Some conclusions not warranted but a very consientous effort!
75-85%
R.M.T.

A MINERALOGRAPHIC REPORT

ON

THE ORES

OF THE

ROCHER DÉBOULÉ MINE AND HAZELTON VIEW GROUP

An essay submitted in partial fulfilment of the requirements for the Fourth Year Geological Engineering Course, Geology 409, at the University of British Columbia

K. G. HOPE

March 30, 1951

The University of British Columbia

Vancouver, Canada

3860 West Thirteenth Avenue,
Vancouver, British Columbia,
March 30, 1951.

Dr. H. V. Warren,
Professor of Mineralogy,
Department of Geology,
University of British Columbia,
Vancouver, British Columbia.

Dear Sir:

It gives me pleasure to submit this essay, "A Mineralographic Report on the Ores of the Rocher Dé Boulé Mine and Hazelton View Group," for your consideration and in partial fulfilment of the course in Mineralography (Geology 409).

Yours very truly,

K. G. Hope
K. G. Hope

KGH/AOR

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ACKNOWLEDGMENTS

I am extremely grateful for the assistance and guidance of Dr. R. M. Thompson, assistant professor of geology, University of British Columbia and Messrs J. Gower and T. Barker, laboratory assistants and post-graduate students of geology, University of British Columbia, given during the period of laboratory work prior to the preparation of this report.

K. G. Hope

ABSTRACT

In addition to the partial fulfilment of the course, Geology 409, this report is designed principally to disagree with, confirm and add to, the mineralogy and paragenesis previously reported by various examiners of the Rocher Déboulé Mine and the Hazelton View Group. It is to be realized that the writer has not visited the properties and as a result, statements made throughout the text are based upon mineralographic determinations and available written material.

A brief summary of the topography, geology and reported mineralogy are presented, followed by a more detailed description of the mineralogy and paragenesis.

Two minerals, cobaltite and uraninite, have been added to those already known. Cobaltite was substituted for safflorite which was reported present in the Rocher Déboulé ore. Uraninite has been added to the Hazelton View mineral assemblage, but has not been confirmed. Some minor alterations were made in the reported paragenesis of the ores of both properties.

The writer has obtained valuable experience in mineralographic techniques and procedures, and it is hoped that the report will serve some beneficial purpose.

Introduction

This report on the Rocher Déboulé Mine and the Hazelton View Group will serve a three-fold purpose. First, to partially fulfil the requirements of the course in mineralogy (Geology 409) as outlined on page 150 of the University of British Columbia Calendar for 1950-51. Second, to give a concise resume of all available material written about these two properties, with special attention to history and ownership, geology of property area and reported mineralization, and to present the results of the author's mineralographic analysis. This portion of the report will constitute most of the text.

The specimens composing the suite of ores, from which polished and thin sections were made, were obtained during a visit to the respective camps by Gower[1] in the summer of 1950. Laboratory work was commenced by the writer in January and completed by mid March 1951.

The Regional Setting

Topography

The Rocher Déboulé Range, generally spoken of as Rocher Déboulé Mountain, commences immediately south of

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1. J. Gower, Post-graduate student in Geology, University of British Columbia.

Hazelton and extends for a distance of 20 miles southerly, terminating at Sheedy Creek. The Range is 14 miles wide and several of its peaks surpass 8000 feet, the highest having an elevation of 8200 feet. There are numerous small alpine glaciers on the east sides of the higher peaks. The Range is bordered on the north and east by the Bulkley River Valley, on the northwest by the Skeena River and on the west and southwest by the northerly flowing Kitseguecla Creek. The elevation of the enclosing valleys is approximately 1000 feet so that the maximum relief exceeds 7000 feet. Many glacial fed streams flow east and west from the summits of the Range. Timberline follows approximately the 5000 foot contour.

Geology

Bed rock is well exposed above timberline, at an elevation of approximately 5000 feet, but elsewhere outcrops occupy less than five percent of the map area and these are found mainly in cliff and stream canyons. Drift deposits are chiefly of glacial origin.

The cores of Rocher Déboulé and neighboring mountains are composed of igneous rocks probably related to the Coast Range Batholithic intrusions. The enveloping sediments and flows have been metamorphosed and indurated by contact with the intrusions, but away from the contacts, the rocks are softer and unmetamorphosed.

The sediments belong to the Hazelton Group, which consists of interbedded flows and sediments, and has been established as ranging in age from Lower Jurassic to Lower Cretaceous. The flows consist of andesites, dacites, rhyolites and basalts. Conglomerate, shale, argillite, sandstone, quartzite, tuffs and breccia constitute the continental sediments, while some limestone represents a marine phase. Granite, granodiorite, diorite, in part porphritic, and some rhyolite comprise the igneous mass.

Most of the rock strata have been correlated by color and composition rather than paleontologically because of the lack of fossils.

Mineralization and the resulting numerous properties lie in and around the contact of the igneous rocks with the sediments.

The Rocher Déboulé Mine

Location and Accessibility.

The Rocher Déboulé Mine, in the Omineca Mining Division, is located on the northwest slope of Rocher Déboulé Mountain, 6.5 miles south of Hazelton. The town of Hazleton lies in the Skeena River Valley 120 miles north easterly from Prince Rupert and may be reached by highway from Vancouver through the Interior Plateau or by rail from Prince Rupert.

