A MINERALOGRAPHIC REPORT ON A SUITE OF MINERALS FROM THE WANN RIVER PROSPECT BRITISH COLUMBIA

A report submitted in partial
fulfilment of the course Geology 409
at the University of British Columbia

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ACKNOWLEDGMENTS

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Dr. Thompson took the X-ray powder photographs and Mr. E. Dodson furnished the description of the prospect and the data regarding its location and access.

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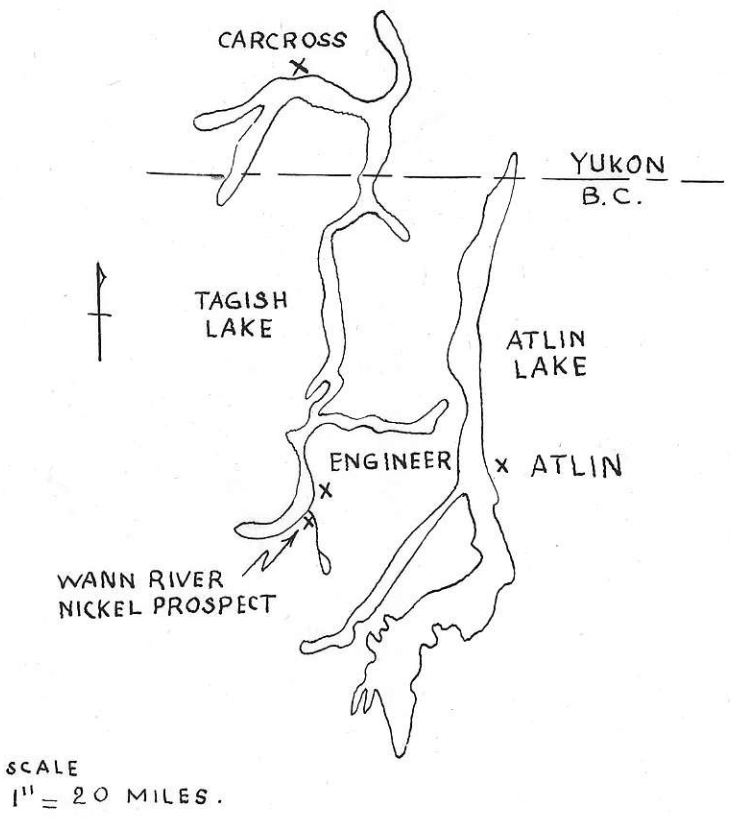

Sketch Map of Location .

Wann River Nickel Prospect .

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Introduction

The suite of minerals examined was collected by the Whitepass and Yukon Railway Company in the summer of 1953 from the Wann river nickel prospect.

No previous mineralographic work was done on minerals from this property and the primary object of the examination was to determine in which mineral or minerals the nickel occurs.

No nickel minerals were found and the conclusion reached in this report is that the nickel probably occurs in solid solution with pyrrhotite.

Location and Access

The Wann river nickel prospect is situated in the Atlin mining division, British Columbia. It lies on the

northwestern bank of the Wann river at the site of the old hydrodam of the Engineer mine. This dam lies one and one half miles from the mouth of the Wann river on the Taku arm of Tagish lake, (frontspiece).

A lake steamer service from Carcrosse to the wharf of the Engineer mine and a road from this wharf to the old hydrodam provide access to the prospect.

History

The Wann river nickel prospect was first staked as a copper prospect at the beginning of this century.

The presence of nickel was discovered in the summer of 1953.

Description of the Prospect

The prospect consists of a zone of solid sulphides exposed on the southwestern wall of the canyon of the Wann river.

Massive pyrrhotite and minor, irregularly distributed chalcopyrite form a steeply plunging body about five feet across. This body is surrounded by relatively barren hornblendic pyroxenite which in places grades into hornblendite. The contacts of the sulphide body are in general sharp although they locally are gradational over a distance of

several inches. Patches and blebs of chalcopyrite occur in the surrounding ultrabasic rocks. An evenly distributed gangue of coarsely crystalline hornblende makes the sulphide body appear porphyritic.

