600075

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A careful study but poorly presented.

MINERALOGICAL PROBLEM NO. 4

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MORRIS MINE

The following information is taken from the Report by the Minster of Mines 1935.

The property, Morris Mine, is situated south of the head of Mathew Creek, 3 miles Southeast of the south end of Tatlayoko Lake, near the east boundary of the Nanaimo Mining Division. Access to the area is by Road, 160 miles from Williams Lake, on the Pacific Great Eastern Railroad, or in the Bute Inlet, and 45 miles up Homathko River to Tatlayoko Lake.

The Mine was discovered in 1907 by T. Morris, and has not been worked for the last 30 - 40 years.

GEOLOGY:

Rocks in the Area consist of Argillite, Sandstone, and thin beds of Cherty Conglomerat. Not far away are stocks of Quartz-Diorite. Several Dykes of Composition, Diorite to Basalt, cut the Country Rock. Quartz (Veins, Stringers and Lenses) fills fissures, or fractures in Country Rock. The veins strike Northeast. No.1 Vein (Morris Vein) is best exposed. It can be followed 850'between elevations 6150' to 6600'. It strikes Southerly, and dips 25° - 50° East. It is exposed underground over 280'. The vein cuts Argillite, but follows one, or both walls of a Basalt Dyke, which is from 2 - 6' wide. At elevation 6250' there is 3 - 5' of strong Sulphide mineralization on footwall side of Dyke. At elevation 6550' there is similar mineralization 15" wide on hanging wall and 12-18" on the footwall. The paystreak generally is less than 2', locally it reaches 5'. In Adit 1, the paystreak averaged 2.73' wide.

What is this!

Minerals in approximate order of abundance:
Stibnite, Arsenopyrite, Pyrite,
Sphalerite and Tetrahedrite.
Gangue Minerals:
Quartz with altered crushed wall rock, and
Kaolinitic material - Minor Calcite.

GRADE:
18 Samples averaged .25 Oz/Ton of Au, and 3.1 Oz/Ton of Ag. Ag attributed to the presence of Tetrahedrite.

Stibnite, Arsenopyrite give yellow green oxidation products.

SPECIMENS:

23 Polished Sections.

2 Sections in transparent glass (1 Oxidized - 1 Not)
9 Sections by R.B.Campbell No. 1 - 9
3 Sections by H. Livingston No. 1 - 3
6 Sections by J.G. John A - F
3 Sections by MacRae #4, #5, #20.

A large amount of unsorted Handspecimens.

Description of various Hand Specimens.

1. H.V. Warren (11) No.4.

The Specimen is fresh. It consists mainly of Quartz (80%), Metallic Minerals Stibnite (20%), Minor Pyrite in Cubes less than 1 mm, Chalcopyrite and Sphalerite of Brown colour. The Mineralization is more or less uniformly distributed through the Specimen, with odd aggregates of Pyrite. A light Green powdry Mineral occurs on the surface in a few places - probably Scorodite. The Specimen is from a strongly brecciated Quartz vein with metallic minerals filling spaces and replacing the breccia matrix.

2. H.V. Warren (21) No.8.

The Specimen is open space filling with Quartz crystals growing more or less perpendicularly to the wall of the vein and with crystals (needles) of Arsenopyrite in it also growing perpendicularly to the wall in typical cockscomb structure. This occupies 1"-½" of the vein - next comes a ¼" band of Quartz, Arsenopyrite, and dark brown Sphalerite. These bands occur symetrically on both sides of the vein and the middle is taken by 1½" to ½" of Quartz and Stibnite. The Arsenopyrite takes on a strong tarnish - blue - purple - green (Blowfly colours). This is evidently deposition on the walls of an open fracture in a sequence qtz., Arsenopyrite, - qtz., Arsenopyrite, Sphalerite, - Qtz., Stibnite. Some minor Green oxidation products - Scorodite. ?

3. H.V. Warren (5) No.2.

Open Vein filling showing very good Cockscomb, and crustification banding. Deposition is not quite symetrical on both sides of the vein, but the sequence is the same, with Pyrite occuring in wallrock (yellow Carbonate) and close to walls of the vein, hence Pyrite deposited at the same time as Arsenopyrite, or maybe even before. Arsenopyrite also occurs in the wall rock. In the middle of the Vein with the Stibnite and Quartz, occurs in aggregates a black bluish very soft mineral, and greasy so that it sticks a bit to the needle - unidentified.