A road, 10.5 miles in length, leads northeast from Skeena Crossing (see Map 1, page 5) and follows the north bank of Juniper Creek to the mine camp at elevation 4000 feet.

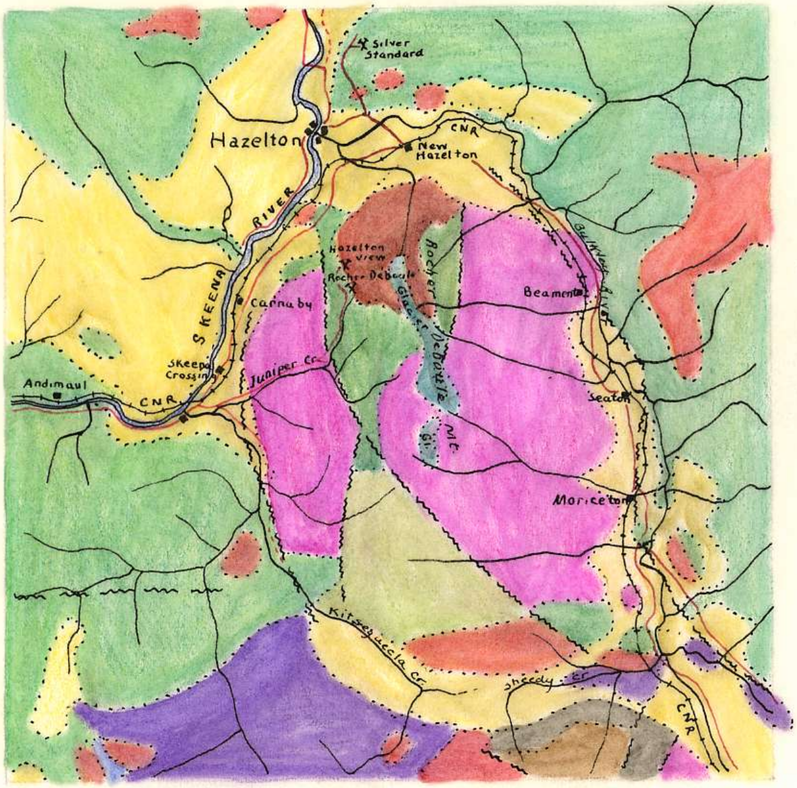
Ore from the mine is transported by aerial tramway from elevation 5040 feet to a railway siding near Carnaby.

History and Ownership

The Rocher Déboulé Mine has been one of the most productive copper properties in the Omineca Mining Division. The mine consists of a group of nine claims, the Jack Pine, Timberline, Iowa, Balsam Fraction, Balsam, Juniper, Third Fraction, Joe Fraction, and Log Cabin. Map 3 on page 7 shows the location of these claims. Two prospectors, Munro and

HAZELTON AREA

Scale 1 inch to 8 miles



LEGEND

Geologic

- Cret. – granite, granodiorite, diorite
- L. Cret. – bas. & rhy. flows, pyroclastics
- Jur. – arg., ss, sh., qtzite, tuff, cgl.
- Jur. – and. & bas. flows, rhyolite
- Jur. – arg., qtzite, ss, ls.
- Jur. – flows & pyroclastics
- Jur. – mainly and. & bas. flows
- drift covered area