Associated Rocks

The rocks associated with the sulphide body were megascopically identified as diorite, norite (?), hornblende gabbro, hornblendite, pyroxinite and partly serpentized peridotite. These rocks form a southerly striking belt which extends for at least two miles south of the prospect. Most of the area underlain by these rocks is covered by drift and muskeg. This belt of rocks is bounded on the east by mesozoic andesitic volcanics and on the west by westward dipping gneisses and schists of the Yukon group. The sulphide body lies in ultrabasic rocks which border the eastern contact of the belt. The sulphides are situated within 100 feet of the mesozoic volcanics.

Examination of Hand Specimens

Six specimens were examined. Of these one consists of massive pyrrhotite and chalcopyrite (specimen 8); three consist of massive pyrrhotite and minor chalcopyrite which

occur in and around shattered and twisted columnar aggregates of hornblende (specimens 2, 4, 6); and two consist of massive chalcopyrite and minor pyrrhotite which also occur in and around shattered and twisted columnar aggregates of hornblende (specimens 10 and 12).

The weathered surfaces of the specimens are a dark rusty brown; they stain pink with dimethyl glyoxime.

Examination of Polished Sections

The polished sections, numbered 2,4,6,8,10 and 12, were cut from hand specimens 2,4,6,8,10 and 12 respectively.

The following minerals were seen in these sections: Pyrrhotite, chalcopyrite, pyrite and two unknown minerals "X" and "Y".

Pyrrhotite:

This mineral constitutes the main mass of sections 2, 4, 6 and 8 in which it is associated with chalcopyrite, "X" and pyrite. (Figures 1 to 8). In sections 10 and 12 it occurs as small masses (50 - 400 microns diameter) which lie adjacent to or within veins of pyrite (figure 9).

The pyrrhotite was identified by the following properties and tests: creamy, pinkish brown colour, smooth polish, Talmadge hardness D(-), strong anisotropism - colours

grey to orange brown, positive etch reaction with KOH - the mineral stains brown, negative to all other etch reagents, strongly magnetic.

Chalcopyrite:

This mineral constitutes the main mass of sections 10 and 12 in which it is associated with pyrite, pyrrhotite and gangue (figure 9). In section 8 one large mass of it occurs (1/2 inch diameter); elsewhere in this section it occurs as it does in sections 2, 4 and 6 namely, as irregular masses (50 - 400 microns diameter) which lie within or adjacent to gangue (figures 2, 3 and 6). It also occurs as small blebs (10 - 50 microns diameter) and veinlets (20 - 50 microns wide) in the pyrrhotite, (figures 1 and 5).

The chalcopyrite was identified by the following properties: smooth polish, yellow colour, talmadge hardness C, black streak, and weak anisotropism.

Unknown Mineral X:

This mineral is present in sections 2, 4 and 6. Its relationship to the pyrrhotite and the chalcopyrite is identical in these three sections. A description of section 4 illustrates this relationship.

An examination of the polished surface with the unaided eye disclosed a main grey mass of pyrrhotite which

encloses numerous angular fragments of a black gangue and a few patches of chalcopyrite. Within the main grey mass parallel zones which are a lighter grey were noted. These zones are from one to ten millimeters wide and lie from 1/8 to 1/2 inch apart. In direct reflected light they resemble stringers of pyrite.

An examination with a low power objective confirmed the features noted with the unaided eye. It disclosed in addition two sets of fractures traversing the pyrrhotite. One of these sets is an irregular pattern of randomly oriented, short fractures which butt one against the other. The other set consists of parallel fractures most of which traverse the section from end to end. On either side of these fractures lie zones which have a brassy color, an extremely pitted surface and a Talmage hardness greater than D. These zones grade laterally into pyrrhotite.

Under a medium power objective these zones resemble an extremely poorly polished pyrite surface.

An examination with a high power objective disclosed that these zones consist of a close intergrowth of pyrrhotite and numerous small blebs (1 - 100 microns diameter) and veinlets (5 - 50 microns wide) of "X" (figures 1, 3, 4 and 5)

Blebs and veinlets of "X" also occur scattered

throughout the main mass of pyrrhotite. These veinlets in most cases branch out from many irregular fractures which traverse the pyrrhotite.

Two veinlets of "X" cutting both pyrrhotite and chalcopyrite were noted.

Mineral "X" shows the following characteristics. It appears white next to pyrrhotite and chalcopyrite, it is harder than pyrrhotite, it takes a rough polish, it is isotropic, it slowly stains brown with HNO_3, it is negative to all other etch reagents.

