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MINERALOGRAPHIC STUDY OF THE LUCKY STRIKE GOLD MINING CO.

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Mineralographic Study of the
LUCKY STRIKE GOLD MINING COMPANY

Location

The Lucky Strike Gold Mine is located in the Lillooet District of South Western British Columbia. It is roughly 40 miles North west of the town of Lillooet in the Bridge River Area.

The Lucky Strike group of seven claims are situated within and adjacent to Taylor Basin at the head of Taylor Creek, a tributary of Tyaughton Creek, which in turn flows into Bridge River.

The mine may be reached by following the Bridge River Road and branch off at a point east of the Pearson ponds 33½ miles from Bridge River Station on the Pacific Great Eastern Railway. From the branch off you follow the new road along the Northwestern side of Tyaughton Lake, then along the high ground bordering the western side of Tyaughton Creek to Cinnabar Creek, and finally north westerly to Taylor Creek, its northwestern side being followed to the camp, a total of about 14 miles.

History

According to the Minister of Mines of British Columbia Report in 1933 the Lucky Strike of seven claims is staked and owned by Jack McPhail. In late

1935 the claims were acquired by option by the Goldside Mines Limited. Considerable work has been done on the property and samples taken assayed quite favorably. Gold ranged from 0.12 to 1.30 ounces per ton, more often around .30 ounces per ton; and silver from 0.6 to 6.0 ounces per ton. Recently it has been announced that the Lucky Strike Gold Mining Company has been incorporated in connection with the property.

General Geology of the District

Taylor Basin: (From Report of Minister of Mines of B. C., 1936) The boundaries of the basin consist of broad, smoothly-rounded, bare ridges rising to elevations of about 8,000 feet; the upper slopes being covered with talus and rock-slides through which emerge rugged outcrops of rock. The middle slopes, covered by a heavy mantle of glacial drift, are traversed by snow-fed creeks and are covered by a shrub-like growth of balsam-fir, together with a rank growth of grass and wild flowers.

The oldest underlying rocks exposed consist of highly-metamorphosed sediments of the Bridge River series. Next in ascending order are serpentines of the Shulaps volcanics and the Elderado series, referred to the Lower Cretaceous, which are locally represented by outcrops of argellite, grey feldspathic sandstone, and conglomerates. Intruding the last mentioned series are large bodies of diorite mapped as being related to the Bendor batholith.

Geology of the Lucky Strike

In the new workings, on Lucky Strike ground, geological conditions are said to be complex. The rocks are highly metamorphosed and structures are difficult to determine. As exploration work was not carried out very extensively it is not possible to definitely correlate conditions on the surface and underground. The deposits occur as lenses along the walls of dykes cutting serpentine and altered rock consisting largely of ferruginous carbonate. The dykes, striking northerly with steep westerly or vertical dips, are from four to ten feet wide. At underground points the dyke is fine-grained and porphyritic and a specimen, examined under the microscope, consists of a highly altered complex of sericite, chlorite and feldspar. Phenocrysts of feldspar were largely altered to white mica; some granular epidote is present in places, together with a very little quartz, probably secondary. Pyrite is desseminated through the rock associated in places with pale chlorite. To the south of the dyke there are irregular areas of horneblende diorite, a medium fine-grained holocrystalline, greenish rock. It is found from examining a fresh specimen under the microscope that it consists of plagioclase (andesine) 80 percent and hornblende 20 percent, the whole rock being highly chloritized. Both white mica and epidote are present. The hornblende diorite merges without definite boundaries into a dense dark rock with green serpentinized phases.

The mineralization consists mainly of sulphide streaks and masses occurring in irregular lenses on one or both sides of the dykes, also penetrating them in places. The gangue is generally silicified altered rock, with minor amounts of quartz and occasional calcite, the sulphide masses at underground points frequently being associated with a bright-green chlorite mineral.

Surface showings are found on the steep southerly slope of the ridge at an elevation.of 6,575 to 6,620 feet. In this outcrop section, which follows a bearing of about north 7 degrees west, the showings are along the eastern side of a basic dyke from 8 to 10 feet wide, dips being westerly at angles of from 65 to 85 degrees or in some cases vertical. The dyke cuts brown-weathered soft rock, probably altered serpentine, which is traversed, in places, by numerous veinlets of chalcedony.

Another section of vein-outcrop, possibly the faulted southerly continuation of the previously described showings, is exposed in bluffs at 6,600 to 6,610 feet elevation on the western and south-western slope of the ridge just below its apex.

At its southern extremity the showing splits into stringers and at the northern end it curves north-easterly and is then dragged south-easterly along an apparent fault striking towards the first described vein section. Just south of the fault a hornblende-porphyry dyke, three to four feet wide, causes minor displacement. The vein consists of banded sulphides and decomposed streaks between smooth, approximately vertical walls.

Results of Assays on open cuts (Provincial Survey)

Assays on material sampled from open cuts are:

	Ounces per ton		Percent
Sample across	Gold	Silver	Zinc
56 inches	0.12	3.0	10.1
36 inches	1.02	6.0	18.3
10 inches	1.04	2.0	----

Mine Workings and Assays (Mines Report of B.C.)

The portal of the adit, at 6,275 feet elevation, is 422 feet on a bearing of north 32 degrees 35 minutes west for 390 feet. At station Number 1, 368 feet in from the portal, drifts extend northerly and southerly. The north drift, extending north 21 degrees west for 66 feet, contains a winze 11 feet deep, between points 25 and 35 feet from Station Number 1. The south drift has been driven south 13 degrees east for 99 feet to Station Number 2, then south 18 degrees 45 minutes east for 84 feet to Station Number 3, and finally south 34 degrees 20 minutes east for 20 feet to Station Number 4, where a fault cuts off the dyke and shearing and a crosscut extended south 50 degrees west for 37.5 feet. (This face was being advanced). Beyond Station Number 4 the main working continues south 45 degrees east for 17 feet to the face. Other workings consist of a curving branch driven 25 feet southerly from Station Number 2 and a branch 6 feet long east of Station Number 3. In the drift sections the dyke is from 4 to 5 feet wide, its western wall being generally well marked with gouge and evidence of shearing. The eastern wall is poorly defined in general. Dips at underground points approximate the vertical with a tendency to dip westerly. In the north drift between Station Number 1 and the winze, 25 feet northerly, mineralization is present on both sides of the dyke, the two narrow pay-streaks joining and forming a short lens across the full width of the drift at a point 2 feet southerly from the winze. Northerly from the winze the western pay-streak, average 4 inches wide, extends for 16 feet. The dyke comes to a point, terminating here, and beyond the face, which is in schistose greenstone, the sheared western fracture continues without any mineralization. Along the eastern wall, between chainage points 8 and 10 feet northerly from the winze, there is a feet length of mixed sulphide mineralization 3 inches wide. The following samples, taken along the continuous western pay-streak section, 45 feet in length, are referred to chainage points northerly from Station Number 1:

Inches Across	Feet At	Ounces per ton Gold	Ounces per ton Silver	Percent Zinc	Percent Arsenic	Percent Antimony
6 - 8	10.	0.26	1.0			
10	15.5	0.40	0.6			
64	23.	0.74	2.8	4.7	1.15	4.0
36	30.	0.56	0.8			
4/av.	35-51	0.60	2.0			

A sample across 10 inches representing a 2 feet lens on the eastern wall, between chaingages 43 and 45 feet northerly from Station 1, assayed:

Gold	0.40 ounces per ton,
Silver	0.6 ounces per ton.