Symbolic

- Prospect or Mine
- Railroad
- Road
- Fault or shear
- Town or village

N

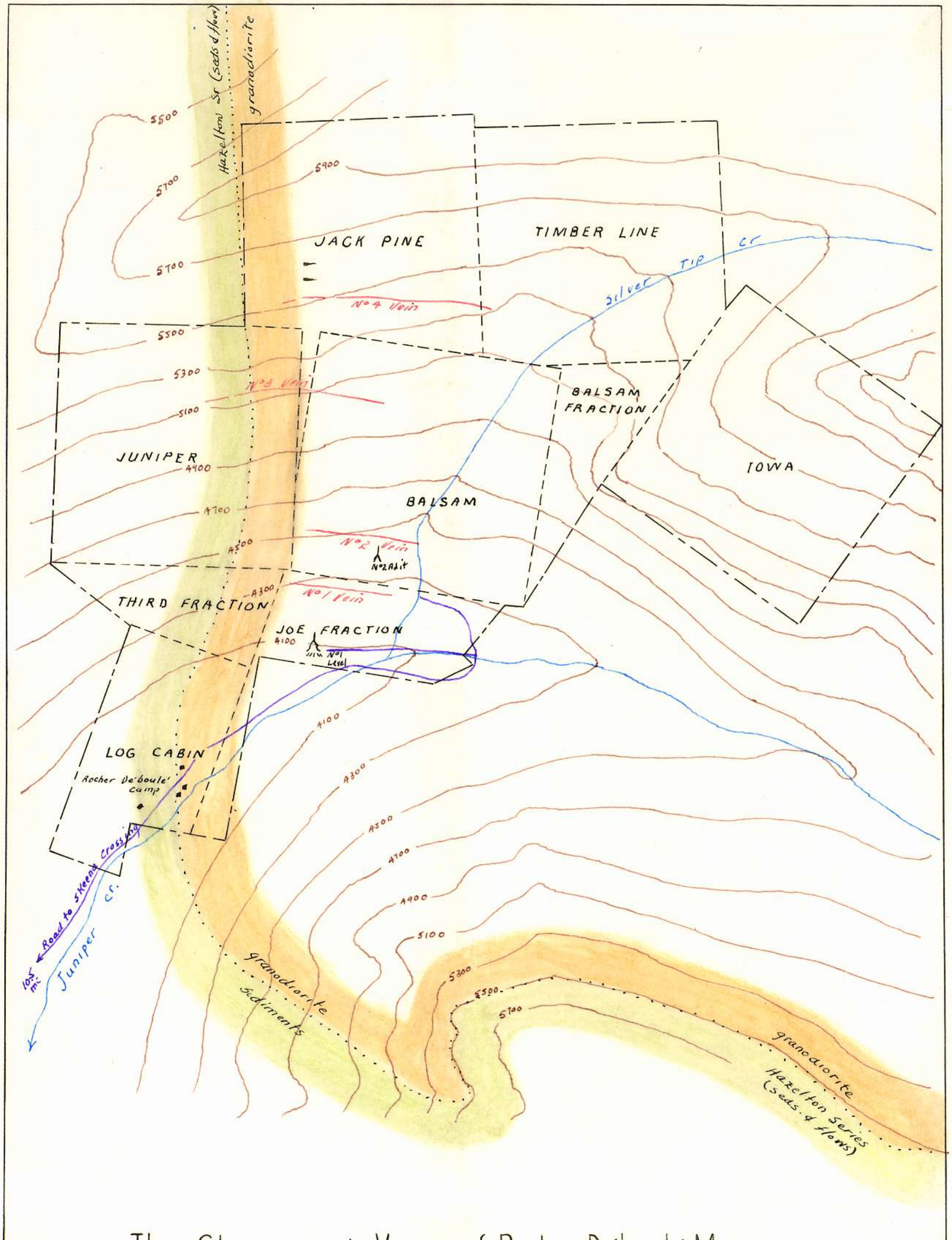
Tracing from
Map 971A
Smithers – Ft. St. James
B.C.

— MAP 1 —

Rocher Déboulé Mountain

MAP 2

MAP 3



The Claims and Veins of Rocher Déboulé Mine

Scale 1 inch to 1150 feet

Tracing from map accompanying GSC Memoir 110 – "Principle Veins on Mining Properties, Head of Juniper Creek, Rocher Déboulé", British Columbia"

Sargent were the original locators.

In 1911, the group was secured by the Rocher Déboulé Copper Company, Limited, of Salt Lake City. During the next two years the company explored two strong fissures and subsequently, considerable copper ore was blocked out.

In 1914, the Continental Development Company of Butte, Montana obtained a two years lease on the mine and constructed a hydro-electric plant, surface and aerial tramways and a short narrow gauge railway. In 1915, this company shipped 17,000 tons of copper ore to Granby smelter at Anyox. The ore averaged 8 per cent copper with some silver and gold.

In 1916 the property reverted to the Rocher Déboulé Company and they produced another 17,000 ton shipment averaging 9.5 per cent copper. In 1918 all mining operations were suspended.

Aurimont Mines Limited obtained an option on the property in 1929 and shipped 70 tons of 4 per cent copper ore. Forty ounces of silver and 0.14 ounces of gold were also won per ton.

In 1930, the Hazelton Copper Mines, Limited, took over the property and a limited amount of work was done.

At present, the mine is owned and operated by the Western Uranium Cobalt Mines, Limited. No productive mining has been undertaken as yet.

Geology

The geology of the mine area consists essentially of two units. First, the igneous stock, forming the core of the Rocher Déboulé Mountain, is a true granodiorite. The texture is coarse and the weathered surface displays a mottled grey color. Second, this granodiorite stock is in contact with interbedded sandstones, argillites and pyroclastic sediments. These are metamorphosed and indurated. The contact trends northerly across the western boundary of the property. Three types of dykes traverse the area. One is a fine grained quartz diorite which was intruded before faulting and shearing. Another type has a porphyritic diorite composition and which was intruded after movement but prior to mineralization. After ore emplacement, several lamprophyre dykes were intruded.

The Granodiorite is traversed by a number of strong fissures that outcrop on the mountain slope, the lowest being at elevation 4400 feet and the highest at 5300 feet. The zones strike easterly and dip from 35 and 65 degrees north. Only the lowest vein extends into the sediments; the others are confined to the granodiorite. The lengths of the fissures range from 400 to 3500 feet and the width varies from 4 inches to 8 feet. Movement along these zones has brecciated and altered the granodiorite which later served as a host for replacement by rising mineralized solutions. Map 3 on page 7 shows the location of these fissures.

Emplacement of Ore Minerals

Throughout the various reports written about the sequence of events resulting in the emplacement of the various gangue and ore minerals, the writer can find no contradictory statements. Placing weight on the judgment of the several property examiners, the writer has kept their results in mind when determining the paragenesis microscopically. A summary of their reports follows.

Apparently, the initial faulting was followed by alteration of the brecciated granodiorite and appreciable amounts of hornblende and actinolite were developed. No metallic mineralization can be connected with this initial break.

