GEOLOGY 9 600053

REPORT ON ORE FROM

ISLAND MOUNTAIN MINE

CARIBOO DISTRICT, B. C.

BY

A. I. E. GORDON

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The result of examination both in the hand specimen and under the reflecting microscope of a suite of ores collected by E. W. Johnson for Dr. H. V. Warren.

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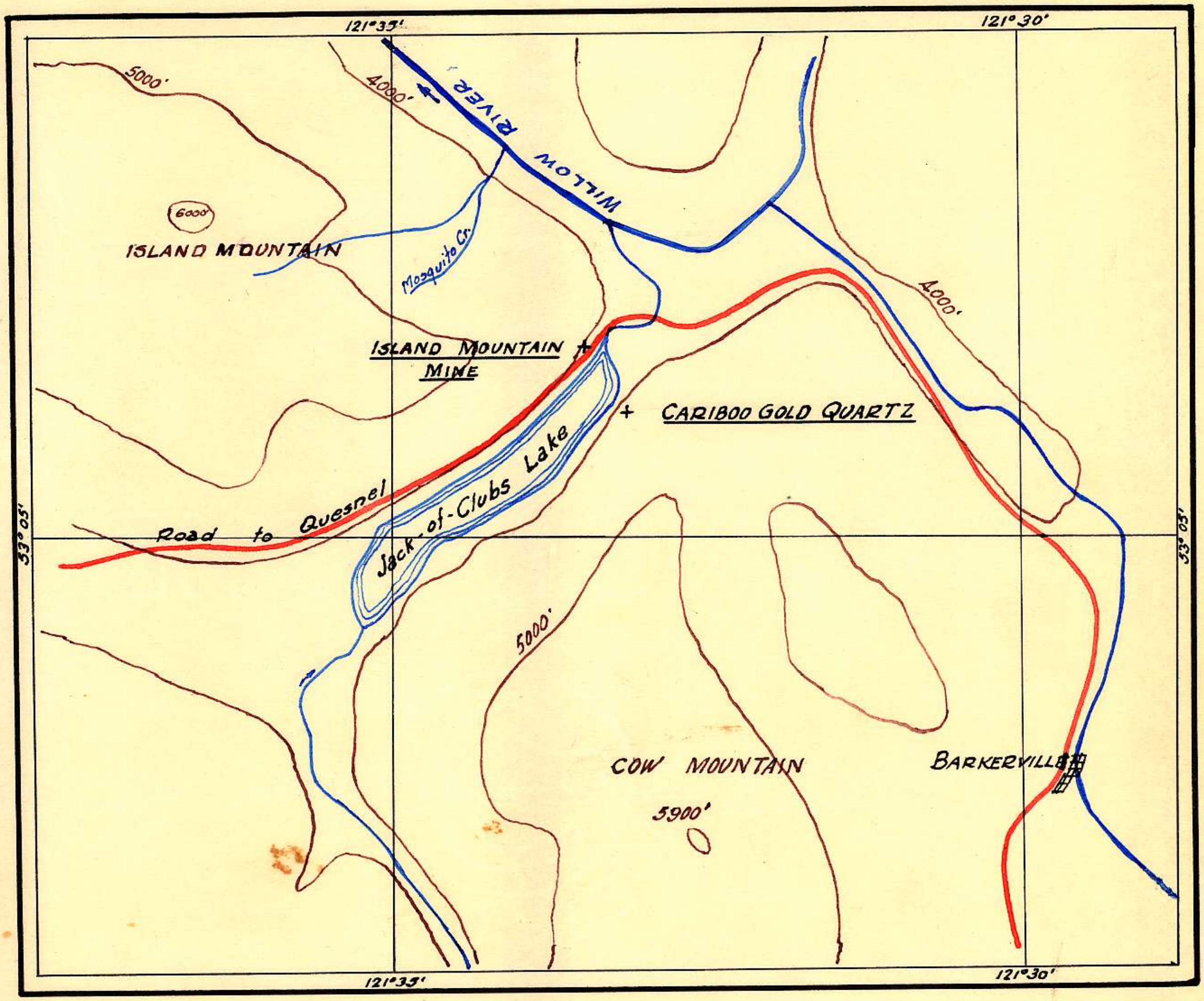
April, 1935.