A sample representing a narrow lens, swelling up to 24 inches, along the eastern wall between chainages 10.5 feet northly and 3.5 feet southerly from Station 1, extending across the drift-crosscut intersection, assayed:

Gold	1.30 ounces per ton
Silver	1.2 ounces per ton.

At its northern end this showing pinches and then reappears just south of the winze, where it is included in the 64 inch width sampled at the junction of the two pay-streaks. In the 11 foot winze, where mineralization is irregular, the two pay-streaks have joined and form a 7.5foot width at from 7.5 to 8.5 feet down from the collar just above the water level. Samples across this 7.5 foot section on the northern and southern sides of the winze assayed respectively:

Gold	Silver	Zinc	Arsenic
Ounces per ton		Percent	
0.44	3.0		5.3
0.50	1.0	8.2	0.65

On the southern side of the winze, 6 feet below the collar, the vein complex from west to east is as follows:

1. 6 inches of massive sulphides
2. 49 inches of rock-parting
3. 28 inches chiefly consisting of massive sulphides.

Assays of 6 and 28 inches sections are:

Sections	Gold (Ounces per ton)	Silver (Ounces per ton)	Arsenic (Percent)
6 inches	0.20	1.0	9.0
28 inches	0.70	2.2	8.7

Chaining southerly from Station Number 1, mineralized sections along the western wall of the south drift are as follows:

(1) 28 foot length, averaging 11 inches in width, between 8 and 36 feet, which assayed:

Gold 0.24 ounces per ton

Silver 0.1 ounces per ton.

(2) 18 inch length, up to 4 inches wide, between 51 and 52.5 feet.

(3) 16 foot length of irregular mineralization, 4 to 8 inches wide, between 59 and 75 feet.

According to the company's assay-plan, valves in the above Numbers 2 and 3 sections are low grade.

REPORT OF STUDY

The following is a report on a brief microscopic study of polysections made from specimens of ore veins collected and submitted by Mr. E. A. Schmidt to Dr. H. V. Warren of the Department of Geology of the Univerisity of British Columbia. The suite of ores is supposed to be samples of the mineralization at the Lucky Strike Gold Mine.

The Suite of Ores

As the specimens are not labelled as to the positions in the mine at which they were collected correlation of the results of the following study with the vein cannot be made. A further disadvantage caused by the "non-labelled" specimens is that the observations will bear different significances if all the specimens came from different positions of the same vein than if they came from different veins.

General Classification of the Specimens

Roughly the suite of ores may be divided in six different types of ore. They are, as they are now labelled.

Lucky Strike

No. 1: A narrowly banded ore of mainly

pyrite, pyrrhotite, quartz and bright green chlorite.

No. 2: A heavy sulphide of chiefly sphalerite and pyrrhotite with little of anything else visible to the naked eye.

No. 3: A silvery colored ore quite finely banded and consisting mostly of arsenopyrite jamesonite and quartz stringers.

No. 4: Specimen of almost pure radial clusters of acicular crystals of stibnite impregnated with brown sphalerite.

No. 5: A highly crystalline ore of mainly arsenopyrite with small amounts of stibnite, jamesonite, calcite and quartz. The ore is very fragmental and brittle so that sections had to be made in dammer gum sets.

No. 6: Another banded ore specimen which consists of highly crystalline, but badly crushed and fractured arsenopyrite, jamesonite and pyrite with filling gangue of quartz.

No. 7: This cannot be classed in another division for it resembles very closely to the samples of class Number 1.

Summary of results of observations

The summary will be divided into two parts;

first, a description of the separate minerals, and secondly, a sketch of the propounded paragenesis.

Gold

Gold, being the chief commercial mineral of the property, will be discussed first. Of the seventeen polysections made from the suite of ores, and after careful microscopic studies, no visible gold has yet been found. Two reasons may be offered for this latter condition.

1. Since assay reports of samples of the mine show that the average values of gold are low, particles of gold must necessarily be rare.

2. Since magnification used to study the sections was not high and since gold may occur in very fine particles, possible presence of fine gold may have been missed.

Pyrite

This mineral is found in the ores of classes numbers 1 and 2, and occur in great abundance. It is usually massive but sometimes well crystallized in fairly large crystals. It is badly fractured and is usually healed by quartz, primary and secondary, with borders of calcite stringers. The pyrite is often found to encompass and encroach upon sphalerite, pyrrhotite and chalcopyrite as is shown in diagrams $1A_1$, $1A_2$, 1B , 2A, and 2B. Where pyrite occurs in suspended crystals a circumscribing rim of secondary quartz is commonly found. This latter is exemplified in diagrams 1A, and $1A_2$.

It is also interesting to note that pyrite is not found in the types of ores other than those named above except as very rare occasional crystals.

Sphalerite

Sphalerite is found in every class except in class No. 3, the silvery colored finely banded ore of mainly arsenopyrite, jamesonite and quartz. Sphalerite, therefore, has a widespread occurence in the Lucky Strike mineralizations. Structurally, sphalerite is massive and quantitatively it is abundant under the microscope. In the hand specimen this mineral shows the common characteristics ,with its usual brown resinous lustre and indicative brown streak. This material is observed to be commonly replaced by stibnite. It is often fractured and healed by quartz and calcite. Its boundaries are usually very irregular giving a strong impression of corrosion. Paragenetically, sphalerite and pyrrhotite are intimately related as is typically illustrated by diagram 2A.

Another characteristic of sphalerite is that chalcopyrite where found is almost exclusively occluded in the sphalerite phase as tiny specks and blades. This latter feature is well illustrated in diagrams 2B, 4A, and 4B.

It is found, therefore, in association with pyrrhotite, chalcopyrite, pyrite, stibnite, quartz and calcite.

