrite is rather thick although it only covers a small total area. No erythrite was seen on the main part of the deposit although a peculiar reddish stain was seen on some slickensided surfaces. Blowpipe analysis of this material did not reveal the presence of any cobalt. Malachite staining was prevalent in certain parts of the deposit especially where the mineralization was near limestone and high in copper.

Three tunnels have been driven into the mineralized zone. The longest tunnel which is over 150 feet long, runs through the mineralized zone to the igneous contact. The tunnel is in rather uniform mineralization for its entire length. The contact with the igneous rock is sharp and clean. Small amounts of chalcopyrite can be seen here and there; there are also a few small veinlets of yellow serpentine cutting across the tunnel. The mineralized zone is cut by a few small faults,but the rock as a whole, is very strong as evidenced by the fact that the tunnel, which is not timbered, shows no signs of caving after about 40 years.

The south end of the property is more sparsely mineralized and a few small bodies of garnetite are found in the limestone. The south tunnel which is rather short and was partly filled with ice, is driven in disseminated mineralization and contained some white quartz which is not found elsewhere on the property. Some disseminated tetrahedrite can be found in the quartz. Further south the contact is hidden by overburden but appears to swing east out under the valley floor.

Assays were made on samples from various parts of the deposit for gold, silver, copper and cobalt. Gold was only in traces, silver ran below one once per ton, copper was as high as three and one-half percent but was usually around one percent and cobalt was found only in samples from the north end of the deposit, the best assays being about .6% over three feet. Although the iron mineralization seems to be very uniform, the amounts of the other metals vary considerably from place to place.

## Macroscopic Examination of Hand Specimens.

Most of the specimens examined are from the north end of the property where the erythrite coating is found on the mineralized zone. Several specimens from the long tunnel were also examined. The hand specimens are rather uniform in appearance, varying only in the amount of magnetite in the serpentine and in presence, or absence, of pyrite cobatite and large bunches of chalcopyrite. In all specimens magnetite is the predominant mineral and it occurs either massive or disseminated in dark green serpentine. A few specimens which usually have an erythrite coating on the surface have small amounts of cobaltite scatterd through the magnetite or as aggregates of grains in the magnetite and gangue. Varying amounts of chalcopyrite can be seen here and there mixed with the magnetite. Weathering gives a coating of erythrite and malachite on some specimens, but the magnetite shows no signs of weathering probably because of recent erosion by the glacier which still occupies the upper end of the Hoboe Creek valley.

Microscopic Examination of Polished Sections

About one dozen polished sections were cut from the ore minerals. All but one are from the hand specimens collected from the cobaltiferous material at the north end of the property. The other is from a specimen from the long tunnel. The majority of the sections showed only magnetite, serpertine, and here and there a bit of chalcopyrite. Three sections contain cobaltite along with the usual magnetite, serpentine, and cobaltite. Two of these sections and one containing chalcopyrite, pyrite, and sphalerite, will be described in some detail since all the significant structures and relations are found in these three sections.

Section No. 2

This section is the only one polished by the super polisher. The finish of the magnetite is very good but the cobaltite is somewhat pitted. This section contains more cobaltite than any of the other sections. Along with magnetite, cobaltite and gangue, there are chalcopyrite, pyrite and some specularite. All the minerals are fractured as if by crushing or slight movement and the fractures are filled with gangue which seems to partly replace the other minerals.

The magnetite occurs as broken fragments which are rather deeply corroded and partly replaced by the serpentine and as well formed grains in the cobaltite grains. The small fragments usually occur in groups as though they were formed by the break-up of grains about one millimetre in diameter. (See FIG I). The magnetite in all the other sections occurs in the same way but is not as clearly seen because the polish of the magnetite is not as good as on this super-polished section. The chalcopyrite occurs as broken grains of irregular shape which are neither broken nor replaced as extensively as those of the magnetite. The cobaltite occurs mostly in several aggregates of grains and also as a few grains scattered through the gangue. It is fractured but is only slightly corroded and replaced. The individual grains which are rounded and about one millimetre in diameter can be clearly seen even in the aggregates because of a difference in surface finish from one grain to another. (See FIG II) Since cobaltite is isometric this change of surface can only be attributed to differences in crystal alignment within the section. The pyrite occurs in scattered fractured and severely corroded grains. Specularite occurs mostly as small inclusions in the magnetite. It was too small for positive identification, but was identified on basis of red internal reflection, color, and the fact that it occurs in identifiable amounts in section No. 8.