KEY PLAN

Scale

1 inch = 1 mile

REPORT ON ORE FROM ISLAND MOUNTAIN MINE, CARIBOO DISTRICT, BRITISH COLUMBIA

LOCATION AND ACCESS

The ores herein described are from the property on Island Mountain, Cariboo District, B. C., now under development by Newmont Mining Corporation. The workings are on the south-east slopes of the mountain, directly across Jack of Clubs Lake from the Cariboo Gold Quartz property. The main tunnel portal at 4000 feet elevation is 80 feet above the lake. The camp is about 50 miles from Quesnel on the P. G. E. Railway and 4 miles from Barkerville, on the highway between the two.

HISTORY

The Cariboo placers, discovered in 1860 had by 1888 produced over $54,000,000 in gold. No attempt was made at lode mining until 1876, when the placer deposits began to show signs of depletion. Ore from Mosquito Creek on Island Mountain was milled in 1878, and in 1888 the original Island Mountain Mining Co. moved their 10-stamp mill to Jack of Clubs Lake and milled a few hundred tons of oxidized ore from the vein deposits there. Several hundred feet of tunnels were driven but no attempt was made to prove depth below 50 feet or to treat the primary sulphide ore, and the operation closed down when the oxidized ore was exhausted. The old tunnels were cleaned out in 1903, but only intermittent and small scale development took place previous to the boom of 1932, which resulted from sensational discoveries on the Cariboo Gold Quartz property.

RECENT DEVELOPMENT

Island Mountain Mines Ltd., a subsidiary of Newmont Mining Corporation, was incorporated in October, 1933, to continue work started some 10 months previously by the parent company. Development has been along the lines successfully followed at Cariboo Gold Quartz and one of the old tunnels has been advanced over 1600 feet to strike the veins at depth. Several quartz-vein deposits and one replacement deposit in a limestone bed have been encountered. According to the Company's Annual report for 1934 reserves of 15,970 tons of replacement ore, with an average gold content of 1.10 ounces per ton and 20,280 tons of quartz vein deposit running 0.43 ounces per ton in gold, were considered assured. This, together with 1000 tons of ore on the dump running 0.70 ounces in gold per ton, constitutes about 2 years' feed for the present mill. The company is ~~working~~ employing about 65 men. The 50 ton cyanide mill commenced operations on November 4, 1934, and has been treating about 65 tons per 24 hours. Recovery is about 95%. January, 1935, production was 1213 ounces of gold valued at $41,000.00; February production was worth $40,900.00.

GEOLOGY

The gold of the Cariboo District, both lode and placer, is confined to the pre-Cambrian Cariboo Series. All known lode-gold deposits are contained in the lower Richfield member consisting of over 8000 feet of metamorphosed sediments, occasionally schistose, and containing minor limestone beds. The Richfield is overlain by the Barkerville limestone and the Pleasant Valley formation, ~~and~~ the other two members of the Cariboo Series, which together have a total thickness of about 7500 feet.

The Cariboo Series occup~~y~~ies several large open folds striking in a north-west direction. The principal gold belt, 2 to 2½ miles wide and several miles long, occurs in a north-westerly trending fracture zone along the north-east limb of an anticline and is parallel to, but about a mile east of the contact between the Richfield and the overlying Barkerville. Mesozoic erosion has stripped the anticline, to leave, beneath Tertiary and Recent deposits, the hard massive quartzites near the base of the Richfield. The distribution of placer gold in streams crossing the belt shows it to be the source of the gold.

Uglow described two sets of veins in this district. He called the non-commercial ones A-veins and the productive ones B-veins.

The A-veins strike northwest along the formation. They vary from one foot to 200 feet in width, are up to a quarter-mile in length and weather to leave very prominent outcrops standing as much as 10 feet above the ground. They are extremely irregular, broken and fractured. The mineralization is largely quartz and pyrite, with minor galena and sphalerite in some places. Gold values seldom exceed 0.1 ounces per ton, except at the intersection of B-veins. The pure pyrite carries up to 0.6 ounces per ton.

