THE BLUEBIRD - MAYFLOWER ORES

Geology 409

2nd class

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submitted by

Marc Lemieux

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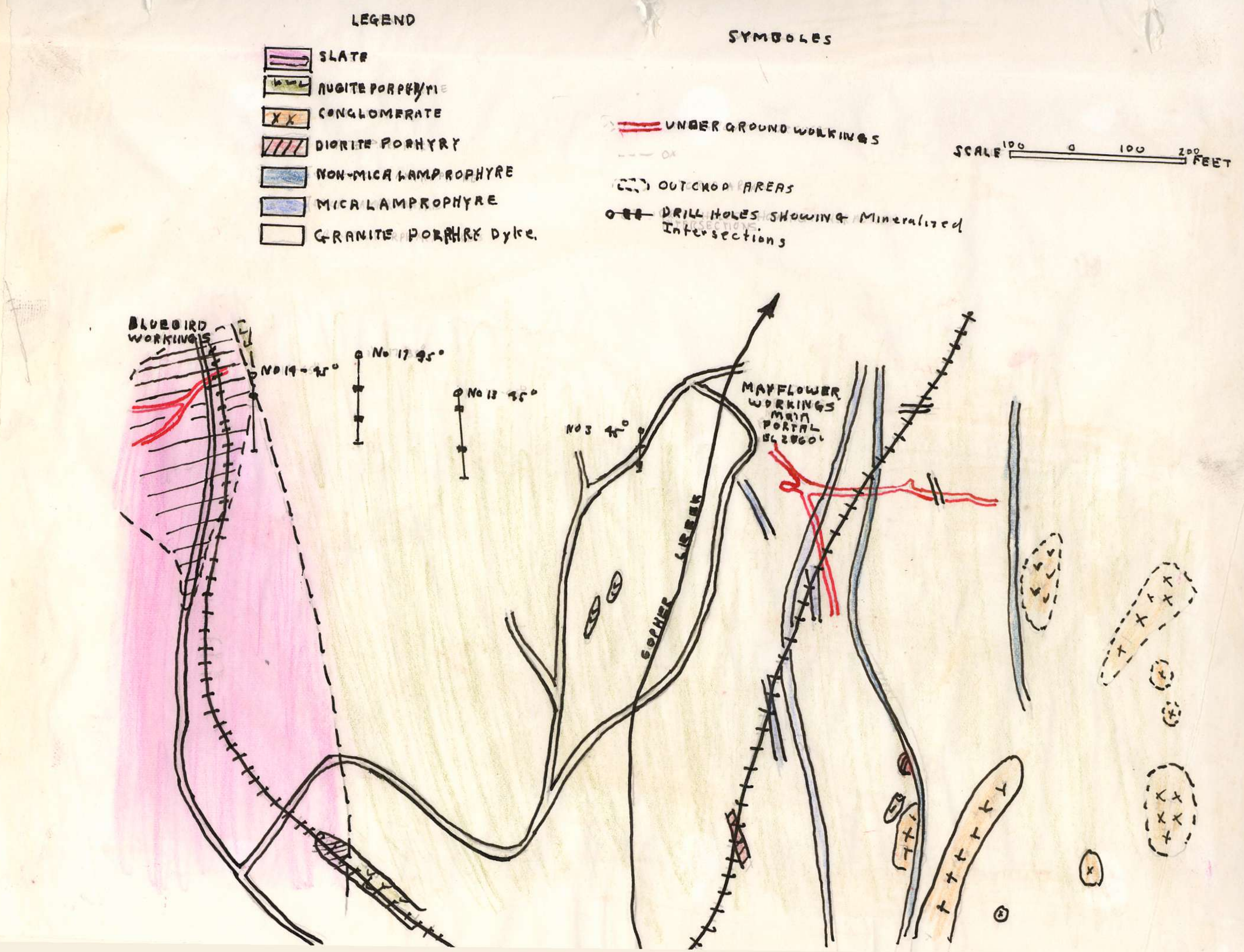
LEGEND
SLATE
AUGITE PORPHYRY
CONGLOMERATE
DIORITE PORPHYRY
NON-MICA LAMPROPHYRE
MICA LAMPROPHYRE
GRANITE PORPHYRY Dyke.
SYMBOLES
UNDERGROUND WORKINGS
OUTCROP AREAS
DRILL HOLES SHOWING Mineralized Intersections
SCALE 100 0 100 200 FEET
BLUEBIRD WORKINGS
NO 19 - 45°
No 17 45°
No 13 45°
NO 3 45°
MAYFLOWER WORKINGS Main PORTAL
GOPHER CREEK