Pyrrhotite

Pyrrhotite, generally is not as abundant as the two preceding minerals described. It is, however, very abundant in the specimens of class No. 2, but it occurs only sparsely in the rest of the different types of ores with the exception of class No. 3, the stibnite ore, where it is not found at all. Where the pyrrhotite is found sphalerite is found to be present also, and in close relation. Either the pyrrhotite and sphalerite both occur in corroded irregular blebs and masses or that the pyrrhotite is found to form a graphic structure in the more or less continuous phase of sphalerite. The first of these conditions is illustrated in diagram 1B while the latter condition is illustrated in diagram 2A.

Chalcopyrite

This mineral is observed in very small amounts. It occurs in tiny specks and blades or in small irregular blebs with the sphalerite.

Chalcopyrite as found in the different specimens does not seem to occur separate from the sphalerite. This seems to indicate that either the sphalerite has almost wholly replaced the chalcopyrite by some reaction or other or, the chalcopyrite is formed from the same mineral solution as the sphalerite by the method of unmixing. The corroded and encroached nature of some blebs of chalcopyrite does not, however, seem to support the latter theory.

Arsenopyrite

Arsenopyrite occurs abundantly in classes No. 3, No. 5, and No. 6 but only in minor amounts in class No. 4.

In class No. 3, illustrated by diagram 3A, the arsenopyrite is found in alternating bands with jamesonite and quartz. Both arsenopyrite and jamesonite, in places, have been fractured by quartz. Arsenopyrite and jamesonite apparently were deposited contemporaneously as is illustrated by the mixtures of crystals occluded one in the other.

In diagram 3B arsenopyrite is seen associated with pyrrhotite and badly fractured by quartz veinlets.

In class No. 5 arsenopyrite formed the major part of the specimen, the minor part being composed of jamesonite and intruding quartz.

In class No. 6 the arsenopyrite is highly crystalline, ~~by~~ badly fractured and crushed. Quartz and possibly feldspar comprise the healing material.

Jamesonite

Jamesonite is found in ores of classes No. 3 and No. 6. This mineral is very soft and gives a very definite test with the standard reagents. The mineral as seen has very little tendencies of forming crystals, rather it occurs mainly as blebs or bands with irregular boundaries.

Jamesonite is not found in any of the other types of ores. Deriving from this assertation it is to be noted that, jamesonite in the Lucky Strike mineralization, occurs only in association with arsenopyrite and in those types of ores where arsenopyrite is abundant.

Jamesonite is often noted to be suspended in the form of blebs in the continuous quartz phase of the section.

Stibnite

Stibnite is found in classes No. 4, No. 5, and No. 6. In No. 4 and No. 6 the hand specimen is almost pure stibnite with small amounts of sphalerite impregnated through the needle-like crystallized mass. In No. 5 stibnite is found only in small amounts in association with the arsenopyrite and jamesonite.

Sections of No.4 and No. 6 under the microscope show pure glistening stibnite forming the main mass. It is very little fractured and sphalerite with its specks of chalcopyrite is found here and there in small masses. The sphalerite is usually fractured and healed either by quartz or calcite. The fractures of the stibnite is usually filled by quartz but the very fine fractures are often filled by fine veinlets of calcite. This is illustrated in diagram 4A.

Silver

According to assays, silver occurs in small amounts but this has not yet been seen in any form under the microscope.

Calcite

This is one of the gangue minerals present in the ores. It is found in every one of the classes but not to any great amount.

It occurs commonly as a filler for the fractures within the sphalerite masses. It is also seen to form narrow borders for the quartz veinlets.

The peculiar manner in which this mineral associates itself with quartz leaves no doubt to the belief that it came in as a solution with the quartz.

Some of the common methods of occurence are illustrated in diagrams 2B, 4A, and 4B.

Chlorite

This mineral is closely related with the quartz intrusions. It occurs in a bright green color following the streams of quartz lenticularly and has no tendency to form tributaries into the surrounding minerals off the main course of travel of the quartz.

It is noted only in class No. 1, the banded sulphide ores. There is not a large quantity of this gangue mineral. Its bright coloration, however, renders it very attractive and prominent.

There is every indication of its secondary origin but what its origin is, is not determined.

Quartz

This mineral comprises the main constituent of the gangue. It occurs as a continuous phase having in suspension crystals of the other minerals or, as veinlets filling fractures or, as crystals surrounding crystals of pyrite especially. Associated with it in the same stream are the two previously described minerals, calcite and chlorite.

The quartz seems to be composed mainly of two varieties namely; primary and secondary. Primary quartz is found far in excess of the secondary variety.

The primary and secondary varieties are accurately represented together in diagrams $1A_1$ and $1A_2$.

Quartz have been found to cut at some place or other every type of mineral present in the suite of ores. There is little doubt as to the late origin of this gangue.

Paragenesis

The theory of order of origin is derived from knowledge gained from Fairbanks, from Lindgren and from indicative evidences of observation.

In short the order of deposition is believed to be as follows:

1 Chalcopyrite
2 Pyrrhotite
3 Sphalerite
4 Pyrite
5 Jamesonite
6 Arsenopyrite
7 Stibnite
8 Quartz
9 Calcite
10 Chlorite

Chalcopyrite

Chalcopyrite where it is found is nearly always corroded and surrounded or encroached upon by either or together, pyrite, sphalerite and pyrrhotite.

In diagrams $1A_1$ and $1A_2$ pyrite is shown intruding upon chalcopyrite. In diagram 2A the very irregular mass of chalcopyrite is attacked by pyrite, sphalerite, pyrrhotite and quartz.

Diagrams 2B, 4A, and 4B show chalcopyrite in specks or spicules totally surrounded by sphalerite. These and many similar conditions led to the conclusion that chalcopyrite was first.

Pyrrhotite

Pyrrhotite is found in irregular masses and in graphic forms included or surrounded by sphalerite. The graphic textural form of pyrrhotite in sphalerite may discount in some way the indication offered by the surrounded irregular masses of pyrrhotite, that pyrrhotite is earlier than sphalerite. However, if the graphic textural form typifies unmixing then pyrrhotite is still deposited earlier than sphalerite although not to a great difference of time.

Then there is the high possibility of overlapping in period of deposition.

Sphalerite and Pyrite

Pyrite is obviously later than sphalerite and at the same time later than pyrrhotite and chalcopyrite. Numerous evidences support this statement.

Diagrams $1A_1$, $1A_2$, and 1B show pyrite attacking and encompassing chalcopyrite and pyrrhotite. Diagrams 2A and 2B show pyrite intruding into and markedly cutting pyrrhotite and sphalerite.