The B-veins occupy cross-fractures striking N25°E to N60°E, intersecting the A-veins almost at right angles. They vary in width from a few inches to over 5 feet and are very numerous and continuous across all formations, but mineralized only in the Richfield. The mineralization consists of quartz, with appreciable but varying proportions of siderite, ankerite, pyrite, galena and sphalerite; and, in places, arsenopyrite, pyrrhotite, rutile, and scheelite. Sericite is abundant on Island and Cow Mountains. The gold values are much higher than in the A-veins. Assays from the Cariboo Gold Quartz property show average values as high as one ounce per ton. The pyrite in many places extends into the wall rock and shows similar gold values to the veins.

At the Island Mountain property the main tunnel has intersected a body of replacement ore 1300 feet from the portal, where one of the B-veins cuts a limestone bed 40 feet thick dipping northeast at about 45°. The deposit has been followed over 300 feet along the strike and opened up by an inclined raise 300 feet long in the ore and tunnels on an upper level. The deposit is about six feet wide and in places shows over two feet of almost solid pyrite. Occasional samples of sphalerite, galena and chalcopyrite occur, and scheelite has been found in one place. Similar ore is reported from Cariboo Gold Quartz where the mineralization is mainly auriferous sulphides in quartz. The main tunnel also intersects ordinary B-veins which, however, are better developed in the upper tunnel where the average width is 2½ feet.

The oxidized zone of these veins extends to a depth of 20 or 30 feet and some good shoots were mined in early development. The gold was fairly coarse, much of it in minute cubes and octahedra. The upper sulphide portion is rather barren. Uglow reports that the pure pyrite carried 0.5 to 0.6 ounces, and the pure arsenopyrite (which is quite scarce) up to 140 ounces of gold per ton.

The B-veins weather easily leaving inconspicuous outcrops in many cases. Of eight penetrated in the Cariboo Gold Quartz famous main tunnel, not one showed on surface.

The A-veins are considered to have been formed about the time of the intrusion of the (Pre-Mississippian ?) Proserpine Sills and dykes of quartz porphyry, aplite, etc. Shear-zones and fractures due to mountain-building were extensively filled with great lenses and veins of quartz. The first series of cross-faults was formed by the settling of the country after its elevation into an anticlinorium. These faults were then healed with quartz and mineralized with quartz and sulphides to form the B-veins. The source of the mineralization is considered to be a deeply-underlying batholith which has not been unroofed. The gold occurs in the most schistose part of the Richfield, and though no deposits are known in the overlying Barkerville, it is considered to have had an important influence on the localization of the fracture-zone in which the ore-deposits developed.

Later folding of the region at the time of the intrusion of the (Jurassic?) Mount Murray Sills, though not severe, resulted in adjustments along the planes of the B-veins and the fracturing of their harder minerals and the flowage of their galena.

GENERAL DESCRIPTION OF THE ORE

The ore consists of gold associated with pyrite and arsenopyrite in a gangue of milky quartz. No free gold was seen in the specimens examined. The hard minerals are much shattered and the broken ore crumbles readily. Dense galena has flowed in some instances to fill the interstices between crystals of the harder minerals.

ORE MINERALS

Pyrite is the most abundant sulphide and occurs most abundantly in minute cubes 1/16 to 1/32 inch on a side, generally embedded in quartz, but present in small euhedral crystals along contacts between the other minerals, as in Figure II-A, and with arsenopyrite, as in Figure IV-A & B. Two-inch cubes occur near the wall rock in the replacement deposit.

Arsenopyrite is scarce and occurs intergrown with pyrite (Figure IV) in quartz gangue. Like the pyrite, it is often crushed and fractured.

Brown resinous sphalerite, (Figures II-A and III-A) containing minute specks of chalcopyrite, occurs associated with quartz and the other sulphides.

Chalcopyrite seems to be associated mainly with the sphalerite but in specimen G1 is seen cutting sphalerite and is itself cut by galena. See figures I, II and III-A.

Galena (Figures I, II, III) generally shows excellent cubic cleavage, both as complete crystal outlines and numerous triangular pits. A denser variety fills small fissures on some specimens. Nitric acid causes the galena to effervesce and turn black. When the etched surface is examined rhombohedral tracery betrays the fact that the galena has replaced a carbonate.