No area of this mineral was large enough to obtain some powder for an X-ray powder photograph or microchemical test.

Pyrite:

This mineral was identified in sections 8, 10, and 12. In the former two sections it veins chalcopyrite and borders gangue fragments (figure 9). In section 8 it occurs as blebs and masses (2-200 microns diameter) and veinlets (1-100 microns wide), in zones bordering fractures in the pyrrhotite and chalcopyrite (figure 8). The ensemble of pyrite veinlets and pyrrhotite appears as a pale brassy, rough surface which resembles the intergrowth of pyrrhotite and "X" in sections 2, 4 and 6.

The pyrite has an anomalous colour, it appears greyish white next to chalcopyrite and pyrrhotite. Its other properties are as follows: hardness $\bar{F}$, rough polish, isotropic, stains slowly brown with HNO_3, negative to all other etch reagents.

Its identify was conclusively established by X-ray powder photograph.

Unknown Mineral "Y"

This mineral occurs in section 8. It is closely associated with a soft gangue and the intergrowth of pyrite and pyrrhotite. This gangue and "Y" have healed fractures throughout the section. On either side of these fractures they have replaced the other minerals.

Mineral "Y" has the following characteristics: smooth polish, purplish grey colour, Talmage hardness D^+ black streak, pleochroism - dark bluish grey to purplish grey, strong anisotropism, translucent orange to bluish grey, 4 times per revolution. Under crossed nicols it appears as a sericite-like aggregate. It is negative to all etch reagents except HCl. It stains dark with HCl, the drop turning yellow. It exhibits no internal reflection.

An X-ray powder photograph proved that this mineral is not delafossite, which exhibits the properties listed

above. The photograph did not establish the identity of the mineral.

This mineral is probably a gangue.

Gangue:

In sections 2, 4, 6, 10 and 12 a dark grey fairly hard (F) fragmental gangue constitutes from 25 to 50% of the total surface.

In section 8 minor amounts of this fragmental gangue occur as well as the soft gangue associated with mineral "Y".

Percentage by volume of total sulphides

Section 2.

Pyrrhotite	74%
Chalcopyrite	20%
Unknown "X"	6%

Section 4.

Pyrrhotite	94%
Chalcopyrite	5%
Unknown "X"	1%

Section 6.

Pyrrhotite	91%
Chalcopyrite	3%
Unknown "X"	6%

Section 8.

Pyrrhotite	56%
Chalcopyrite	23%
Pyrite	21%

Section 10.

Pyrrhotite	13%
Chalcopyrite	67%
Pyrite	20%

Section 12.

Pyrrhotite	5%
Chalcopyrite	72%
Pyrite	20%

Conclusions

The unknown mineral "X" is probably pyrite. Its properties and its occurrence are identical with the properties and occurrences of the pyrite in section 8.

The relationships noted, namely chalcopyrite veining pyrrhotite, and pyrite veining pyrrhotite and chalcopyrite indicate that the paragenetic sequence is as follows: pyrrhotite, chalcopyrite, pyrite.

The nickel probably occurs in solid solution with pyrrhotite.

Since pyrrhotite is a mineral characteristic of high temperature deposits, the Wann river prospect is probably a high temperature deposit.