H.V. Warren (5) No. 2. (Sawed off Section)

Brecciation of White Bull Quartz with filling of space by new Blue Quartz and Metallic minerals - mostly Arsenopyrite, Pyrite also two specs of Magnetite, and in contact with it occurs the dark soft Bluish mineral. Tetrahedrite is also present, also needles of Stibnite with a strong blue tarnish.

4. H.V. Warren (19) No.6.

Consisting mostly of White Quartz, with a few specs of soft Stibnite. One part of Specimen is strongly mineralized with Arsenopyrite, Pyrite and a large amount of dark (metallic) sphalerite - on top of the Sphalerite and beside it in the Quartz there is a clear - vitreous - soft mineral growing in a radiating form (1 mm across). Probably secondary Hemimorphite.

5. H.V. Warren (7) No.3.

Specimen 1 - Crustiformed banding with Stibnite in blue tarnished needles growing perpendicular to the wall of the vein next to aggregates of Arsenopyrite.

Specimen 2 - Brecciated rock with dark bluish very soft (can scratch with finger nail) mineral - same as previous unidentified mineral, taking on a thick white, yellow, powdery, soft secondary cover. The Unidentified Mineral is probably Stibnite in a state of oxidation, and the cover being cervantite. Pyrite and Arsenopyrite occurs in close by (2 mm) spaced fractures also radiating aggregate of Arsenopyrite needles.

6. Box: The Black Crystals.

Mainly Quartz with considerable green covering. Metallic minerals amount to 12%, half of which is brown Sphalerite. Three specs of free Gold occur in the Quartz in contact with Sphalerite or close to it - also Arsenopyrite, Pyrite. Minerals are irregularly distributed. Weathering gives a thick cover of brown Limonitic material with green patches of Scorodite. In Yellow soft Carbonate mineral there occurs small black crystals (Black tarnish) - soft non-magnetic metallic Grey - seems to show up best on weathered surface.- probably strongly tarnished, and somewhat oxidized Pyrite cubes.

Other Hand Specimens also show Chalcopyrite, otherwise they are the same.
In Sample Morris No.9 there is more (1 Speck) free gold.

POLISHED SECTIONS

Minerals identified in decreasing order of abundance.

HYDROTHERMAL:

1. Stibnite $Sb_2 S_3$ (Traces of Fe,Pb,Cu) 15%.
2. Arsenopyrite Fe As S (Traces of Co) 10%
3. Sphalerite ZnFeS (Maximum Fe 26% - Christophite, Mm 5.81% - Cd 1.66%) 2%. ?
4. Tetrahedrite $(CuFe)_{12}Sb_4S_{13}$ (Also Ag up to 18% Zn,As) 1%
5. Pyrite (FeS_2) 1%

Minor amounts of

6. Chalcopyrite $Cu_2S. Fe_2S_3$.
7. Argentite Ag_2S
8. Gold Au. Strongly sectile, but does not react to KCN even after several minutes.
9. Hessite (?) Ag_2Te
10. Sylvanite (?) Ag,Au,Te_4.

Magnetite (Fe_3O_4)

SYNGENETIC:

11. Cervantite Sb_2O_4 - Minute Acicular crystals, fibrous and powdery yellow - soft.
12. Scorodite Fe''' ($As\ O_4$). $2H_2O$, porous earthlike, fibrous soft greenish.
13. Limonite $FeO\ (OH). nH_2O$ plus $Fe_2O_3. nH_2O$.
14. Hemimorphite $Zn_4Si_2O_7\ (OH)_2. H_2O$.

GANGUE:

15. Quartz SiO_2.
16. Calcite $CaCO_3$.

There was some difficulty in mineral identification.

The occurrence of Hessite is not ascertained. The occurrence of Sylvanite is doubtful, but if the Telluride Hessite occurs, then it is also likely that Sylvanite occurs. ?

does not follow.

HESSITE: Appears as a lead grey soft slightly sectile - strong bluish anisotropic - showing twinning - taking good polish.

Etch Tests:

HNO_3 (1:7) Faint yellow tarnish.

HNO_3 (1:1) Black - deep etching.

HCl Yellow Tarnish

$FeCl_3$ Deep Blue Tarnish (Very Characteristic)

KCN No reaction.

Aq. Reg. Yellow Tarnish.

SYLVANITE: Monoclinic prismatic 2/m. Light grey White mineral, very fine grained also in fine blades or needles and squares and diamond shapes. Not marked strongly Anistropic.