Jamesonite and Arsenopyrite

In places not shown in any of the diagrams but in polysections made from ore of class No.3, pyrrhotite has been found to be surrounded and attacked by both Jamesonite and arsenopyrite.

Arsenopyrite and jamesonite deposition periods overlap. In fact diagram 3A seem to show that these two minerals were deposited together at the same time. The bottom half of the diagram gives a weak proof that jamesonite may have started to crystallize just a little ahead of arsenopyrite.

Stibnite

Diagrams 4A and 4B shows definitely that stibnite is later than the neighbouring sphalerite.

In polysections 5A and 5B where stibnite occurs in small quantities, either it is suspended away from everything else in quartz or it intrudes into the accompanying jamesonite and arsenopyrite.

Quartz

There is no doubt that quartz was intruded after the formation of all the preceding minerals. It is probable that quartz did not enter into the mineralization till some time have lapsed after the first minerals were deposited.

Calcite

The way in which calcite occurs has all the earmarks of late deposition in relation to quartz. It rims and borders the quartz veinlets and fill fine fractures where there is no quartz. It seems therefore that calcite enter by following the weak contacts between quartz and the other minerals and at the same time probably caused new fractures. These new fractures whether they are caused directly by the calcite intrusion or not is nevertheless filled by calcite and calcite alone. The fact, therefore, is substantiated, that calcite intruded later than quartz.

Chlorite

Chlorite is secondary and must necessarily be later than quartz.

DESCRIPTION OF DIAGRAMS

$1A_1$

This section is part of a polysection made from a hand specimen of banded sulphides. The drawing shows the fracturing of the pyrite very indicatively. Associated with the pyrite is the secondary, chalcopyrite and quartz. The character and position of the chalcopyrite seems to indicate that it is the early mineral in relation to the pyrite. The chalcopyrite is corroded and almost completely replaced by the pyrite.

There is no doubt that the quartz came in quite late and filled up part of the fractures between the early minerals. The secondary quartz must be late and formed by recrystallization. The recrystallized quartz almost surround the pyrite. At other parts of the polysection not shown in the drawing calcite stringers are found to follow the fractures of the quartz quite faithfully while also at still other parts we find the calcite in small blebs quite isolated from everything by the quartz phase.

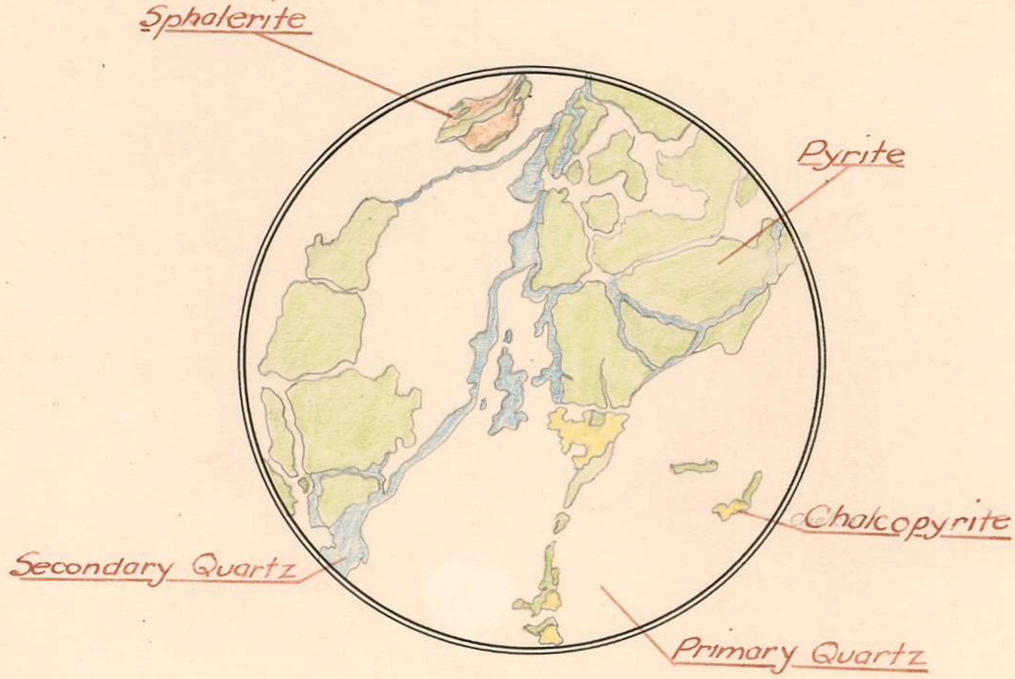

Diagram $1A_1$

Features to be noted in this diagram are:

1. The fractured condition of the pyrite.
2. The corroded nature of the chalcopyrite.
3. The secondary quartz.
4. The association of the sphalerite.
5. The continuity of the quartz phase.

$1A_2$

This is another section of the same poly-section as in $1A_1$. It shows some other features. Pyrrhotite is found here in association with ~~the~~ pyrite and quartz. A speck of chalcopyrite is found also at the bottom right corner. It shows the same corroded feature as in $1A_1$ giving an appearance of replacement by the pyrite.

The most important features shown here are:

1. The sharp boundary of the pyrite.
2. The corroded feature of the pyrrhotite.
3. The circumscribing tendency of the secondary quartz always tended to follow the outline of the pyrite.

Feature 1: indicates the resistance of pyrite, to the corrosion effect of the later minerals.

Feature 2: gives almost positive evidence of the early deposition of the pyrrhotite. The surrounding and encroaching effect of the pyrite shows definitely that the pyrite is late. It is possible that from this and from description of $1A_1$ that chalcopyrite and pyrrhotite were deposited at the same time.