BIBLIOGRAPHY

1. Short, M.N. Microscopic Determination of the Ore Minerals.

2. Uytenbogaardt, W. Tables for Microscopic Identification of Ore Minerals.

3. Edwards, A.B. Textures of the Ore Minerals and their Significance.

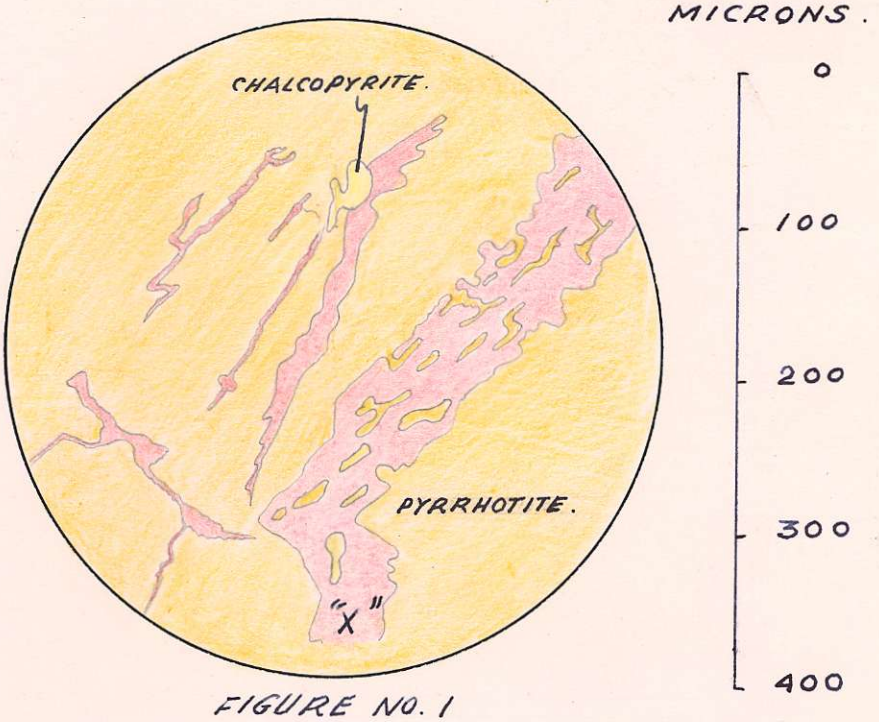

FIGURE NO. 1

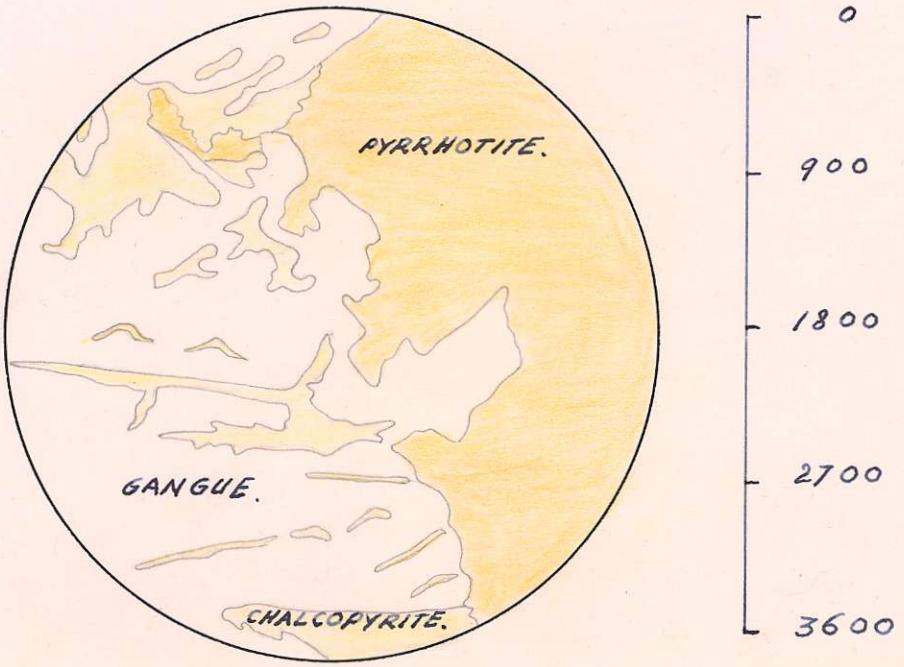

FIGURE NO. 2

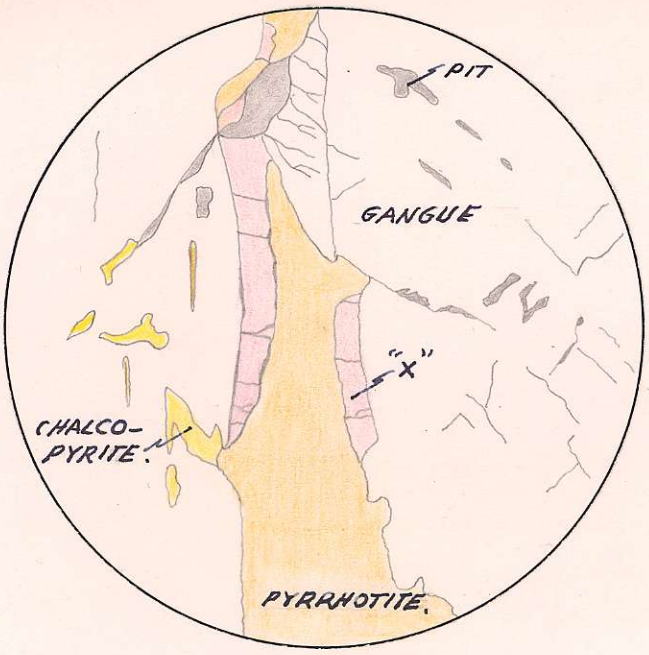

FIGURE NO. 3

SCALE IN MICRONS.