All minerals were checked by etch tests.

Quartz (Figures II-B and IV) is of the milky white variety, much shattered, but in many sections under the microscope showing rounded outlines evidently due to abrasion. Uglow mentions this in his report and attributes it to the adjustment of stresses along the B-veins, as above noted.

The most interesting feature of the ore was the discovery of a new mineral in the galena. This did not show on first polishing, but after specimens etched with nitric acid had been rubbed on a rouged chamois, it was brought out as illustrated in Figures I-A, II-B, and III-B. This mineral appears to be distributed fairly uniformly throughout the galena in a rhombohedral pattern along the old carbonate cleavage traces. Much of it is probably sub-microscopic but local concentrations occur as in Figure II-B, where inclusions up to .01 inch diameter occur within the rhombohedra outlined by the smaller inclusions. The mineral is silver-white in color, lighter than the galena and has a hardness of about B. It responded to etch tests as follows:

HNO_3 - Effervesces. Stains black.

HCl and KCN - Negative.

$FeCl_3$ - Stains light brown.

$HgCl_2$ - Some pieces stained dark, others unaffected.

Reference to U.S.G.S., Bul. 825, shows that wittitchenite (?), $3CuSBi_2S_3$, (p.86) is the mineral responding most closely to these specifications. Microchemical tests for copper, using 5% $K_2Hg(CNS)_4$ in water, were made with the assistance of Mr. S. C. Robinson, and proved that copper was present throughout the galena, though in greater concentration where wittitchenite (?) appeared. Very definite greenish yellow, prismatic crystals of copper mercuric thiocyanate were obtained. A fairly satisfactory test for bismuth using CsCl was obtained from the parts where wittitchenite (?) was concentrated.

No scheelite was found in the specimens examined.

No cosalite or galena-bismuthite, either or both of which are probably present in Cariboo Gold Quartz ore, were found. Several Specimens of this ore were polished and etched, but due to the friable nature of the material and the short time available, the results obtained should be checked before acceptance. A very definite yellow deposit obtained on these galena-like bismuth minerals with HNO_3 was, however, nowhere observed on Island Mountain ore.

VALUES

It is unofficially reported from the mine that the replacement ore averages 1.10 ounces and ordinary quartz vein ore 0.43 ounces per ton. Uglow got 0.5 to 0.6 ounces per ton of pure pyrite (large cubes) and arsenopyrite 140 ounces per ton. Assays of pure minerals picked by the writer and assayed by Dr. H. V. Warren ran:

Sphalerite	- Gold	- trace	
Coarse pyrite	- "	- 0.50	ounces per ton
Fine "	- "	- 3.50	" " "
" " with quartz	- "	-12.20	" " "
Mixed pyrite, sphalerite, quartz	- "	- 7.30	" " "

It is considered the gold is present with the pyrite, not combined, but probably precipitated on the surface. It is evidently better retained when the contacts between the pyrite and adjoining minerals are unbroken. Bismuth, if present, probably has an effect in precipitating gold on the sulphides. The larger pyrite crystals with less surface area assay less than the finer crystals.

PARAGENESIS

The probable order of deposition is as follows:

1. Pyrite,
2. Arsenopyrite,
3. Quartz crystals,

4. Sphalerite,
5. Wittitchenite (?)
6. Chalcopyrite,
7. Galena,
8. Quartz.

Pyrite and arsenopyrite occur in idiomorphic crystals, in many places crushed into one another, and may be contemporaneous. (Fig. IV). Quartz crystals show a rounded worn appearance, as remarked elsewhere. Quartz cement is probably quite late. The relations of sphalerite, chalcopyrite and galena are shown in Figures I and II. Wittitchenite (?) is undoubtedly older than galena as it occurs along the rhombohedral cleavage of the original carbonates in the replacement ore. No free gold was seen in this ore, but in Cariboo Gold quartz ore the only free gold seen was intimately associated with bismuth minerals. It is probable that the gold at Island Mountain is also quite late, probably contemporaneous with wittitchenite (?).