Etch Tests:

HNO_3 (1:7) Neg. Very characteristic is a tarnish of Yellow - Brown rings on Tetrahedrite surrounding fine grained Sylvanite.

HNO_3 (1:1) No reaction for a few seconds, then suddenly a deep dark etch and effervesence.

HCl No reaction.

$FeCl_3$ Faint Yellow tarnish

KCN No reaction

Aq. Reg. No reaction.

TEXTURES AND PARAGENESIS

Glass Section (Inoxidized)

Mainly Arsenopyrite occurring in auhedral crystals - needles and diamond shaped cross - sections - at times it is also filling spaces between perfect six sided cross sections of Quartz. Crystals of Arsenopyrite has been "bitten into" by Argentite. There also occurs Tetrahedrite which encloses a blebb of what was determined to be Argentite. In the Tetrahedrite, but concentrated in the border toward Argentite there occurs minute exsolution bodies of Chalcopyrite. Tetrahedrite and Chalcopyrite are simultaneous. The concentration of Chalcopyrite close to border of Argentite is more difficult to explain - maybe if Tetrahedrite replaced Argentite it might take up some of the silver in Argentite and doing so it is unable to contain as much Fe which will subsequently combine with Cu - S, to form Chalcopyrite. (This might form at a lower temperature than the accepted (500° C) for Tetrahedrite - Chalcopyrite exsolution). (Fig.1)

H.R. McRae Section #20.

Sphalerite occurs in contact with Arsenopyrite, the latter shows straight crystal boundaries being earlier than Sphalerite. Stibnite and Tetrahedrite show a very close association with smooth curving boundaries and blebbs of each in the other - probably simultaneous deposition. Stibnite has filled fractures in Sphalerite and also to a small extent replaced it and Arsenopyrite. There is also some breaking of the Arsenopyrite with Quartz entering fractures (Fig.3).

R.B. Campbell #2.

Tetrahedrite has invaded thin long fractures in the Sphalerite, and also replaced it to some extent showing both matching and non matching walls in veins. (Fig.4). Also another mineral is in with the Tetrahedrite to a small extent - a probability — ? properties point to Sylvanite. The Specimen shows Arsenopyrite scattered through with Quartz. Through the middle of the Specimen goes a zone of strongly fractured broken up Arsenopyrite - a Breccia zone. Next to this zone there is a large area of Sphalerite. The boundary between them is rather straight, probably the mineralizing solutions have moved up the zone of Brecciation, Sphalerite replacing the wall, Tetrahedrite moving into later fractures in the Sphalerite and solutions sealing the Breccia zone with Quartz.

R.B.Campbell #3.

The Section shows large patches of Tetrahedrite associated with which there are some interesting structures. Around one large bleb of Tetrahedrite there are a rim of small blebs (1/5 mm).

of a silvery white slight yellow mineral (Sylvanite) ?. (Fig.5). The texture is hard to explain - one possibility I think is that the mineral existed with the Tetrahedrite and as this cooled it was forced out and"condensed"(- looks like condensation bubbles around a drop of acid) in the rim around the Tetrahedrite. In nearby blebs of Tetrahedrite there occurs minute needles, rectangles, cubes, and diamond shapes of the mineral (Sylvanite ?) (Fig VII) In that Sylvanite shows good crystal outlines it should have deposited before the Tetrahedrite but the close association shows that they are probably of same age. In another part of the Section there occurs Hessite all surrounded by Tetrahedrite - close even boundaries, probably simultaneous depostion, and nearby there occurs an aggragate of a mineral (Sylvanite) in needles extending into Tetrahedrite - simultaneous deposition or Sylvanite replacing Tetrahedrite. (Fig VIII) Several specks of free gold up to 1mm in size occur in the section. It does not react to KCN even after several minutes but it is strong yellow and it shows the typical wavy surface of gold and it is very sectile.

SEQUENCE OF DEPOSITION

First mineralizing solutions deposited

Quartz, Arsenopyrite, and Pyrite

Fracturing of Gangue and Arsenopyrite

Deposition of

Sphalerite, Quartz, Stibnite (?)