0
100
200
300
400
500
600
700
800

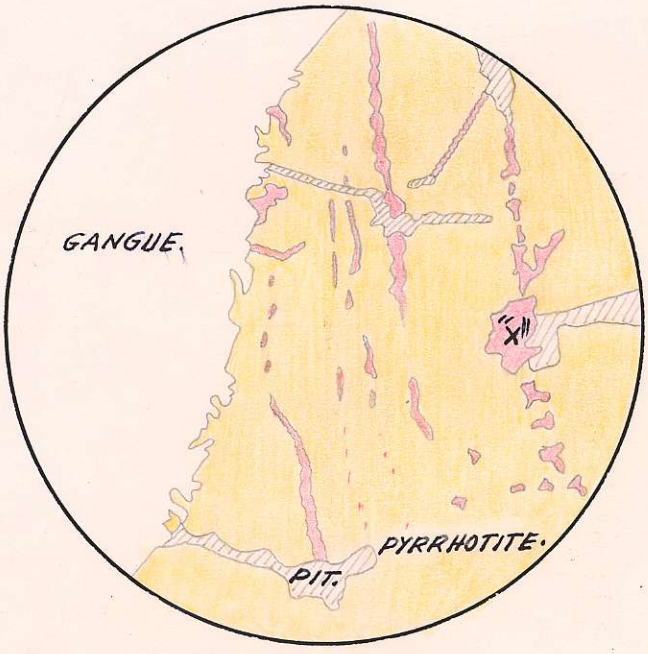

FIGURE NO. 4

SCALE IN MICRONS.

0
100
200
300
400.