The relationships between the various minerals are not very clear in this section. The boundaries between adjacent grains of cobaltite and magnetite are usually followed by fractures and are therefore destroyed. However, in several places where the boundaries were still intact they are seen to be smooth and rounded, or straight. The small inclusions of magnetite within the cobaltite were in most cases in well-formed crystals with straight clean boundaries except where they are intercepted by cracks, when they are deeply corroded and replaced by the serpentine. The straight boundaries and well-formed inclusions in the cobaltite would seem to be best explained by simultaneous deposition of magnetite and cobaltite. The inclusions of magnetite crystals in the cobaltite may be indicative of a slightly higher temperature of crystallization for the magnetite than for the cobaltite enabling the cobaltite to form around well-formed grains of magnetite. The specularite occurs only in the sections which contain cobaltite so there seems to be some relationship between the cobaltite and the specularite. This is better seen in section 8.

Section no. 7

This section consists of two pieces cut from the same hand specimen. There is no cobaltite but more than the usual amount of chalcopyrite and pyrite. The section was polished by use of a fine abrasive on a cloth lap after grinding on the cast iron lap. The section was then polished on a cloth lap in the usual way. This produces a pitted surface on the magnetite which however, is much better than that obtained by using the glass lap. The magnetite because of its hardness, stands up in pronounced relief from the softer serpentine gangue.

The minerals show the same fractured and corroded structure as described in section no. 2. The chalcopyrite shows the effect of fracturing much less than the magnetite or pyrite. In some places the chalcopyrite is partly replaced by the gangue leaving irregular laths of chalcopyrite to give a structure best described as feathery. (See FIG III) This is particularly promounced in certain areas. In areas near chalcopyrite or pyrite, cracks in grains of magnetite, pyrite and chalcopyrite and the areas between grains are often filled with limonite instead of the usual serpentine gangue. This limonite grades into serpentine away from pyrite or chalcopyrite. The magnetite in several places has a peculiar triangular grid-like pattern of fractures filled with serpentine or limonite depending on the proximity of pyrite and chalcopyrite. This structure is apparently caused by fracturing along the octrahedral parting of the magnetite grains (See FIG 1V).

This section is the only one which gives any definite evidence of the relationship between chalcopyrite, pyrite and magnetite. At one place chalcopyrite seems to fill a crack in a magnetite grain, but the whole structure is so corroded by gangue that the evidence is not clear. At several places the pyrite seems to replace chalcopyrite. In each case replacement has apparently gone only to a short distance from magnetite leaving a rim or line of un-replaced chalcopyrite between the pyrite and magnetite. However, the structure is brecciated and the mineral boundaries are followed by cracks filled with limonite. (See FIG V) The general impression is of replacement of chalcopyrite by pyrite, however the same thing might result if chalcopyrite tended to form along pyrite-magnetite boundaries.

There are two grains of sphalerite in this section, the only sphalerite seen in any of the sections. The sphalerite occurs in small lens-shaped grains along the outer boundaries of larger masses of chalcopyrite with smooth rounded boundaries. The sphalerite is apparently opaque because it shows no internal reflection even with oblique illumination by means of an arc lamp. The usual inclusions of chalcopyrite are seen in the sphalerite, but they are exceedingly small and can only be seen by use of a high power oil immersion lens.

## Section No. 8

This section was polished by the same method as described for no. 7. This produced an excellent finish on the cobaltite but left the magnetite somewhat pitted. The cobaltite is streaked but has even a smoother finish than given by the super polisher. Where magnetite and cobaltite are in contact the magnetite stands up in relief.

The magnetite occurs in its usual broken and corroded grains and as small well-formed crystals in the cobaltite grains. The cobaltite occurs both as individual grains and in aggregates of grains. The grains show differences in the surface finish as described in section no. 2. In addition to the magnetite and cobaltite there is some specularite. The specularite occurs in rather wide zones between some grains of magnetite and cobaltite, and is less fractured and corroded than the other minerals. (See FIG. VI) The specularite was identified by colour, red internal reflection, etch tests and a red streak. The specularite may have been derived from the magnetite since the magnetite seems to be more replaced than the bordering cobaltite. The formation of specularite apparently depends on the presence of both magnetite and cobaltite since it is only found between these two minerals and as a few small inclusions in magnetite near cobaltite. Where small crystals of magnetite occur as inclusions in the cobaltite there is no alteration or replacement of either mineral and the boundaries are clean and smooth. This section also contains some chalcopyrite similar to that in section no. 2.