DESCRIPTION OF SPECIMENS

G1 - Chalcopyrite, sphalerite, galena, quartz, minor pyrite and wittitchenite (?). The first three well shown.

G2 - Galena, wittitchenite (?), minor pyrite, and quartz. The galena has flowed to fill interstices between rounded quartz crystals. Wittitchenite (?) is well shown.

G3 - Pyrite, quartz, galena and wittitchenite (?). The specimen is mostly galena and wittitchenite (?) is well shown.

G4 - Pyrite, quartz and sphalerite with chalcopyrite inclusions. Specimen mostly pyrite, badly shattered and plucked.

G5 - Pyrite, quartz, and sphalerite with chalcopyrite inclusions.

G6 - Pyrite, and arsenopyrite, partly intergrown, embedded in quartz. Minor amounts of dense galena.

G7 - Pyrite and arsenopyrite, much fractured, in contact. Minor quartz.

CARIBOO GOLD QUARTZ SPECIMENS POLISHED FOR COMPARISON:

G8 - Quartz, pyrite, galena and needles and masses of bismuth minerals, one of which is probably cosalite and the other galena-bismuthite.

G9 - Includes 3 specimens in one damar section. Shows needles of galena-bismuthite or cosalite with quartz and pyrite and probably galena. Also shows free gold and bismuth mineral embedded in pyrite.

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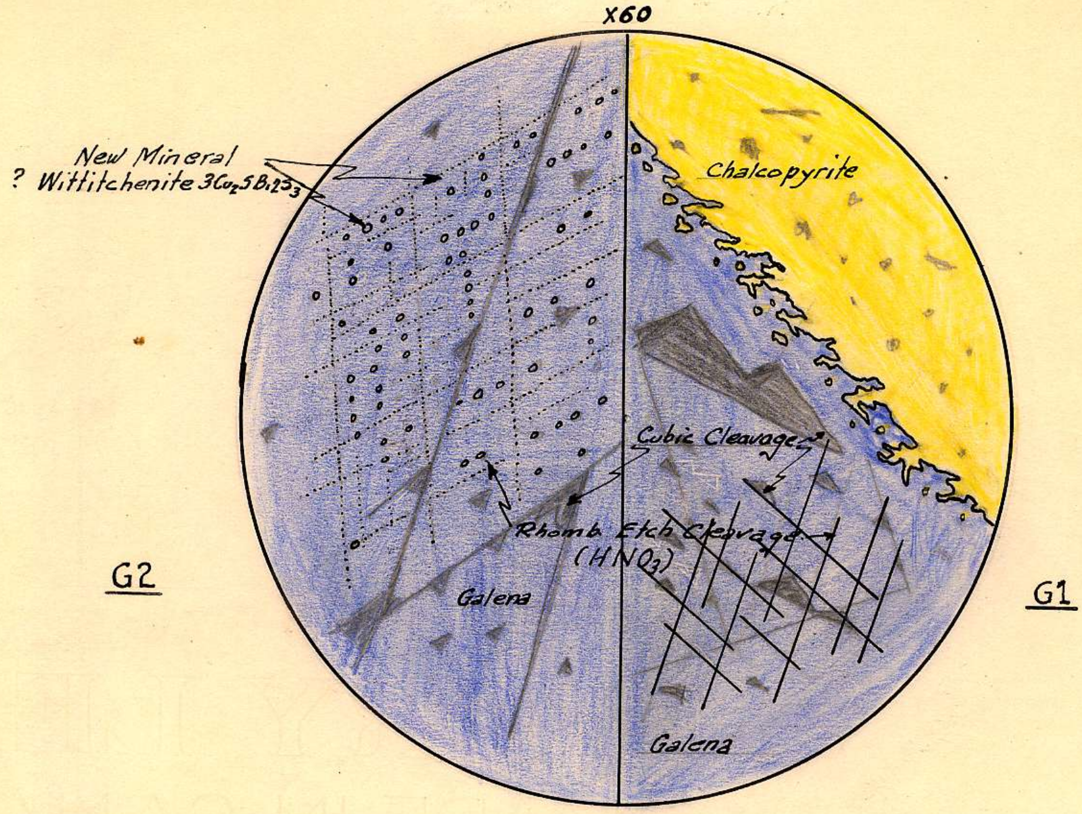

FIG I.