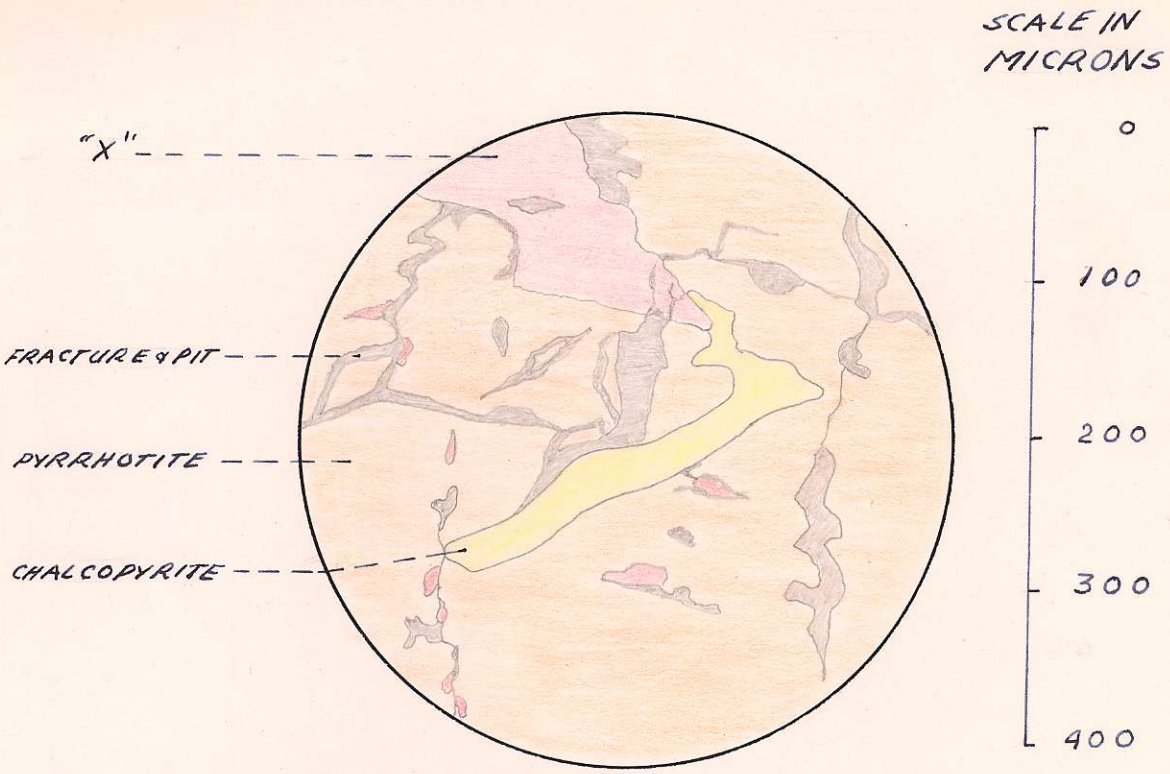

FIGURE NO. 5

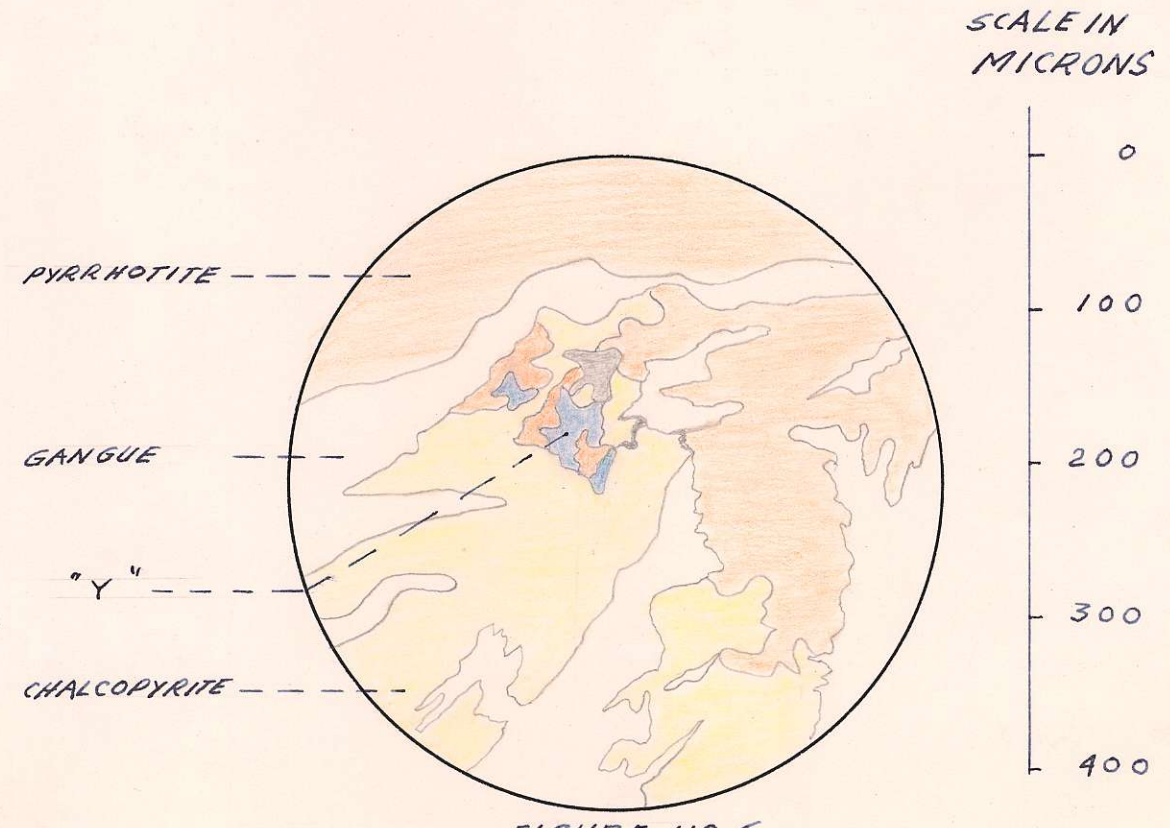

FIGURE NO. 6.