THE BLUEBIRD - MAYFLOWER ORES

INTRODUCTION

The The Bluebird-Mayflower workings are located in the Rossland Mining Camp, 27,000 feet south of the center of Rossland along the Canadian Pacific Railway. The Bluebird workings produced 439 tons of ore between 1908 and 1914 with values in gold and silver. The Mayflower produced ore with gold valued between eight and twenty dollars per ton and large amounts of silver. Some ore shipped from the Mayflower was valued at $100 per ton. From 1946 to 1949 Rossland Mines Limited explored the area by geophysics and diamond drilling. From 1948 to 1949 two hundred and fifty tons of ore were shipped from these properties, containing 55 ounces of gold, 5,254 ounces of silver, 32,053 pounds of lead, 86,958 pounds of zinc and 297 pounds of cadmium.

Surficial Geology

The surficial geology of the area about the Bluebird and Mayflower workings was described by W.H. White in the 1949 report of the British Columbia Minister of Mines. Figure One is a simplified tracing of the geological map by W.H. White which was included as Figure Nineteen in the above emntioned report. The Bluebird workings are in the Mount Roberts formation slates, and the Mayflower workings are in the augite porphyry. The augite porphyry is cut by several lamprophyre and diorite porphyry dykes.

The main Bluebird and Mayflower workings are along a east-west striking shear zone. In the Mayflower mine, the ore shoots are distributed along the shear zone on the hanging wall side of these dykes, raking down their dip.

MINERALOGY

The ore samples examined for the purpose of this report were simply classified as from the Bluebird-Mayflower workings. No distinction was made as to where they came from, so it was impossible to determine changes in mineralogy along the vein.

Megascopic:

A number of hand specimens weighing between one half and four pounds were examined. They are spotted with twenty percent brassy yellow pyrite, thirty percent black spalerite and boulangerite, and fifty percent grey-white quartz and calcite gangue. Some chalcopyrite and galena were visible in several specimens. The ore breaks with an uneven fracture into rough equidimensional pieces. Some of the gangue was fractured and brecciated.

Microscopic:

The minerals observed in polished section in order of abundance were twenty-nine percent pyrite, sixteen percent boulangerite, ten percent pyrrhotite, ten percent arsenopyrite, eight percent sphalerite, six percent galena, three percent chalcopyrite and one half percent owyheeite. The remaining sixteen percent was gangue. The gold is probably carried in the pyrite and arsenopyrite while the silver is primarily in the owyheeite.

The arsenopyrite, pyrite, pyrrhotite, chalcopyrite, shalerite and galena were readily identified by their distinctive characteristics. Pyrite occasionally showed anomalous anisotropism due to the polishing process. The following etch and microchemical tests were used to identify boulangerite, tetrahedrite and owyheeite.

Boulangerite ($5PbS.2Sb_2S_3$)

Color - galena white

Hardness - B

Anisotropism - polarization colors white to dark grey

HNO_3 - fumes and tarnishes

KCN - negative

$FeCl_3$ - negative

Microchemical tests gave positive lead and antimony

Tetrahedrite $5Cu_2S.2(CuFe)S.2Sb_2S_3$

Color - grey

Hardness - D

Isotropic

HNO_3 - negative

HCl - negative

KCN - negative

$FeCl_3$ - negative

<u>Owyheeite</u> $5PbS.Ag_2S3Sb_2S_3$

Color - grey-green-white

Hardness - B

Anisotropism - polarization colors shades of grey

Identified by Dr. R.M. Thompson

Textured Relationships and Paragenises

Figure Two shows shattered and brecciated subhedral arsenopyrite partly replaced by pyrite. In most sections the pyrite appeared to be contemperaneous with the arsenopyrite. Figure Three shows the pyrite cut by a vein of pyrrhotite, and Figure Four shows pyrite and arsenopyrite partly replaced by pyrrhotite. Figures Five and Six show pyrite and arsenopyrite replaced by sphalerite. Sphalerite psuedomorphous after arsenopyrite in quartz was found in one of the sections. No conclusive evidence was found to indicate whether sphalerite or pyrrhotite was percipitated first, however the normal sequence of crystalization places sphalerite later than pyrrhotite.