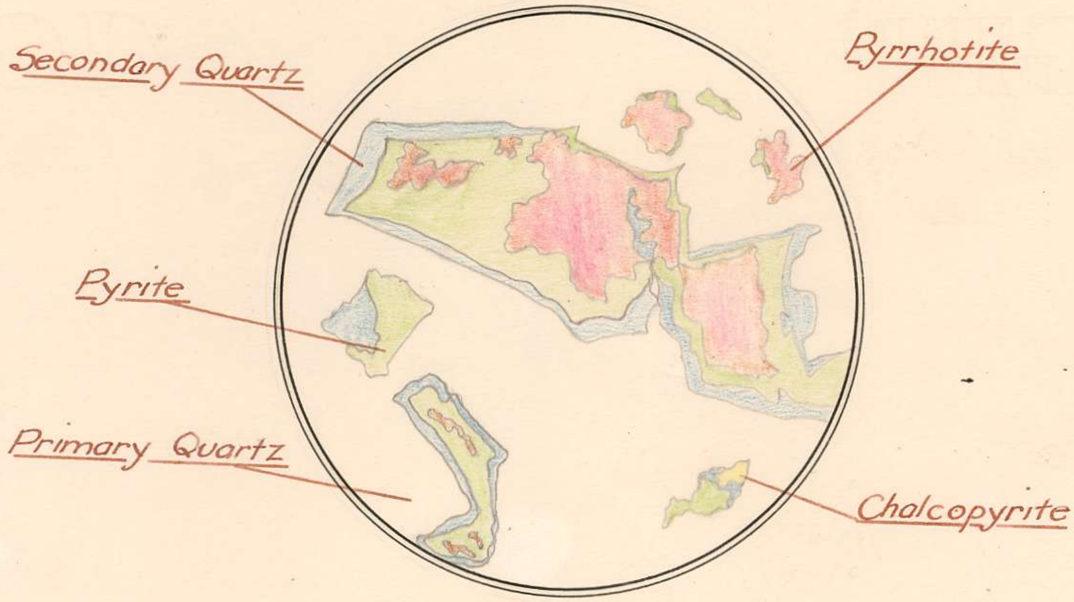

Diagram $1A_2$

Diagram show relations among pyrrhotite, chalcopyrite, pyrite and quartz.

Note the following:

1. The sharp boundary of the pyrite.
2. The corroded feature of the pyrrhotite.
3. The circumscribing tendency of the secondary quartz.

1B

This is another polysection of the same banded sulphide as in 1A.

The diagram shows part of a stringer of pyrite in the centre. At the bottom is a corner of the main mass of mineralization.

The stringer shows the complete inclusion of sphalerite and pyrrhotite by the intruding late pyrite. Note that the contact between the sphalerite and pyrrhotite is irregular and that the contact between the pyrite and quartz is smooth.

The bottom part of the drawing does not typify the actual condition. The pyrite as shown does not reveal any indications of late deposition but on the side of the mass not shown in the diagram the pyrite definitely intrudes upon the sphalerite and pyrrhotite combination.

In this polysection chalcopyrite have been found to be occluded in the sphalerite in tiny specks.

The intimate relation between the sphalerite and pyrrhotite is quite pronounced.

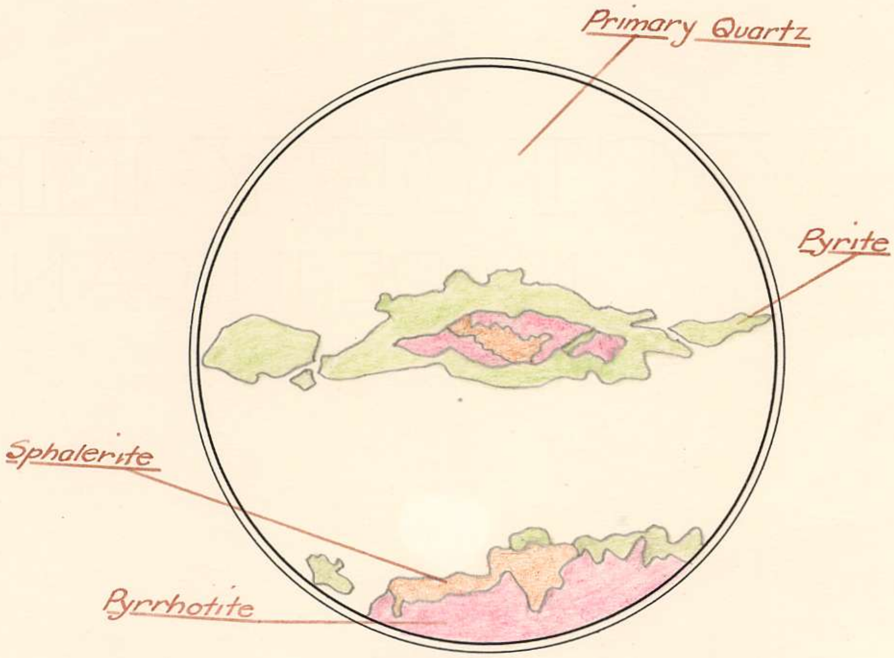

Diagram 1B

View of a polysection, made from banded sulphide ore, showing stringer of pyrite in the centre with the main mass of the mineralization at the bottom.

Note that contact between pyrite and quartz is smooth while that between pyrite and the two included minerals is irregular.

Stringer shows the complete inclusion of sphalerite and pyrrhotite by the intruding late pyrite.

2A

A view of a polysection made from a hand specimen of apparently sphalerite and pyrrhotite ore. This view shows the relation between chalcopyrite, sphalerite, pyrrhotite, pyrite and quartz.

The features to be specially noted are:

1. The intruding nature of the massive pyrite.
2. The fractures of the pyrite and sphalerite due to the intrusion of the late quartz.
3. The graphic texture of the pyrrhotite in relation to sphalerite.
4. The corrosion and encroachment of the chalcopyrite.
5. The small amount of "graphic-structure" pyrite.

Feature 1: gives strong and more evidence of the fact that pyrite was of later deposition than the chalcopyrite, sphalerite, and pyrrhotite.
Feature 2: where the quartz cuts through both the pyrite and the earlier mineral, indicates thats the quartz follow the intrusion of the pyrite. It is to be noted that the quartz have a tendency, as indicated here and elsewhere on the polysection, to intrude along the contacts between the

pyrite and the earlier minerals. This condition is quite obvious and could be explained by the fact that along this contact is a line of weakness.

Feature 3: The graphic texture of the pyrrhotite in sphalerite gives strong indication of contemporaneous deposition of the two minerals.

Feature 4: The corrosion of the chalcopyrite shows that it must have been one of the earliest minerals.

Feature 5: Since from previous facts pointed out, pyrite was shown to have come in later than pyrrhotite and sphalerite, this graphic texture of a small amount of pyrite would seem to set up a contradiction. This, however, is not quite so alarming. It is quite highly possible that the period of deposition of pyrite and the other minerals overlap. That is to say, the theory of pyrrhotite and sphalerite depositing first is still true, but near the end of the period of deposition of the sphalerite and pyrrhotite the pyrite came in, thus forming this intimate relation between the pyrite and sphalerite.