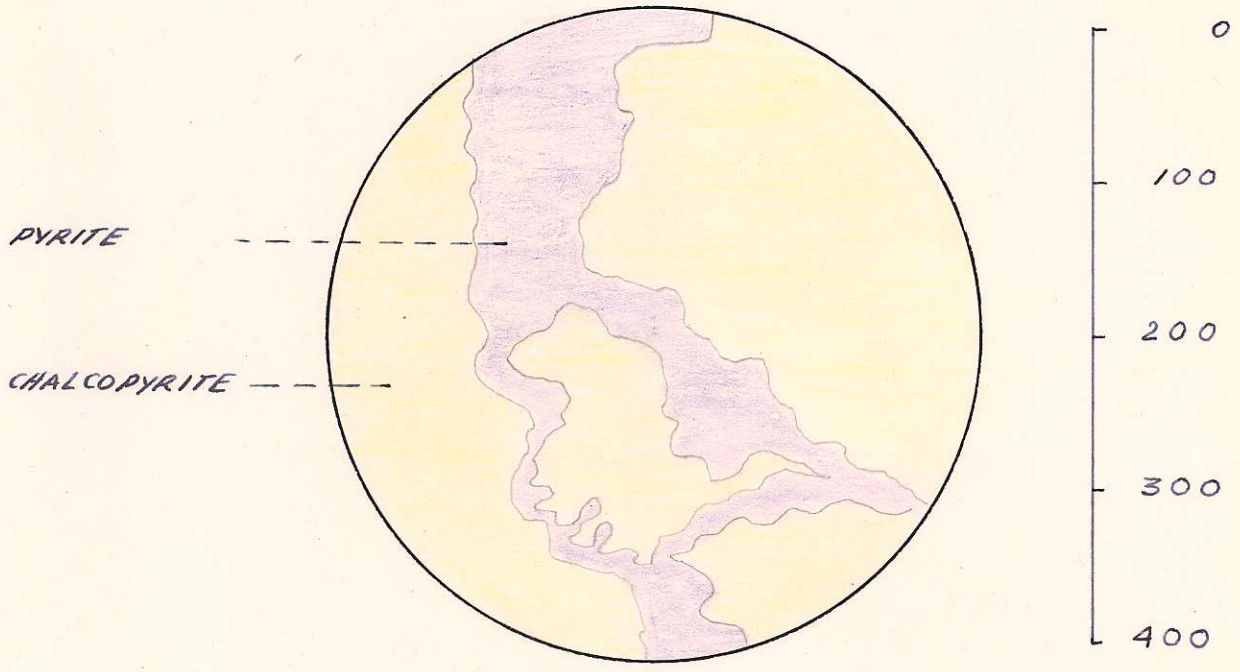

FIGURE NO. 7

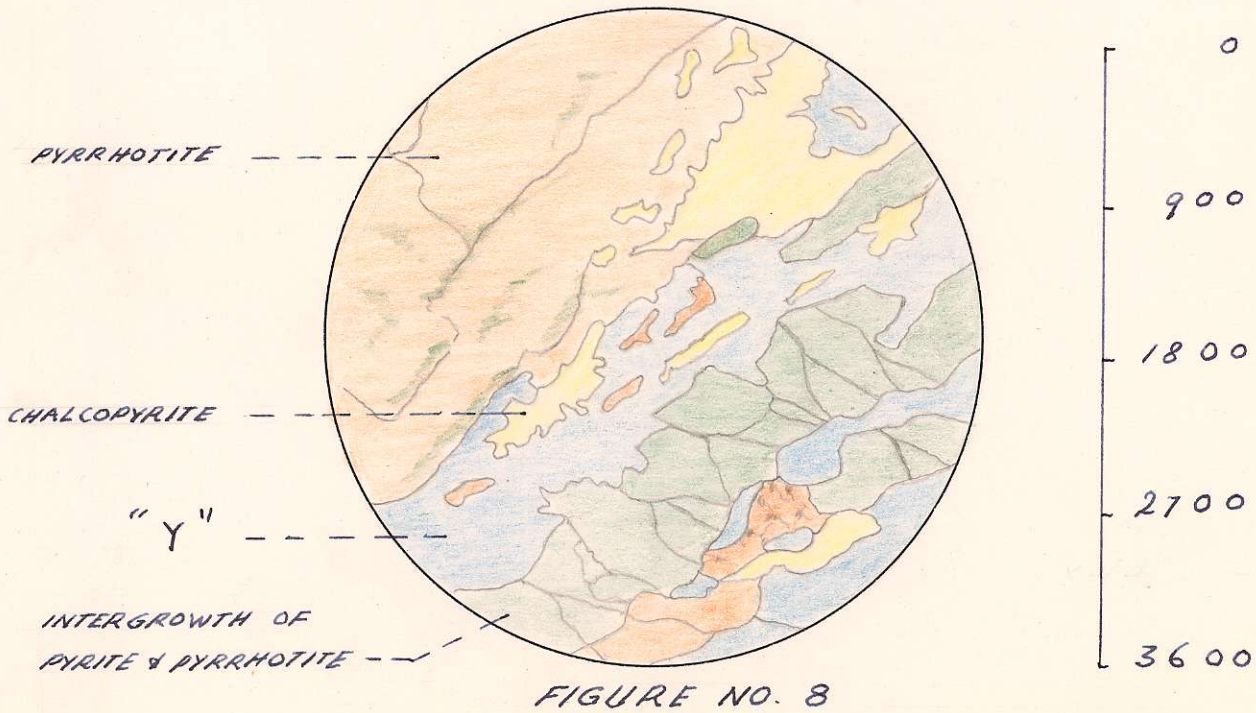

FIGURE NO. 8