Figure Five also shows sphalerite and arsenopyrite partly replaced by galena. Figure Seven clearly shows arsenopyrite and sphalerite replaced by boulangerite. Boulangerite and galena were not observed in the same sections.

Chalcopyrite was noted in only one section. It replaced pyrite, arsenopyrite and sphalerite.

The boulangerite contained tetrahedrite and owyheeite. Figure Eight shows the relationship between tetrahedrite and boulangerite. The texture may be replacement or immiscible segregations of one from the other. Figure Eight shows a small bleb of owyheeite in the tetrahedrite and Figure Nine shows the same bleb under higher magnification. Owyheeite occurred most frequently in the boulangerite as irregular inclusions, as seen in Figure Ten.

During the deposition, movement was occurring in the shear zone. The pyrite and arsenopyrite in Figure Two have been highly brecciated. Cataclastic textures were typical of much of the pyrite and arsenopyrite. The fractures in the boulangerite in Figure Eleven show that stresses were still active during the later stages of formation of the deposite. Figure Twelve shows movement along a fracture of over ~~one~~ two tenth of an inch.

The specimens are subdivisable into three groups on the basis of the ocurrence of galena, boulangerite and chalcopyrite. The Vanderveer diagrams (Figure Thirteen) show the relationships of minerals within these three groups.

The overall sequence of deposition of minerals in the deposite seems to be arsenopyrite, pyrite, pyrrhotite, sphalerite, galena, chalcopyrite, boulangerite, tetrahedrite and owyheeite. The time relations are shown in the bar graph, Figure Fourteen.

CLASSIFICATION OF THE DEPOSIT

The minerals found in this deposit are typical of the medium to low temperature group. Cooking was not rapid as euhedral pyrite and arsenopyrite were extensively replaced by boulangerite, as was much of the gangue. The deposit is therefore probably mesothermal.

MILLING SIZES

Most of the pyrite and arsenopyrite grains are over two hundred microns in diameter. An initial grinding of this size micron would permit the seperation of a large percentage of these minerals and the accompanying gold. The owyheeite carries most of the silver values. It is in inclusions as small as twenty microns so fine grinding is required to release this mineral for seperation.

Scale

Figure Two - Brecciated arsenopyrite (smooth white surface) partially replaced by pyrite (rough grey surface). Sphalerite (dark grey) partially replaced both arsenopyrite and pyrite.

Figure Three - Pyrite (white) cut by vein of pyrrhotite (grey). The black mineral is quartz gangue.

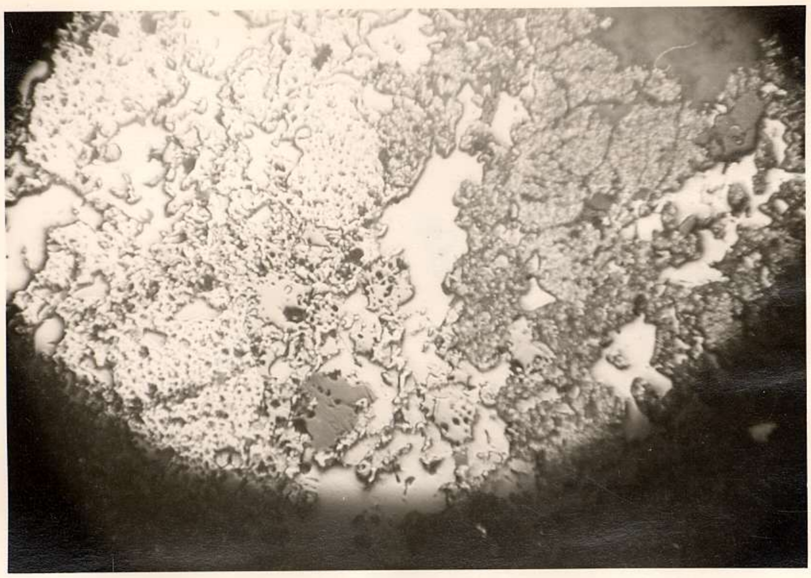

Figure Four - Pyrrhotite (rough white surface) replaced arsenopyrite (smooth, white, high relief surface) and pyrite (rough, light grey surface). Sphalerite (rough dark surface) also replaced pyrite and arsenopyrite. Galena (smooth white, low relief) partially replaced all of the above minerals.