The other sections, including one made from a specimen from the long tunnel, are all about the same showing variable amounts of broken and corroded magnetite in a serpentine gangue with a little chalcopyrite scattered here and there. Since no mineral relationships or structures are seen in these sections which are not seen in the sections already described, they well not be described in detail. There is no sign of alteration to limonite or specularite at any place on these sections.

## Conclusions

This deposit is definitely of the contact metamorphic type. The location along a granite limestone contact, the general appearance, the mineralogy, and the presence of a little skarn are all typical of contact metamorphic deposits. In general the mineralization is very uniform except where cobaltite and pyrite occur. The presence of these minerals and sometimes chalcopyrite seems to have caused alteration of some of the magnetite to limonite or specularite possibly because of the presence of sulphur. The limonite does not seem to be a common weathering product because the specimens from which the sections were cut show no signs of the brown staining so characteristic of weathering to limonite. Both the limonite and specularite may be formed by some type of hydrothermal alteration. The fact that the specularite is less fractured than the other minerals also indicates that it was formed by some late alteration.

Unfortunately the relationship between the chalcopyrite and the other minerals is not shown well in the sections examined. However, the evidence that the chalcopyrite may be younger than the magnetite is in agreement with that found in most contact metamorphic deposits containing magnetite and chalcopyrite. However, evidence that the pyrite replaces chalcopyrite is not in the usual sequence of mineral deposition. However, this pyrite may be due to hydrothermal alteration and may be the same age as the limonite and specularite.

The cobaltite was apparently deposited along with the magnetite as evidenced by the smooth cobaltite magnetite boundaries and the well-formed, unaltered grains of magnetite in the cobaltite. The segregation of most of the cobaltite into aggregates of grains is best explained by assuming a slightly higher or lower temperature of crystallization for cobaltite which might cause segregation.

Following the deposition of the ore minerals there was some movement causing fracturing of the magnetite cobaltite and chalcopyrite and simultaneous or later formation of the serpentine gangue. Serpentine would hardly be expected as a primary gangue in this type of deposit so it seems likely that it was probably formed by hydrothermal alteration of a primary gangue which may have been dolomite. The formation of the gangue, the limonite and the specularite may have been during the same period of alteration.