A. B.

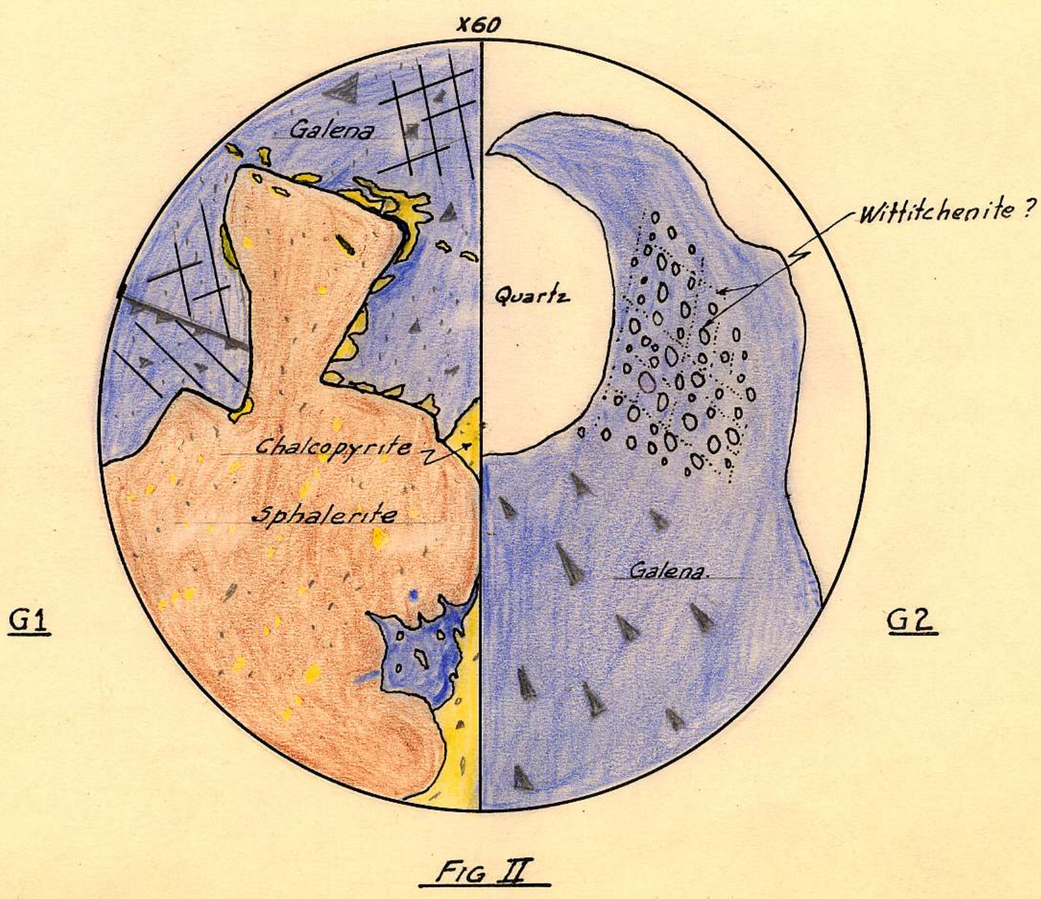

FIG II

A B

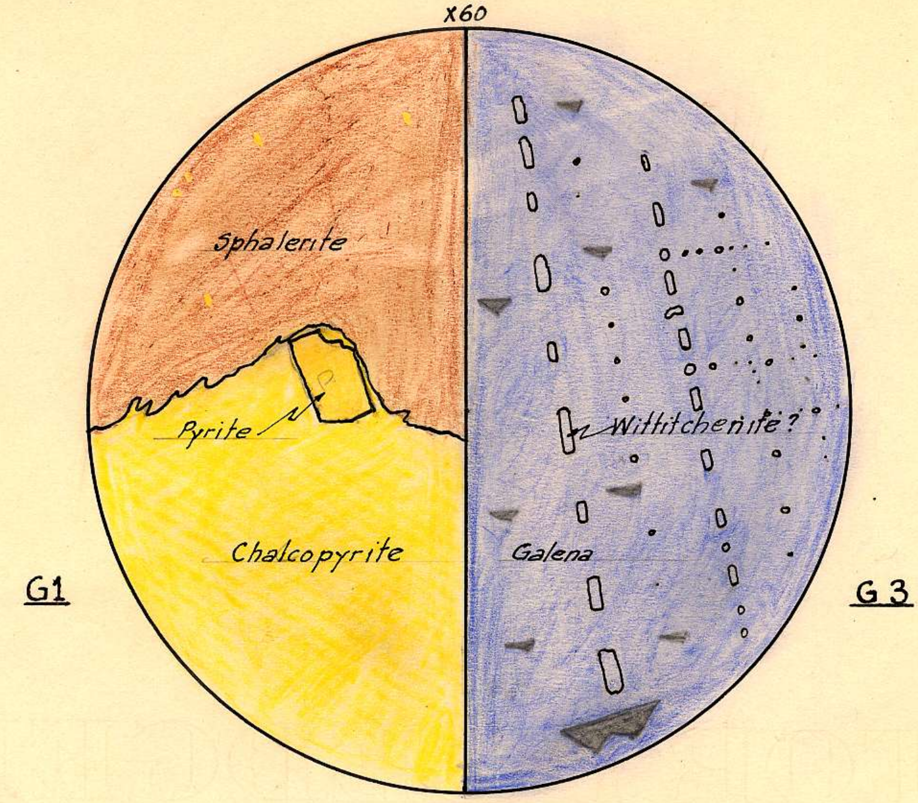