Figure Five - Pyrite (rough grey) and arsenopyrite (smooth white, high relief) replaced by sphalerite (dark mineral). All these were later replaced by galena (white, low relief).

Figure Six - Pyrite (rough white) replaced by sphalerite (dark grey) and pyrite and sphalerite replaced by galena (white, low relief).

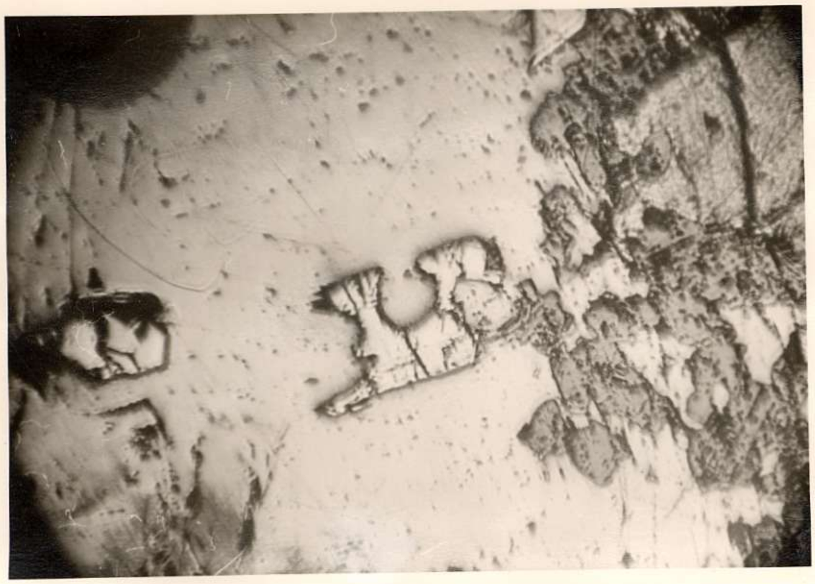

Figure Seven - Arsenopyrite (white, high relief), sphalerite (dark grey) and pyrite (light grey) replaced by boulangerite. Note embayment of boulangerite in arsenopyrite.

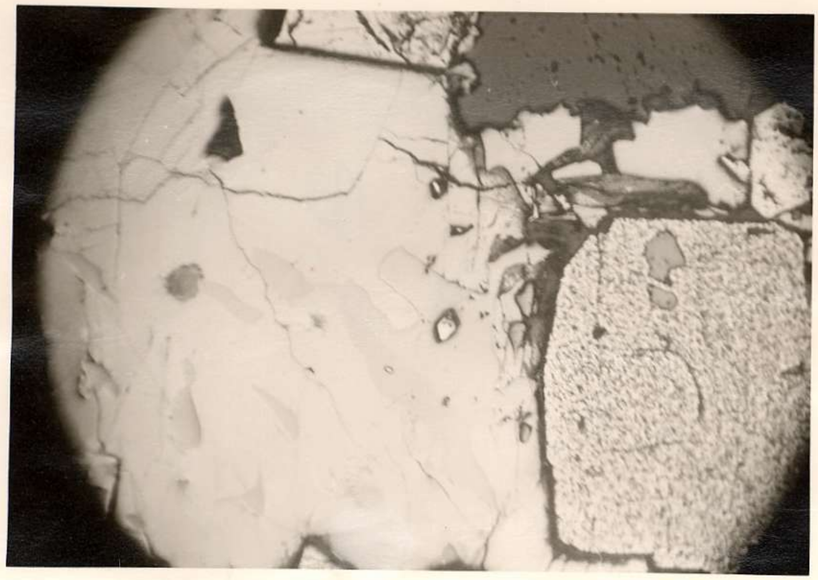

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Figure Eight - Tetrhedrite (grey, low relief) in boulangerite (white). A bleb of owyheeite is encircled. Other minerals are pyrite, arsenopyrite and quartz gangue.