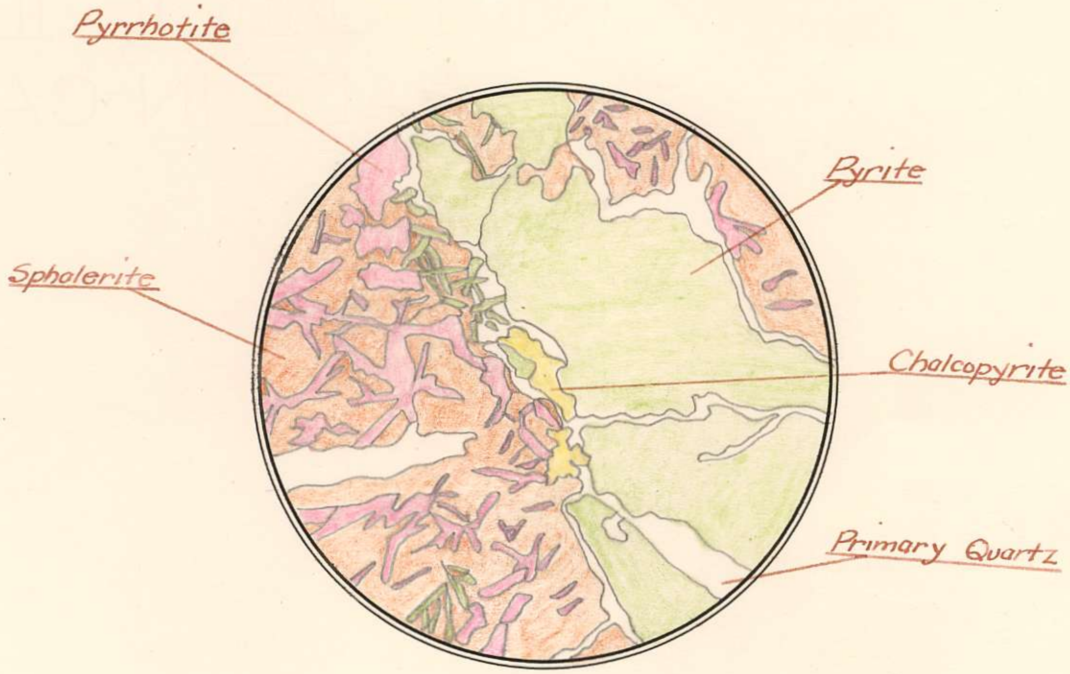

Diagram 2A

Features to be noted in this diagram are:

1. Intruding nature of massive pyrite.
2. Fracturing of both pyrite and sphalerite.
3. Graphic texture of pyrrhotite in sphalerite.
4. Encroachment upon chalcopyrite.
5. Small amount of "graphic texture" pyrite.

2B

This is another section of the specimen of sphalerite ore from the Lucky Strike Mine. This shows the relation between six of the minerals present in the ore namely; sphalerite, pyrite, chalcopyrite, calcite, quartz, and pyrrhotite.

The interesting features of this view are:

1. The corroded specks of chalcopyrite included in the sphalerite.
2. The distinctive cross cutting and complete enveloping of the sphalerite by pyrite.
3. The graphic textural relation between sphalerite and pyrrhotite.
4. The intimate relation between quartz, pyrite, and calcite.

The first feature is more indication of the earlier deposition of chalcopyrite and the replacement of chalcopyrite by sphalerite. This relation of specks of chalcopyrite in sphalerite is very commonly noted in especially this type of ore from Lucky Strike.

The second feature relating to the crosscutting of the sphalerite by pyrite definitely confirms the theory stated before that pyrite is later than sphalerite.

Feature three is just some more showings of this relation.

Feature four shows a mineral not mentioned before. The intimate relation of quartz, pyrite and calcite as shown in the drawing gives the impression that the calcite came in with the quartz. The exact time of deposition would be difficult to determine but there is hardly any doubt that pyrite intruded into the earlier minerals (sphalerite and pyrrhotite) first, then quartz and calcite followed in afterwards along the contacts between pyrite and the earlier minerals. The contacts being especially chosen because it is a zone of weakness.

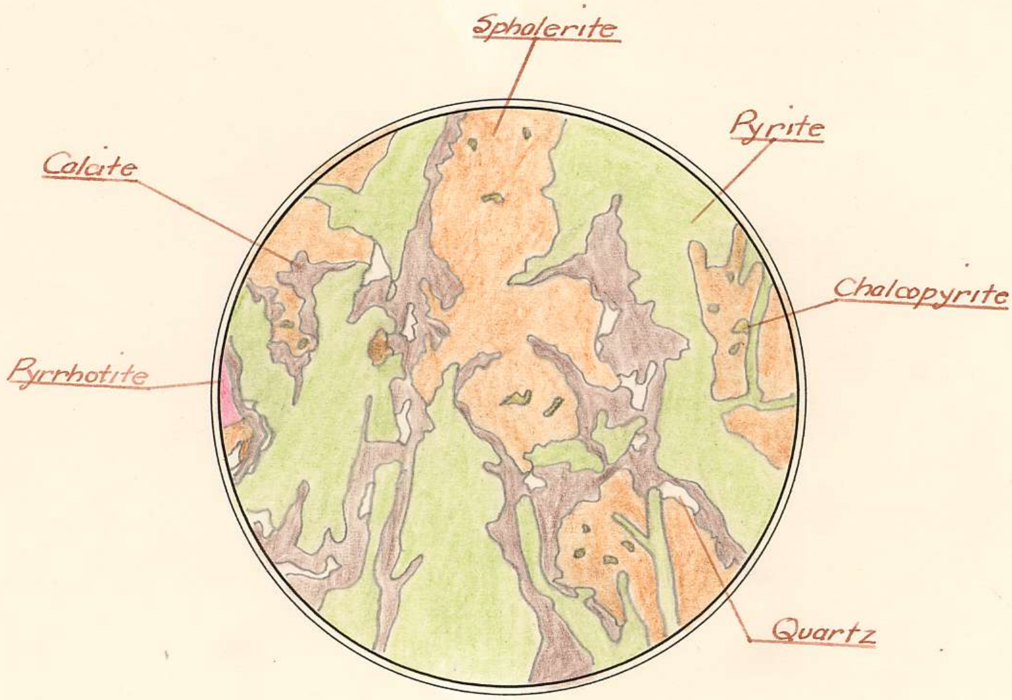

Diagram 2B

Interesting features of this view are:

1. Chalcopyrite specks in sphalerite.
2. Distinctive crosscutting of sphalerite by pyrite.
3. Graphic textural character of sphalerite and pyrrhotite.
4. Intimate relation among quartz, pyrite, and calcite.

3A

This is a view of another specimen from the Lucky Strike Mine. This specimen from general observation contains serpentine, chlorite, quartz, chalcopyrite, pyrite, sphalerite, arsenopyrite, jamesonite and pyrrhotite. The structure is intricately banded.

This particular view shows only the arsenopyrite, jamesonite and quartz.