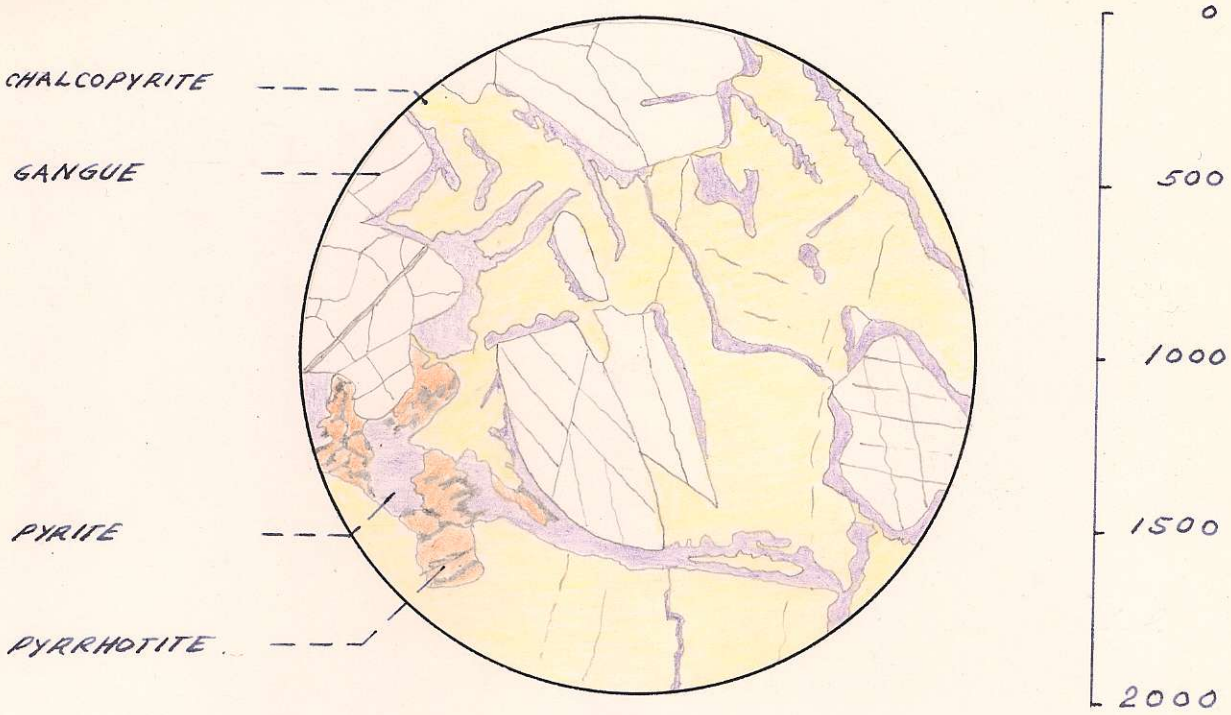
CHALCOPYRITE
GANGUE
PYRITE
PYRRHOTITE
0
500
1000
1500
2000

FIGURE NO. 9