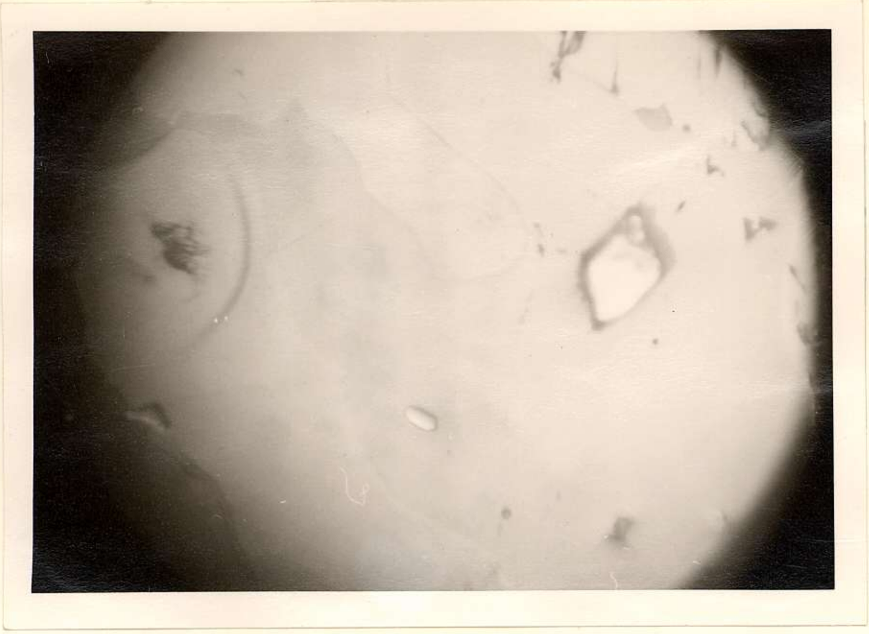

Figure Nine - An enlargement of Figure Eight showing tetrahedrite (grey-white) in boulangerite (white) with twenty micron inclusions of owyheeite (encircled). Arsenopyrite crystl also present.

Figure Ten - Irregular inclusions of owyheeite in boulangerite. The high relief mineral is arsenopyrite.

Figure Eleven - Shows fracturing of boulangerite and pyrite late in the genises of the deposit.

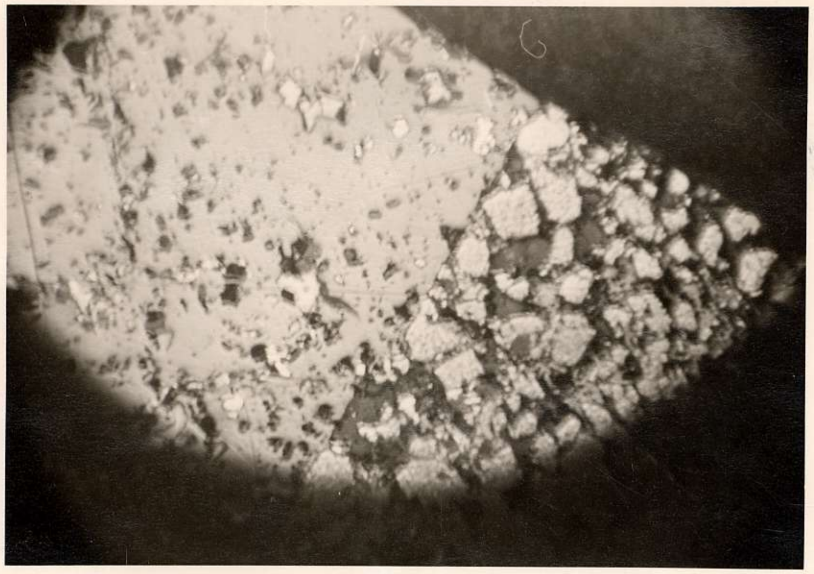

Figure Twelve - Shows a micro-fault, with over one-fifth of an inch in movement, bringing pyrite and sphalerite into contact with boulangerite.