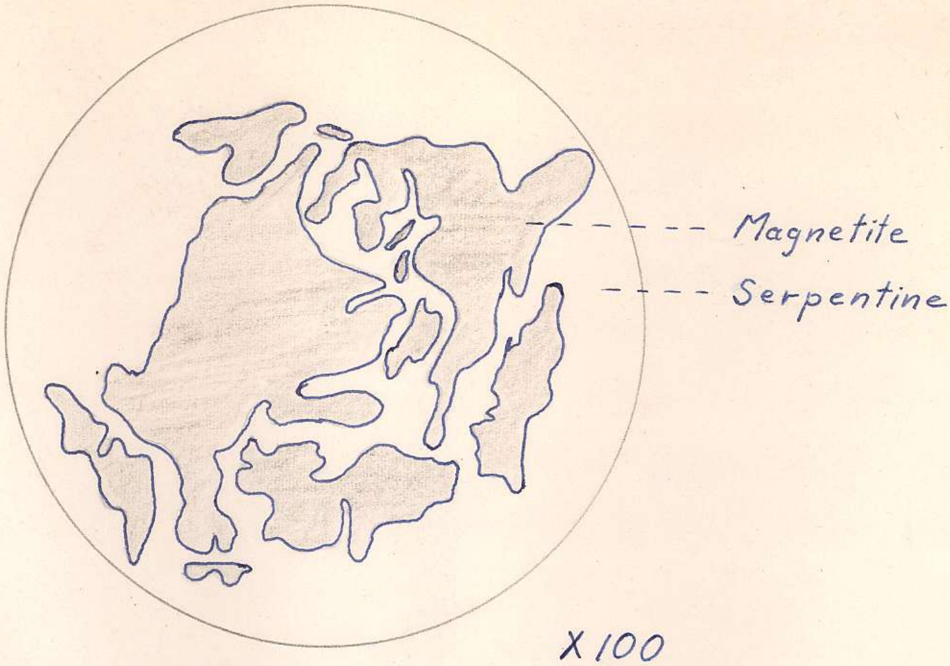


FIG. I

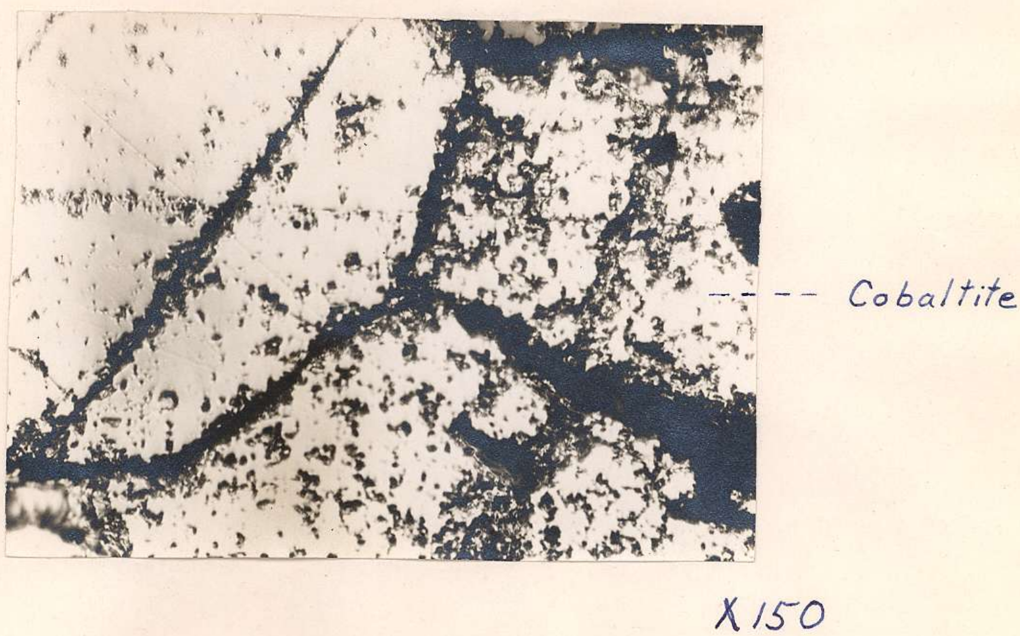


FIG. II

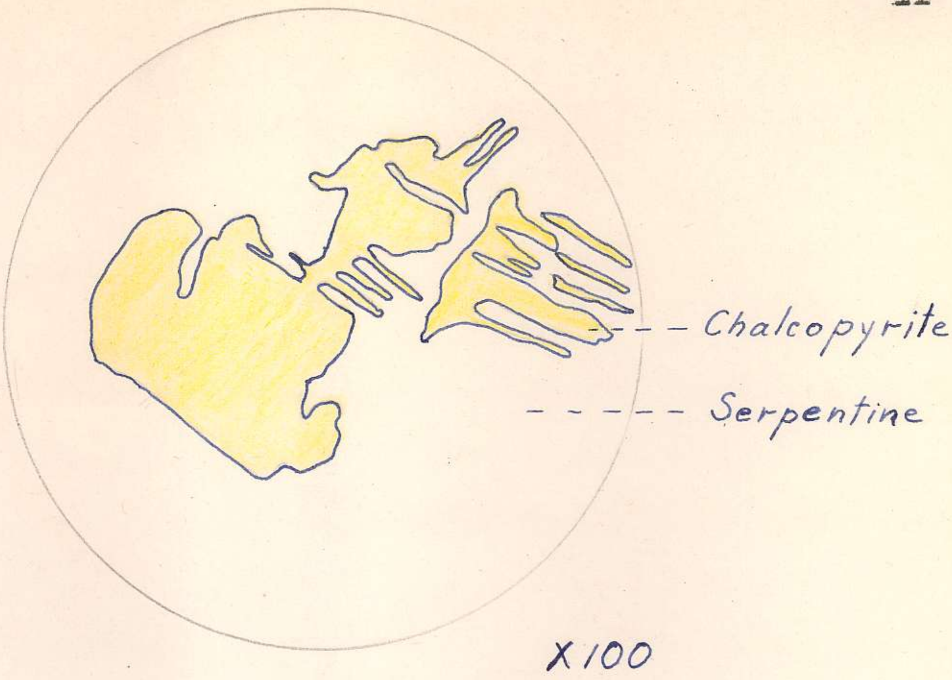


FIG. III

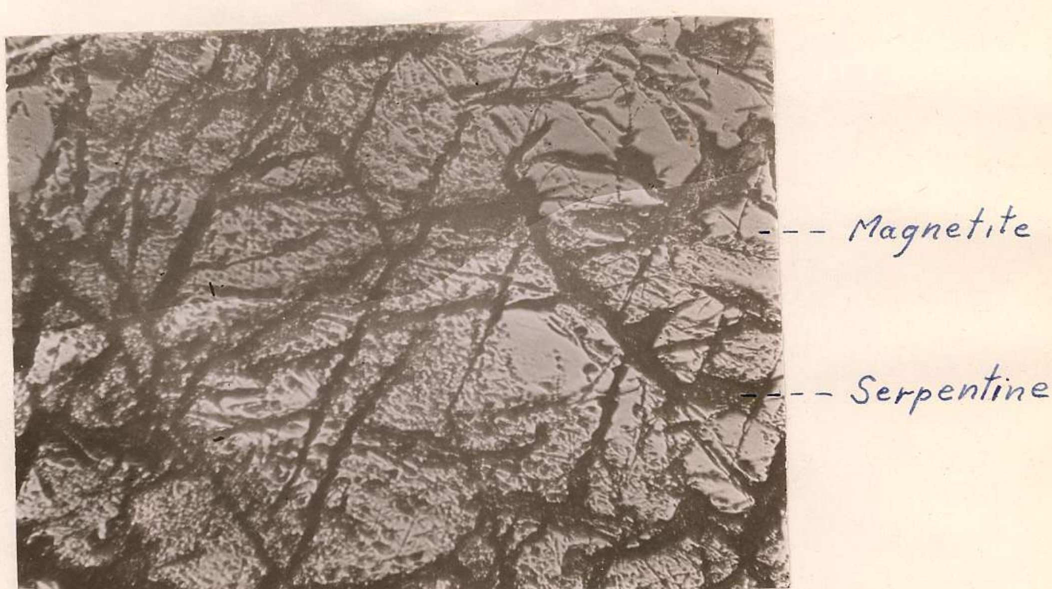