Renewed movement along the respective fissures offered a channelway for rising mineralized solutions and chalcopyrite in particular found the hornblende a very susceptable host to replacement. The richest ore of the mine was of this type. Variable amounts of magnetite, pyrrhotite, arsenopyrite, pyrite,tetrahedrite, safflorite and molybdenite accompanied the chalcopyrite. Glassy quartz characterizes this initial ore emplacement. Calcite and siderite occur in minor amounts.

Further movement is characterized by the admission and presence of banded, milky-white quartz veins. These quartz veins carry principally galena, sphaterite and tetrahedrite and subordinate amounts of pyrite and chalcopyrite.

In summary, there are essentially two types of ore found in this mine. One is a high temperature chalcopyrite-hornblende ore and the second is a relatively low temperature galena-sphalerite-tetrahedrite ore associated with banded, milky-white quartz.

Ore Controls

The ore of the Rocher Déboulé Mine has been emplaced by metasomatism and fracture filling. The chalcopyrite displays the best example of the former while the galena and sphalerite are typical of the latter process. Other minerals appear to have taken part in both processes.

There are essentially two ore controls. First, the primary and secondary fracturing and shearing produced structural channelways for the ore solutions. Second, the development of shearing products, such as fibrous hornblendite, chemically influenced the rising solutions by offering an easily replaceable host, especially to chalcopyrite.

Mineralographic Analysis

Nine polished sections were prepared by the writer from ore and gangue taken from the four levels of the mine. The exact point of extraction is unknown and some specimens were obtained from the dumps of the respective levels.

The results obtained from each section will be reported separately in the following paragraphs and will include the minerals present together with the suggestive paragenesis of each section.

Section No. 1. - 1st Level, 2nd. Vein

Skutterudite.

Two metallic minerals are present in the section. They are cobaltite and chalcopyrite. The chalcopyrite comprises approximately 20 per cent of section while the cobaltite occupies less than 10 per cent. Both minerals are imbedded irregularly in milky white quartz. Megascopically, a thin coating of cobalt bloom is seen on the oxidized surface. No mention of cobaltite has been made in any of the literature written about the mine. It was recognized, however, that a cobalt mineral did exist in appreciable amounts and was believed to be safflorite, $(Co, Fe)As_2$. The cobalt mineral present in this section is cobaltite and not safflorite since microscopically under crossed nicols, this mineral was isotropic, whereas the latter mineral possesses strong anisotropic colors, from yellow to steel blue. Microchemical methods confirmed cobaltite.

It is the writer's opinion that the fragmental nature of the cobaltite in the quartz was caused by movement in the fissure zone with subsequent injection of the quartz. Chalcopyrite entered later to fill voids and fractures in the quartz and where cobaltite was encountered, a very minor amount of replacement was effected. This chalcopyrite belongs to the second generation.

A microscopic sketch (RDeB1) showing chalcopyrite occupying fractured quartz may be seen on page 14a.

Section No. 2. - 2nd Level, - 2nd Vein

The hand specimen, from which a polished section was made, was a part of the vein and wall rock. Galena and tetrahedrite are seen principally adjacent to the wall rock, but minor fragmental amounts are seen as inclusions in the cockaded milky white quartz occupying the centre of the vein.

Microscopically, small intrusions of chalcopyrite are seen in both tetrahedrite and quartz, but predominantly in the former.

Microscopic Sketches
of
Rocher Déboulé Mine and Hazelton View Group Ores

Color Code

Chalcopyrite

Pyrrhotite

Arsenopyrite

Pyrite

Tetrahedrite

Galena

Molybdenite

Safflorite-Loellingite

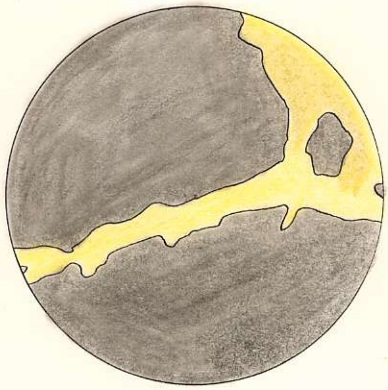
Quartz

Hornblende

Wax

Rocher Déboulé Mine Ore

RDeB 1

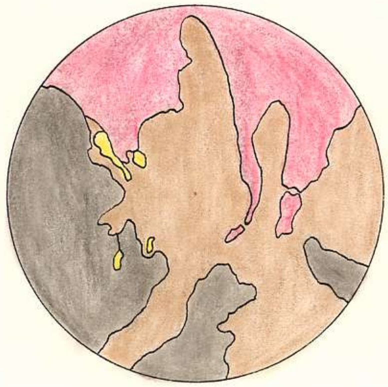


34X

Chalcopyrite occupying fractured quartz

(Text: p13)

RDeB 2

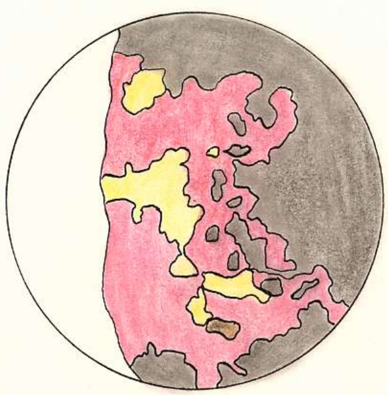


34X

Replacement texture chalcopyrite, tetrahedrite, and galena

(Text: p15)