FIG III

A. B.

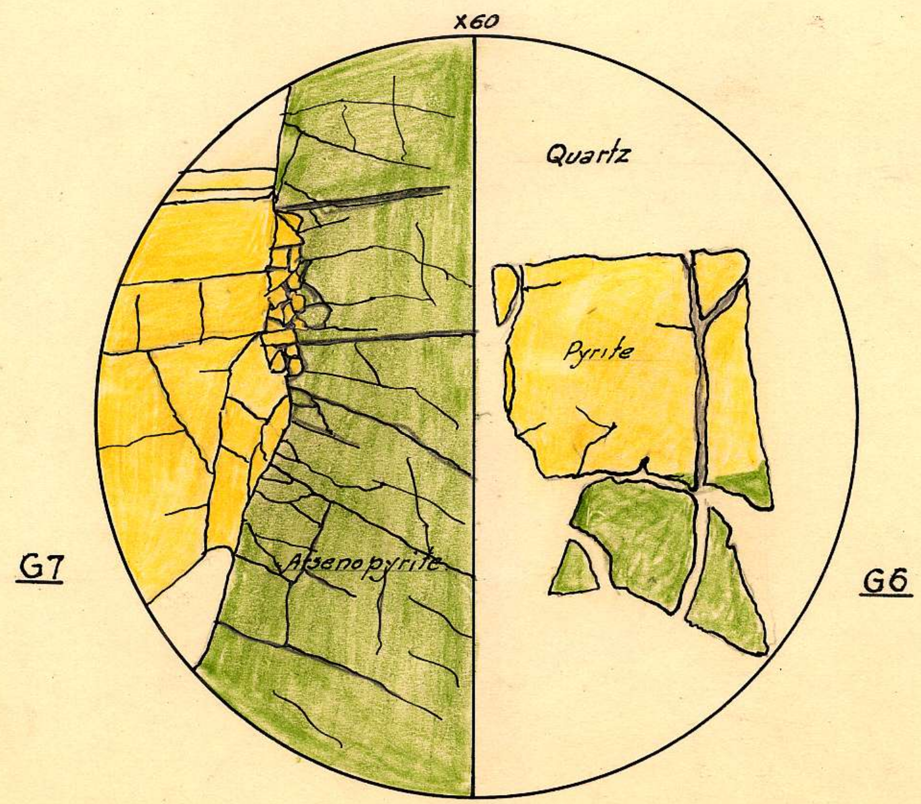

FIG. IV

A. B.