Figure 13

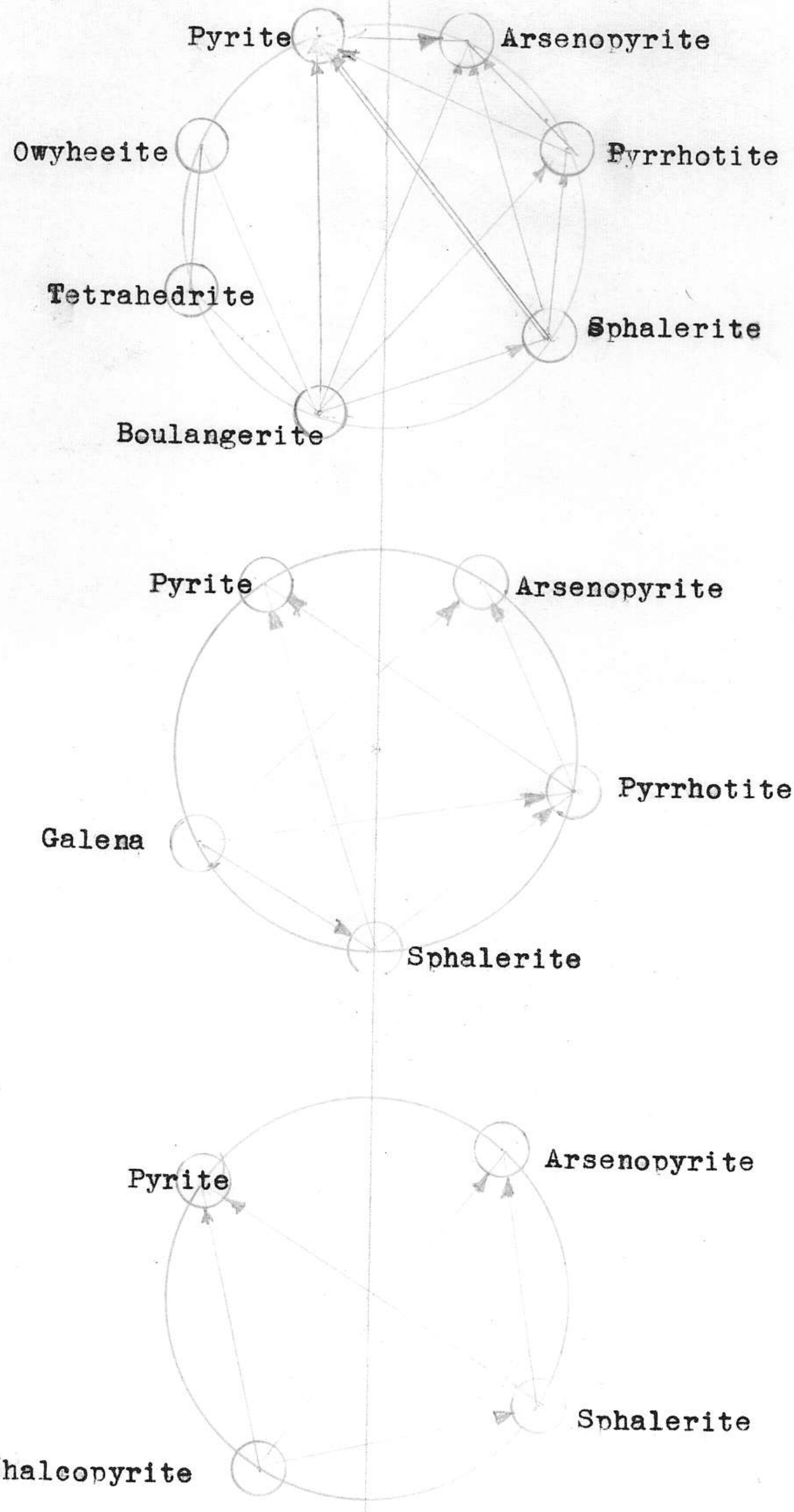
Pyrite
Arsenopyrite
Owyheeite
Pyrrhotite
Tetrahedrite
Sphalerite
Boulangerite
Pyrite
Arsenopyrite
Pyrrhotite
Galena
Sphalerite
Pyrite
Arsenopyrite
Sphalerite
Chalcopyrite

Figure 14

Sequence of Deposition

Arsenopyrite

Pyrite

Pyrrhotite

Sphalerite

- - - - - - - - - - - - - -

Galena

- - - - - - - - - - - - - -

Chalcopyrite

- - - - - - - - - - - - - -

Boulangerite

Tetrahedrite

Owyheeite