RDeB 3



34X

Replacement texture of chalcopyrite, tetrahedrite, and galena

(Text: p 15)

It is rather difficult to state the paragenesis of the ore minerals and gangue. It is clear to the writer that the galena had been replacing the tetrahedrite. Beyond this, at least two conclusions might be drawn. One, that the chalcopyrite was first emplaced, and later almost entirely replaced by tetrahedrite, which, in turn, was attacked by galena. Movement in the fissure zone followed and milky white quartz was injected. Second, the isolated pattern of the irregular inclusions places some weight on the idea that the three minerals may have come in with the quartz. However, it is difficult to explain the replacement textures by this possibility. For the purpose of arriving at a conclusion the writer will consider the first assumption as most feasible.

A typical microscopic sketch (RDeB2) is shown on page 14.

Section No. 3 - 2nd Level, - Dump.

The significance of this section is that two generations of chalcopyrite as well as quartz are shown. The first, an earlier chalcopyrite may be correlated with a glassy quartz. Some pyrite, calcite and siderite are also connected with this early intrusion. The second chalcopyrite may be correlated with an injection of milky white quartz followed shortly by tetrahedrite and galena.

The sequence of emplacement appears to be as follows:

(1) Pyrite has been emplaced, probably by metamorphism, into what is now a leached zone in the section.

(2) Glassy quartz and chalcopyrite were injected upon renewed movement along the fissure zone. The pyrite was partially replaced by the chalcopyrite.

(3) A further movement resulted in the injection of milky quartz and chalcopyrite.

(4) Following this tetrahedrite entered and partially replaced the chalcopyrite.

(5) In the last phase, galena entered and attacked the tetrahedrite principally.

On page 14 may be found a typical microscopic sketch (RDeB3)

Section No. 4. - 2nd Level Annex - 1st Vein

Galena, tetrahedrite and a few specks of chalcopyrite comprise this massive specimen and section. A little milky quartz is present as inclusions in the galena. The specks of chalcopyrite are confined to the tetrahedrite.

The overall picture from the hand specimen strongly suggests that the galena was replacing tetrahedrite. Microscopically it is seen that the tetrahedrite had almost completely replaced the chalcopyrite which had been injected with the quartz prior to the galena-tetrahedrite phase. See page 18 for a typical section sketch (RDeB4).

Section No. 5. - 2nd Level Annex - 1st Vein

The molybdenite in this section displays a beautiful radiating pattern of crystallization. Chalcopyrite, as small blebs in the hornblenditic gangue, is the only other metallic mineral. The hornblendite has, in part, been silicified.

It is probable that the molybdenite was deposited after primary shearing and alteration of the gouge in the fissure zones. Quartz and chalcopyrite were subsequently introduced and the latter attacked and replaced the hornblende, although not illustrated to any degree either in the section or in the sketch (RDeB5) on page 18. This chalcopyrite belongs to the first generation.

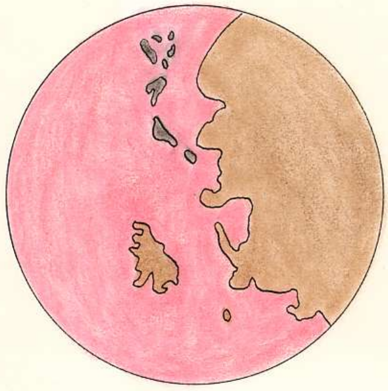
Section No. 6. - 2nd Level Annex - 1st Vein

Once again, galena, chalcopyrite and tetrahedrite occur together. Chalcopyrite, of the second generation, is in minority and the other two minerals occupying an equal portion of the vein material.

Milky quartz has been injected into the fissure zone, which, in this locality, traverses pyroclastic rock. Renewed movement in this zone has fractured the quartz and

Rocher Déboulé Mine Ore

R DeB. 4



34X

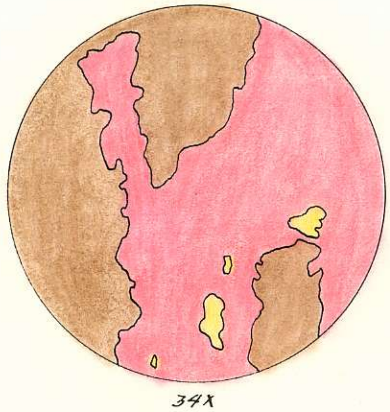
Relationship between tetrahedite and galena
(Text: p 16)

R. DeB. 5

34X

Replacement of Quartz and hornblende by molybdenite
(Text: p 17)

R. DeB 6



34X

Galena - tetrahedrite replacement texture
(Text: p 17)

admitted tetrahedrite which replaced in part the chalcopyrite. Still later movement along one wall of the vein opened a channelway for galena. Clearly illustrated is the preference for tetrahedrite rather than the tuffaceous material for replacement by the galena.

The sketch (RDeB6) on page 18 shows the galena replacing tetrahedrite.