Deposition of

Stibnite, Tetrahedrite, Argentite, Chalcopyrite, Hessite, Sylvanite, Free Gold
(Argentite is probably early in the sequence)

Secondary Oxidation

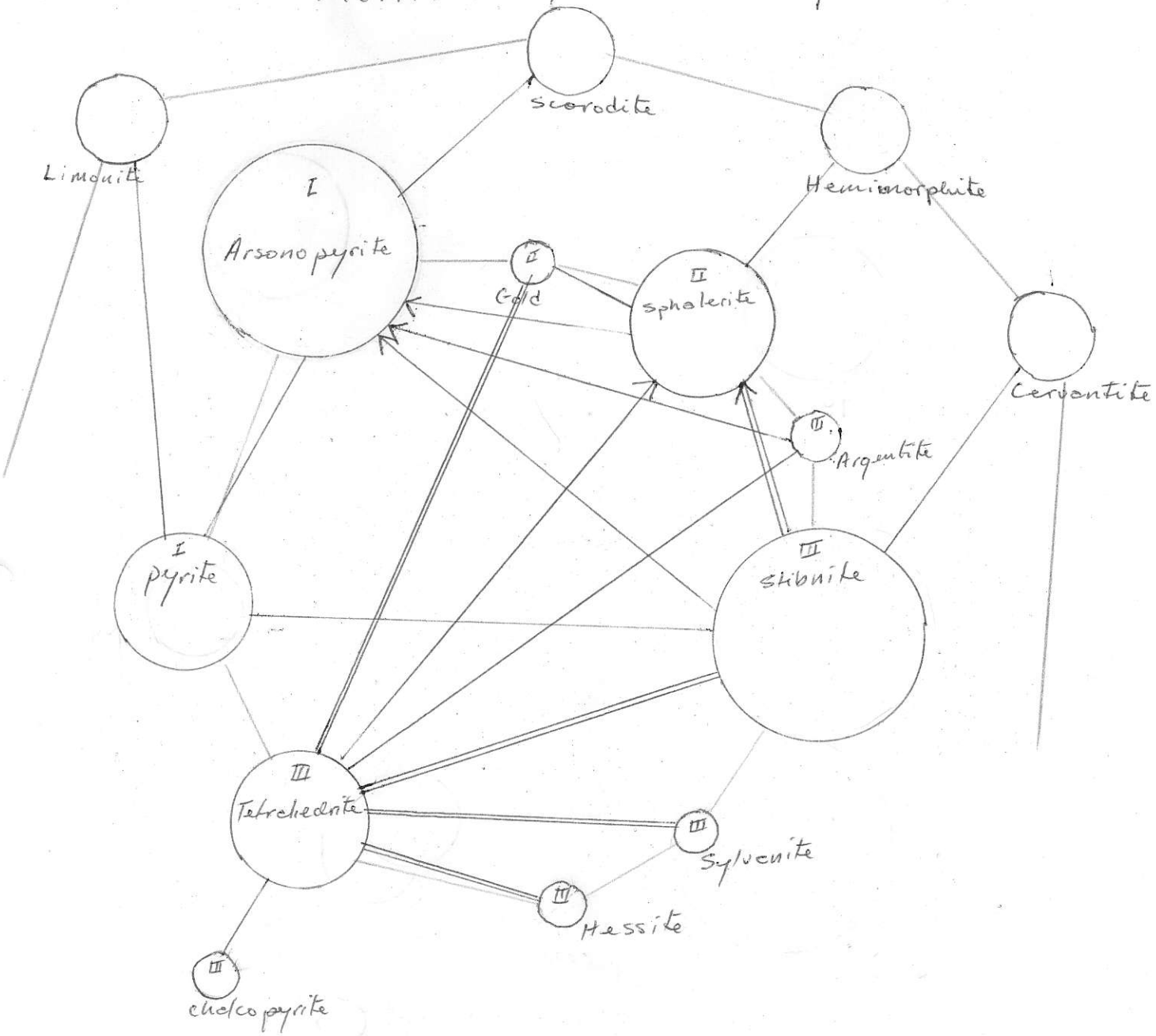
Hemimorphite, Scorodite, Cervantite, Limonite.

TEMPATURE OF DEPOSITION.

First wave of mineralizing solutions of Quartz, Arsenopyrite, and Pyrite where the highest tempatures of deposition - possibly up to 500°C. Sphalerite is of an intermediate tempature as is Tetrahedrite - the exsolution, Chalcopyrite - Tetrahedrite has been set at 500°C by Edwards, also 350°C has been suggested and seems the more likely tempature in this deposit - under which Stibnite and Tellurides could have been deposited.