Interesting points indicated in this view are:

1. The general banded structure of the different minerals present.

2. The graphic intergrowth of jamesonite in the arsenopyrite.

3. The fracturing of the arsenopyrite and jamesonite by the quartz.

The banded structure and the graphic intergrowth are earmarks of contemporaneous deposition of the arsenopyrite and jamesonite. The graphic intergrowth exemplifies the well known fact that you cannot have perfect banding or perfect differentiation.

The manner in which the arsenopyrite and jamesonite are fractured and badly broken up gives strong indication to the fact that the quartz intruded, in between the zone of weakness along the line of banding, later in the period of ore formation.

Other features not shown in this view but is found in the section are, the transverse fracturing of the bands of sulphides by the quartz and the parallel association of the bright green chlorite with the quartz. Apparently the chlorite was formed after or during the same time as the intrusion of the quartz.

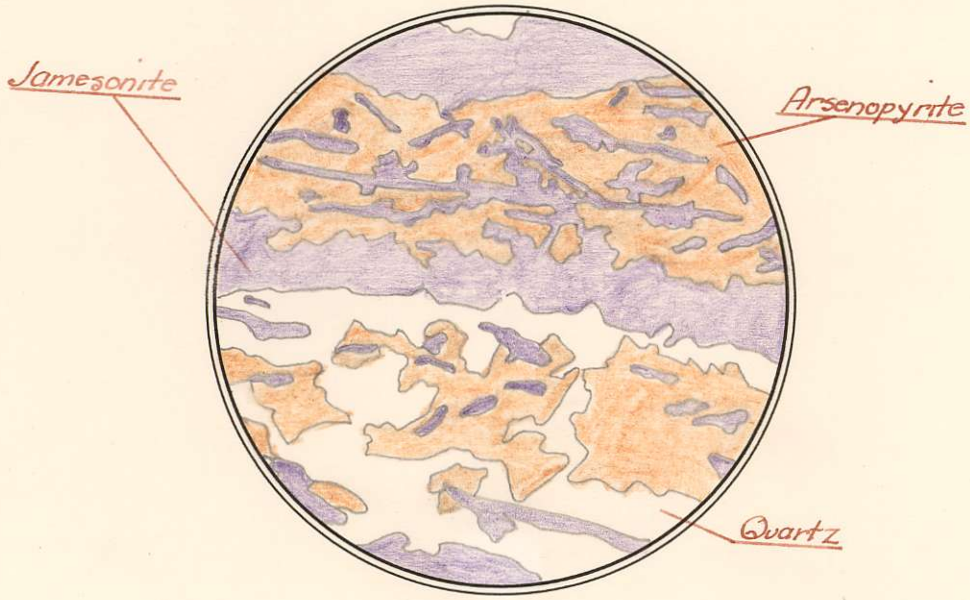

Diagram 3A

Interesting points indicated in this view are:

1. General banding of the different minerals present.
2. Graphic intergrowth of jamesonite in arsenopyrite.
3. Fracturing of jamesonite and arsenopyrite by quartz.

3B

This is a view of a polysection made from the same specimen as in 3A.

This shows the relation among jamesonite, arsenopyrite, pyrrhotite, and quartz. Two salient points of interest shown in this diagram are:

1. The largeness and the shapeliness of the crystals of the metallic minerals.
2. The line of fracture of the quartz gangue.

The size and shape of the crystals shows that the minerals are formed slowly and quite possibly contemporaneously.

The quartz fracture the mineral body along the crystal contacts, again choosing the easiest path. Considerable crushing are shown in parts of the drawing. There is of course no doubt to the fact that the quartz came in after the minerals were crystallized.

Note particularly how even the fractures fit into one another.

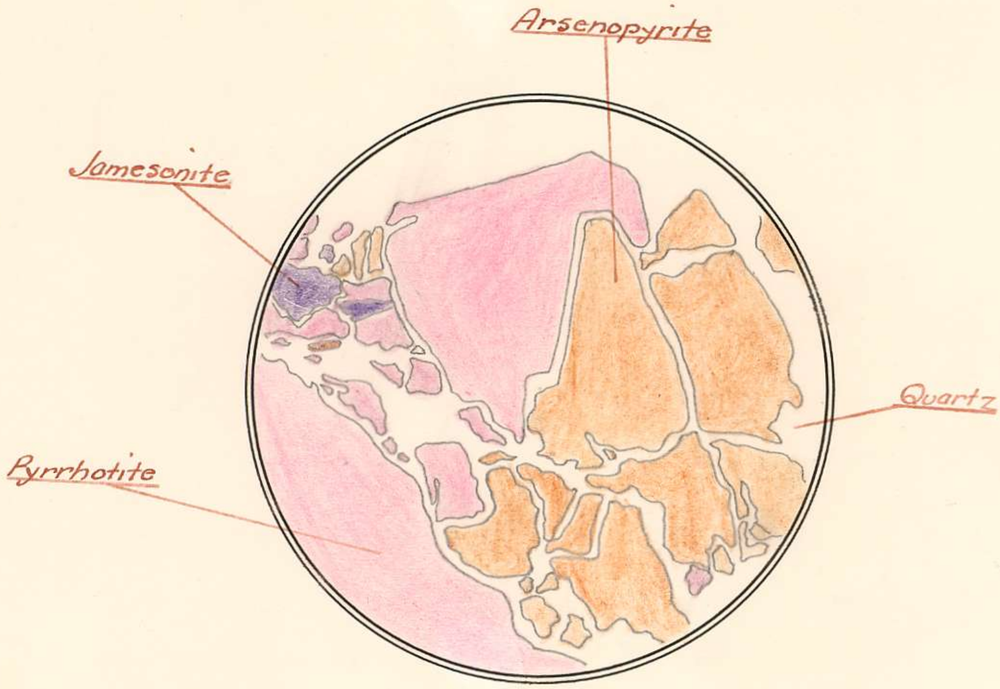

Diagram 3B

Two salient points of interest shown in this diagram are:

1. Largeness and shapeliness of the crystals of the metallic minerals.
2. Position of the line of fracture. (along contacts)

4A

This polysection is made from a piece of stibnite which to the naked eye looks quite pure. This particular piece of ore was made up of pyramidal radiating groups of acicular crystals.

The view shown here is quite typical of the specimen where sphalerite is found. Here we see sphalerite in its usual association with small specks of chalcopyrite. Calcite and quartz are also shown.

It is to be noted that the quartz with is tributaries of calcite cut both stibnite and sphalerite with its chalcopyrite. This latter condition signifies that quartz and calcite intruded later than all the other minerals shown.

Although this view does not show the paragenesis of the stibnite in relation with sphalerite other parts of the specimen do definitely show that stibnite is later in deposition and encroaches entirely upon the sphalerite.