Section No. 7. - 2nd Level Annex - 1st Vein

This section, containing only chalcopyrite, clearly shows the comparative susceptibility of the hornblende and quartz gangue to replacement. The hornblende was readily attacked whereas the quartz was quite resistant to replacement.

Two excellent examples of core replacement are seen in this polished section. They (RDeB7A&B) are accurately sketched and described on page 20.

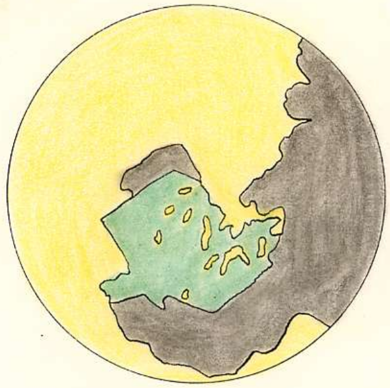
Section No. 8 - 3rd Level. - Dump

Five metallic minerals are present in this section and these are, molybdenite, chalcopyrite, arsenopyrite, pyrite and galena. Gaugue material consists of limy argillaceous slate, tuffaceous sediments and quartz.

The paragenetic relationship between these minerals

Rocher Déboulé Mine Ore

RDeB 7A

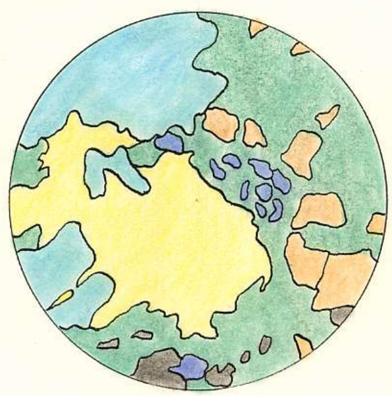


RDeB 7B

34X

Core Replacement of hornblende crystal by chalcopyrite. Note rim reaction in B. Rim is quartz, protecting hornblende
(Text: p 19)

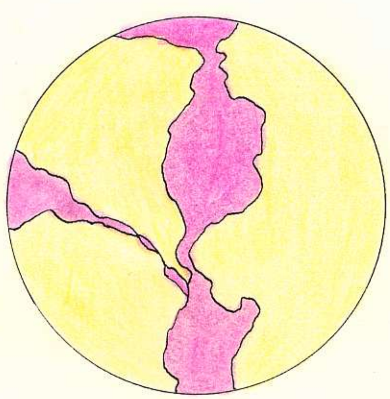
RDeB 8



34X

Complex relationship between molybdenite, pyrite, arsenopyrite chalcopyrite, quartz and hornblende (Text: p 19)

RDeB 9



34X

Fracture replacement of chalcopyrite by pyrrhotite
(Text: p 21)

can be stated as an assumption only, being guided by their melting temperatures and information from former sections. Replacement criteria can be seen between molybdenite - chalcopyrite and pyrite - chalcopyrite. In each case the chalcopyrite was the metasome.

The writer visualizes the paragenesis as follows:

(1) Shearing, alteration ans silicification.

(2) The deposition of pyrite and arsenopyrite contemporaneously.

(3) The injection and deposition of molybdenite.

(4) Movement in the vein has admitted chalcopyrite which shows replacement textures with both molybdenite and pyrite, particularly the latter. Apparently arsenopyrite was not a favorable host.

(5) As a final phase, a little galena found its way into the mineral assemblage.

The complexity of this section is shown in a microscopic sketch (RDeB8) on page 20.

Section No. 9. - 1st Vein

Chalcopyrite and pyrrhotite comprise the minerals of this massive ore specimen and section.

A clear example of pyrrhotite replacing chalcopyrite along fractures in the latter may be seen in this section.

A typical microscopic view (RDeB9) has been sketched on page 20.

Paragenesis

From the nine sections described above, a paragenetic picture can be drawn and is presented as a diagrammatic flow sheet on page 23. The writer can see no reason to differ too materially from the picture presented in various reports, except that some of the minerals mentioned in these reports were not encountered in the suite of ores available and so will be shown in brackets. Cobaltite will be substituted for safflorite because the writer believes that a mistake in identification was made by the various property examiners. Molybdenite, chalcopyrite of both generations and pyrrhotite occupy different positions in the paragenetic table from that reported by examining geologists. Why?

Paragenetic Flow Sheet of the Rocher Déboulé Ore Minerals

~~~ Primary Shearing in Granodiorite ~~~

↓

alteration

↓

development of Hornblende and Actinolite

↓

silicification

↓

~~~ Secondary Shearing ~~~

↓

(Magnetite)

↓

Pyrite and Arsenopyrite

↓

Molybdenite

↓

Chalcopyrite

↓

Pyrrhotite

↓

~~~ Third Shearing ~~~

↓

(Pyrite and Arsenopyrite)

↓

Cobaltite

↓

Chalcopyrite

↓

milky-white Quartz

↓

(sphalerite)

↓

Tetrahedrite

↓

Galena

↓

? ~~~ Movement ~~~ ?

↓

Veining by Calcite and Siderite
~~~

The Hazelton View Group

Location and Accessibility.

The Hazelton View Group is located on the northwest slope of Rocher Déboulé Mountain 5.5 miles south of Hazelton and approximately one mile north of the Rocher Déboulé Mine.