FIG. IV

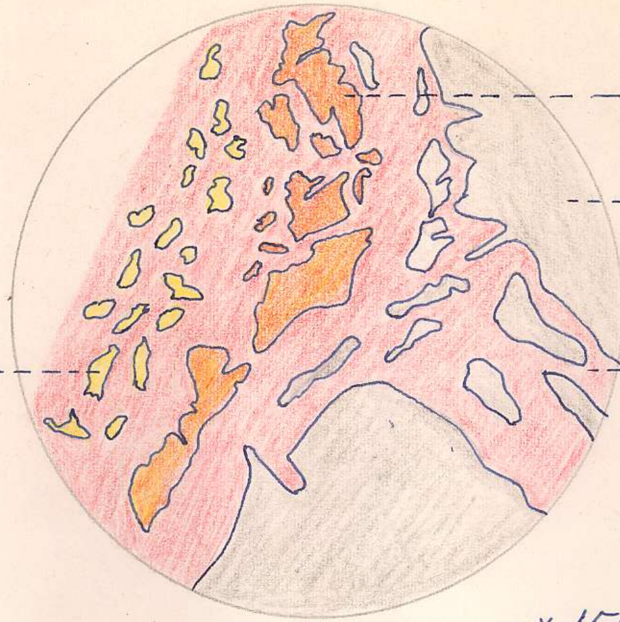
Chalcopyrite
Magnetite
Pyrite
Limonite
x 150

FIG. V

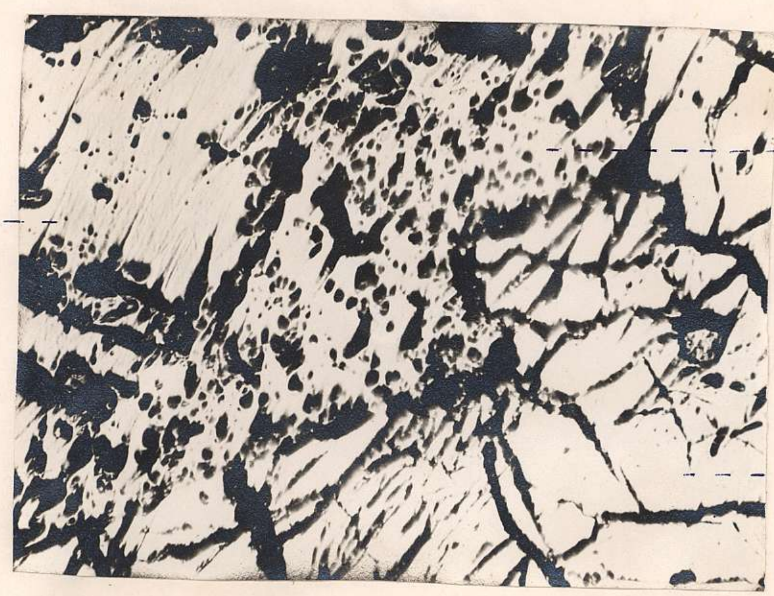
Specularite
Cobaltite
Magnetite
x 200

FIG. VI