The property can then be classed as an Epithermal deposit. Minerals deposited first at rather high tempature for this classification but later mineral assemblage agrees more with this, and the structure with the cockscomb and crustification banding shows deposition in open spaces - low pressure - close to surface.

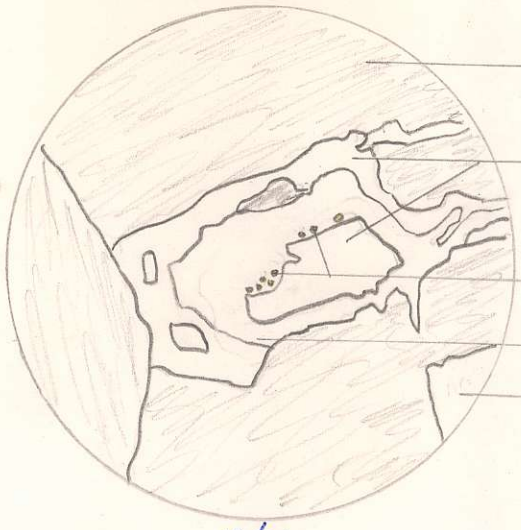
Vandeveer Diagram of Morris Mine mineral deposition.



Sloppy

Fig I

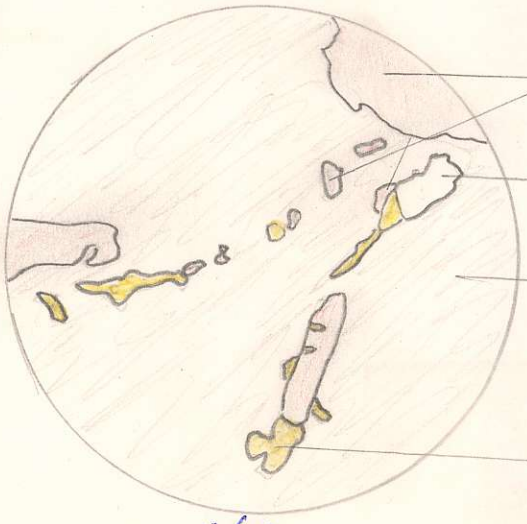
unoxidized glass section



x 60

Fig II