This property may be reached by trail from the Rocher Déboulé camp or by a pack-horse trail commencing at Denis Comeau's ranch near Carnaby and terminating at the property camp at elevation 4100 feet.

Ownership

The group consists of eight claims, which, in 1916, came under the direction of the New Hazelton Gold Cobalt Mines, Limited and was developed continuously until 1919. In 1928 the property was leased by Aurimont Gold Mines Limited.. Little work was done by this concern. In 1940, Jack Lee of Hazelton obtained the property under contract and subsequently some additional development was done. Recently, Western Uranium Cobalt Mines, Limited obtained possession of the Hazelton View, Victoria Group, which is/an adjacent property, and the Rocher Déboulé Mine. Exploration work by this company is now being conducted.

Geology and Mineralogy

The geology is essentially the same as that of the Rocher Déboulé Mine area since the two properties are only one mile apart.

Sediments, consisting chiefly of interbedded graywacke and garnetiferous argillite, are cut by a number of strong fault fissures trending easterly and dipping northerly. These fissures pass over the crest of the mountain and down the east and west slopes to disappear under overburden.

The ore is essentially a gold bearing arsenopyrite and occurs as shoots along the fault fissures. Where the shoots occur, sheared and altered granodiorite is replaced by quartz and hornblende. Metallic minerals followed and are reported to be: arsenopyrite, safflorite, molybdenite and chalcopyrite. Gold was stated to be scattered in grains through the arsenopyrite and safflorite.

Mineralographic Analysis

One specimen from each of the three veins crossing the property was selected by Mr. Gower during the summer of 1950. These three specimens, from which three polished sections and two thin sections were made, comprise the suite of ores examined by the writer.

This material was particularly chosen because from the adjacent Victoria Group veins, Dr. J. S. Stevenson[2] had detected an appreciable amount of radio activity. Whereas this radio activeness was found to originate principally from the hornblende gangue in the veins, a repetition was believed very possible from the similarly occurring hornblende of the Hazelton View veins.

The polished and thin sections will be described below for mineral-gangue content and paragenesis as was similarly done for the Rocher Deboule ore.

<u>Section No. 1</u>. - <u>1st Vein</u>

Neither the hand specimen or the polished section revealed any metallic minerals. The section was cut and polished with the purpose of determining whether any radio active minerals were present. The Geiger count was nil and the microscope revealed nothing. The gangue is entirely recrystallized and sheared hornblende.

<u>Section No. 2. - 2nd Vein</u>

A slice from the hand specimen was mounted and superpolished and revealed two metallic minerals, arseno-pyrite and safflorite-loellingite in hornblende-quartz gangue. The specimen gave no irregularity from the base count of the Geiger.

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2. J. S. Stevenson, Mineralogical Branch, British Columbia Department of Mines, Victoria, B. C.

The arseno pyrite and safflorite-loellingite contained no visible particles of gold, which had been reported its mode of occurrence. Further, the gold proved negative by micro-chemical tests.

Considerable difficulty was at first encountered in recognizing the difference between arsenopyrite and its metasome, safflorite-loellingite. Under reflected light, the two minerals[3] have approximately the same, almost galena-white, color, but with some concentration, the safflorite-loellingite can be recognized as having a slightly lighter color. Further, this mineral accepts a little better polish. Under crossed-nicols and on a super-polished surface, the two minerals have essentially the same polarization colors varying from yellow through red to deep blue. Irregular inclusions of what later proved to be safflorite-loellingite were abundantly present, but it was not realized until later that these indicated replacement texture of another mineral and not different grains of arsenopyrite.

Another characteristic of the arsenopyrite that can be seen in this section, both under crossed-nicols and reflected light, is the distinct diamond shaped outline of the mineral when in contact with the quartz-hornblende gangue.

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3. For the purpose of this report, safflorite-loellingite will be considered as one mineral.

Microchemically, arsenic and iron were obtained but cobalt tests were difficult and doubtful.

The paragenesis shown in this section is that of partial silicification of the hornblende, followed with replacement of the gangue by arseno pyrite, which in turn was later a host to safflorite-loellingite.

The microscopic sketch (HV1) shown on page 28 illustrates the diamond shaped crystal pattern of the arsenopyrite and the replacement of this mineral by safflorite-loellingite.

Section No. 3. - 3rd Vein

From a few small fragments, one polished and two thin sections were made. These fragments, taken collectively, gave a count of 900 on the Geiger. A thin section was made from each of the two fragments giving the highest count.

Megascopically, the polished section shows a coarse banding in the silicified hornblende gangue.