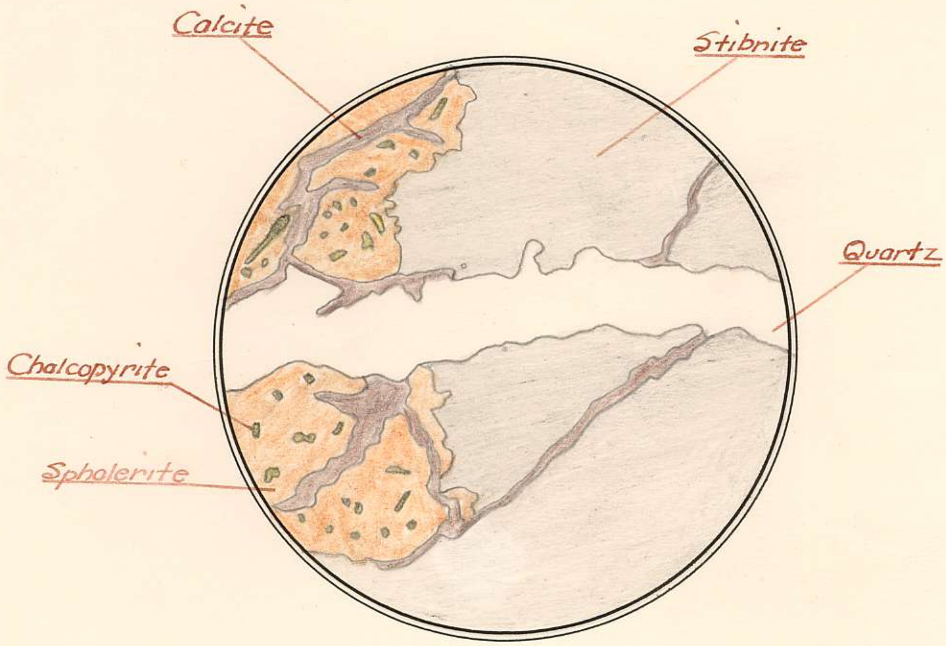

Diagram 4A

View here is quite typical of specimen where sphalerite is found. Chalcopyrite is as usual in specks occluded in sphalerite. Calcite cuts both stibnite and sphalerite.

4B

This is a polysection made from specimen labelled by Mr. E. A. Schmidt as sample of Goldside Dump. The sample is composed chiefly of stibnite with impregnations of sphalerite.

The view shown in the diagram is a spot picked at a contact area between sphalerite and stibnite.

The diagram shows the intruding nature of the stibnite. It is to be noted that here again the chalcopyrite occurs as specks and blebs within the phase of sphalerite. The quartz is seen to cut both stibnite and sphalerite. Calcite shown here occurs as both blebs and stringers.

5A and B

The two polysections are made from a piece of heavy sulphide which is very fragmental. The ore contained chiefly arsenopyrite. Stibnite, jamesonite, calcite and quartz occur only in minor amounts. Conditions shown in these two sections are quite, generally, similar to what has already been illustrated. One feature need be noted and that is the richness of the arsenopyrite relative to the small amount of the other minerals.

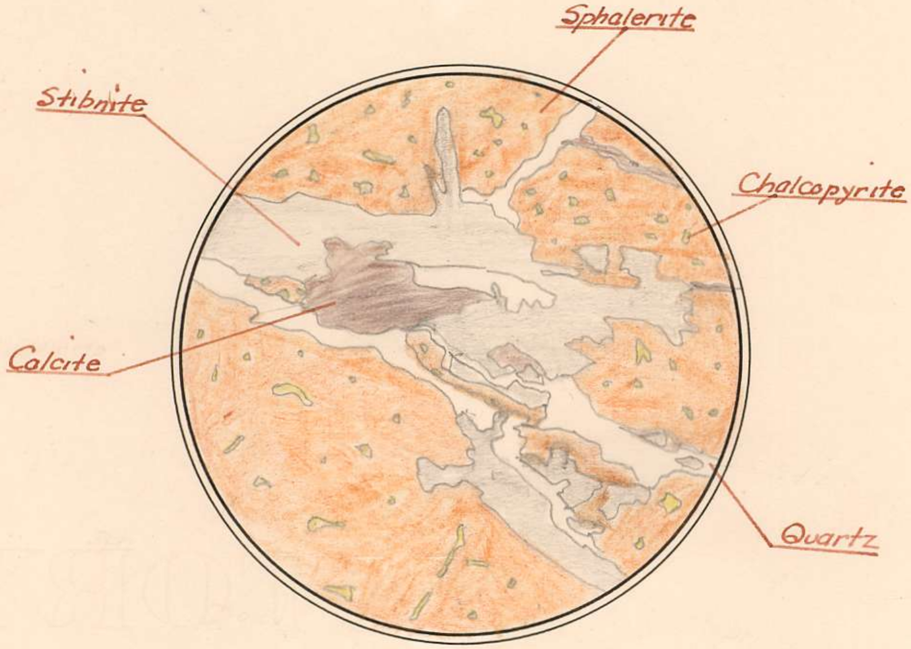

Diagram 4B

Contact area between sphalerite and stibnite. Note intruding nature of stibnite. Calcite occurs here as blebs and stringers.

6A and B

These two polysections like 5A and B showed no new features. The different minerals are highly crystallized but at the same time badly fractured and crushed. The jamesonite occurs in blebs here. The hand specimen shows a tendency of banding of quartz. Main constituents are arsenopyrite, jamesonite, chalcopyrite, quartz and probably feldspars.

7A, B, and C

Polysections 7A and B are almost identical with those of class No. 1. Polysection 7C is quite similar to the stibnite specimens of class No. 4.

Suggestions for further study

Three suggestions for further study of this suite of ores are as follows:

1. That some of the specimens be set in bakelite and polished in oil suspended abrasives to bring on a higher polish. Some of the specimens have been found to be extremely difficult to polish in the ordinary felt lap.

2. That a microscope with a higher magnification be used to try to find the gold which apparently occurs in very fine graims.

3. That a determination be made of an unknown mineral which has not yet been distinguished. This mineral occurs in rare and minute quantities. It is usually found in the middle of calcite stringers. It is very soft and has the appearance and color of galena under reflected light. Because it is occluded with or around calcite micro-chemical tests are difficult to make. It seems to be tarnished almost black by HNO_3 but this can not be assured because the acid when applied instantly reacts with calcite to give a white coating by effervescence and covers up everything. After the acid is wiped off. The surface is dulled and rugged and a needle applied to the area flakes off black or greyish scales. What this substance is may be important.