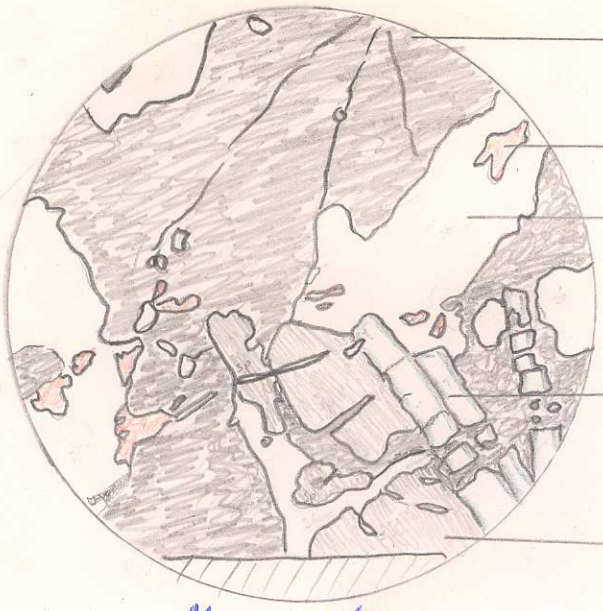
R.B. Campbell # III



x 60

H.R. McRae section 20

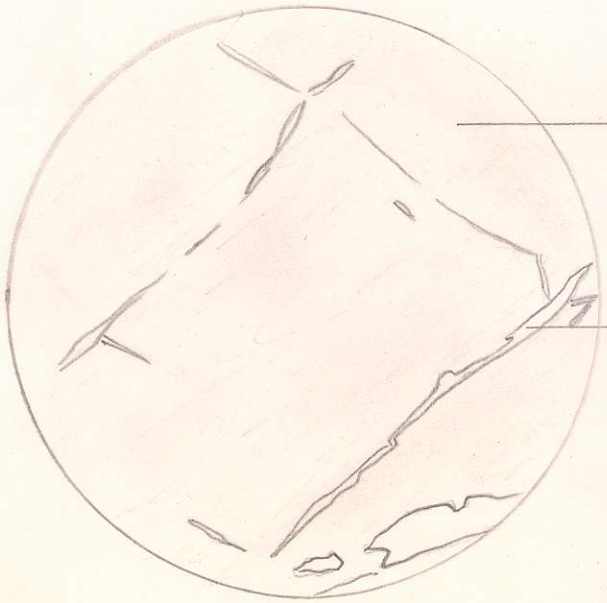
Fig III



Mag. x 60

R. B. Campbell # II

Fig IV

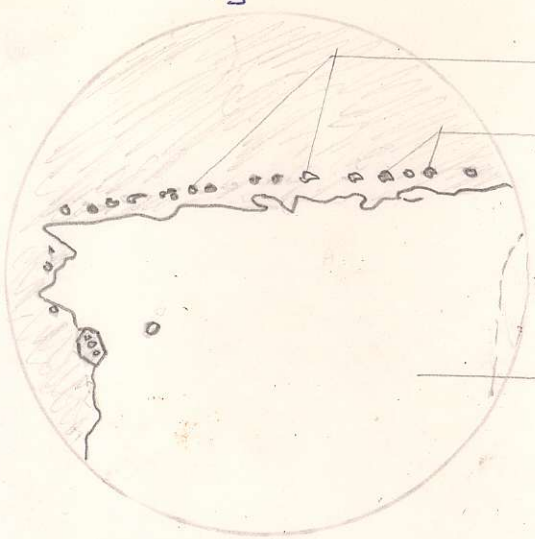


x 60

3X

R B. Campbell #3

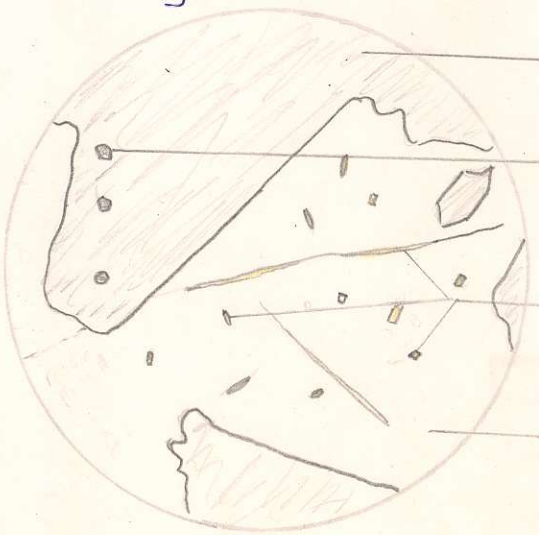
Fig V



x 30

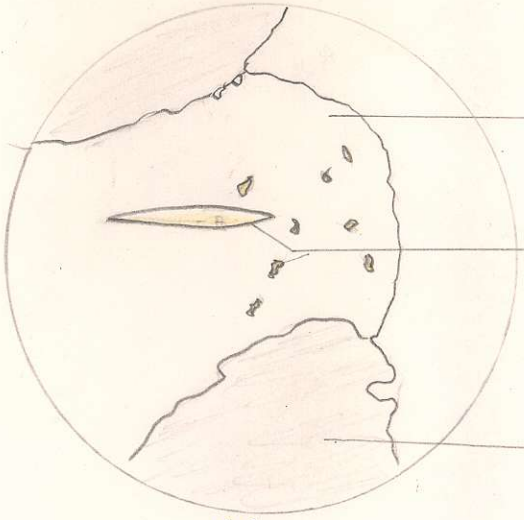
R.B. Campbell #III

Fig VI



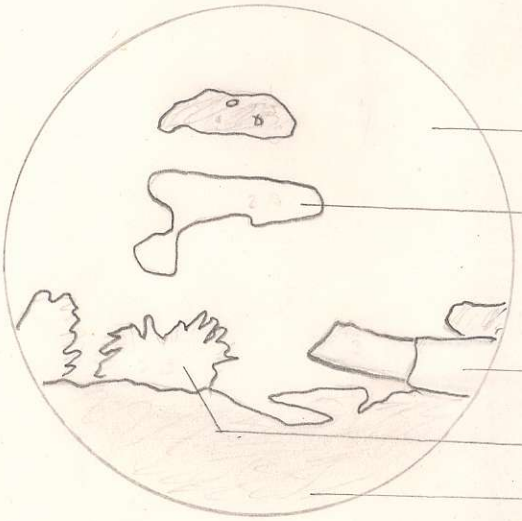
x 60

Fig VII
R.B. Campbell # VII



x 60

Fig VIII
R.B. Campbell # VII



x 60

Referências