Microscopically, two and possibly three metallic minerals can be seen. Arsenopyrite, barren of gold, predominates. On page 28, a microscopic sketch (HV2) shows part of a twinned crystal of the mineral. The other two minerals (if two be present) are magnetite and uraninite, and these occur within the banded zone. Some of these tiny dark minerals have a reddish halo in reflected light, while others

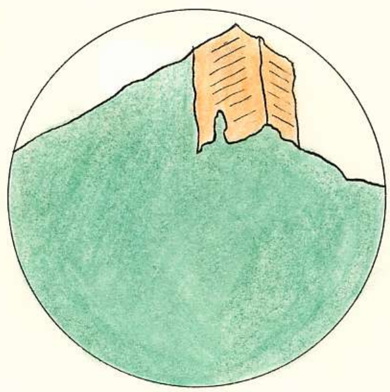
Hazelton View Group Ore

H.V. 1

34X

Replacement of quartz - hornblende gangue by arsenopyrite. Note the diamond shaped crystal form. (Text: p 26)

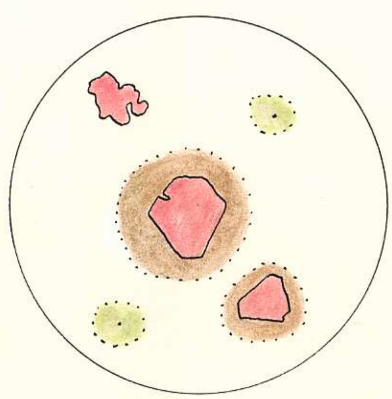
H.V. 2



34X

Twinned crystal of arsenopyrite (Text: p 27)

H.V. 3



X

Composite section showing the 3 modes of occurence of magnetite - uraninite (Text: p 29) possess none. Hence the reason for distinction . A more detailed consideration will be given in the paragraphs under "Thin Sections - 3rd Vein."

Thin Sections - 3rd Vein

No. 1. Under high power the first thin section revealed both crystalline and irregular grains of the metallic mineral (s). In general, these grains were larger than those seen in the second section taken from a fragment giving a higher Geiger count. The halos are not confined to either the crystallized or irregular grains, but it has been observed that if a grain has a crystal form, it always has a reddish brown halo. A composite high-power, microscopic sketch (HV3) on page 28 shows the 6 sided (not 8) crystal form in contrast to the irregular grains.

No. 2. This section made from the fragment giving the highest Geiger count (approximately 250), appears to contain in the hornblende three characteristically different, metallic minerals. The metallic particles are very small, even under high power, and are black in transmitted light. Each will be described as follows:

(1) Irregular and variably sized grains having no visible halo.

(2) Irregular and variably sized grains having a reddish brown halo, relatively narrow compared with the grain diameter.

(3) Tiny specks, sometimes not visible at all, having halos which are of various colors, yellowish, orange, green and brown. These colors are masked in part by the pleochroism of the hornblende, in which the grains plus halo always occur.

Under crossed-nicols, the halos are predominately of a yellowish-brown color which persists as the section is rotated. These halos definitely discolor the hornblende. Physically, the halos are always perfectly circular and may have a diameter twenty times that of the grain. It was difficult to recognize whether or not adjacent halos interfered with one another upon outward growth.

On page 86 of the 1949 Annual Report of the Minister of Mines (B.C.) is shown a photograph of uraninite crystals having no halo. Further, these crystals have an octahedral form whereas those seen by the writer appear to be six sided. However, the fact remains that some mineral or minerals is responsible for radioactivity in the vein matter.

In conclusion, but without proof, it is the writer's opinion that those metallic grains mentioned under (1) are magnetite or ilmenite, preferably the former, whereas those under (2) are the same mineral but carrying relatively appreciable amounts of uraninite. This could explain the halo, but it is recognized that a limonite halo could develop from the magnetite with difficulty. Lastly, that the grains mantioned under (3) are uraninite crystals.

Paragenesis

Primary faulting and shearing in the granodiorite resulted in the alteration of the gouge with subsequent development of hornblende actinolite. There is reason to believe that this and the movements which followed were contemporaneous with those of the Rocher Déboulé area.

It is difficult to determine the relative time of introduction of the uraninite, but it seems reasonable to assume that it entered with the development of hornblende since it is contained within this mineral.

Further movements resulted in the rise of mineralized solutions and subsequent deposition of the ore minerals in the order given below. The bracketed minerals were not seen.

(1) Magnetite - Uraninite - (in the hornblende)

(2) (Pyrite)

(3) Arsenopyrite - (with gold as an ex-solution mineral)

(4) Safflorite - Loellingite

(5) Molybdenite

Conclusions

Contributing to particular mineralogical interest, are the contrasts and similarities of the two adjacent properties as outlined in their respective ore paragenesis. In both cases hornblende is the principal gangue. This material has contributed greatly to the emplacement of the high grade copper ore of the Rocher Déboulé while the Hazelton View has been made economic by gold-bearing arsenopyrite. In addition, uraninite has,in some manner, been developed within this same gangue. Although this mineral is, at present, only a mineralogical curiosity, it is to be wondered if economic concentrations are not to be found at depth.

As a final statement, some clarification should be made regarding the use of the phrase "silver-lead ore" in most of the property reports. Assay results have always revealed silver values from the galena-tetrahedrite ore. The silver element is chemically combined within the tetrahedrite. It was at first thought by the writer that the silver bearing mineral might be freibergite, but this assumption was proved incorrect by etching and other determinative methods. ?

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Footnotes

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1911	p. 80	1917	p. 101
1912	p. 113	1918	p. 111
1913	p. 107	1928	p. 158
1914	p. 185	1929	p. 155
1915	p. 77	1930	p. 138
1916	pp. 106-108	1947	p. 96

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1917	p. 103	1927	p. 132
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