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A MINERAGRAPHIC EXAMINATION OF SOME ORES OF THE UNUK RIVER AREA, BRITISH COLUMBIA

by Marcel J. Guiguet

For Credit in Geology 9 March 1938

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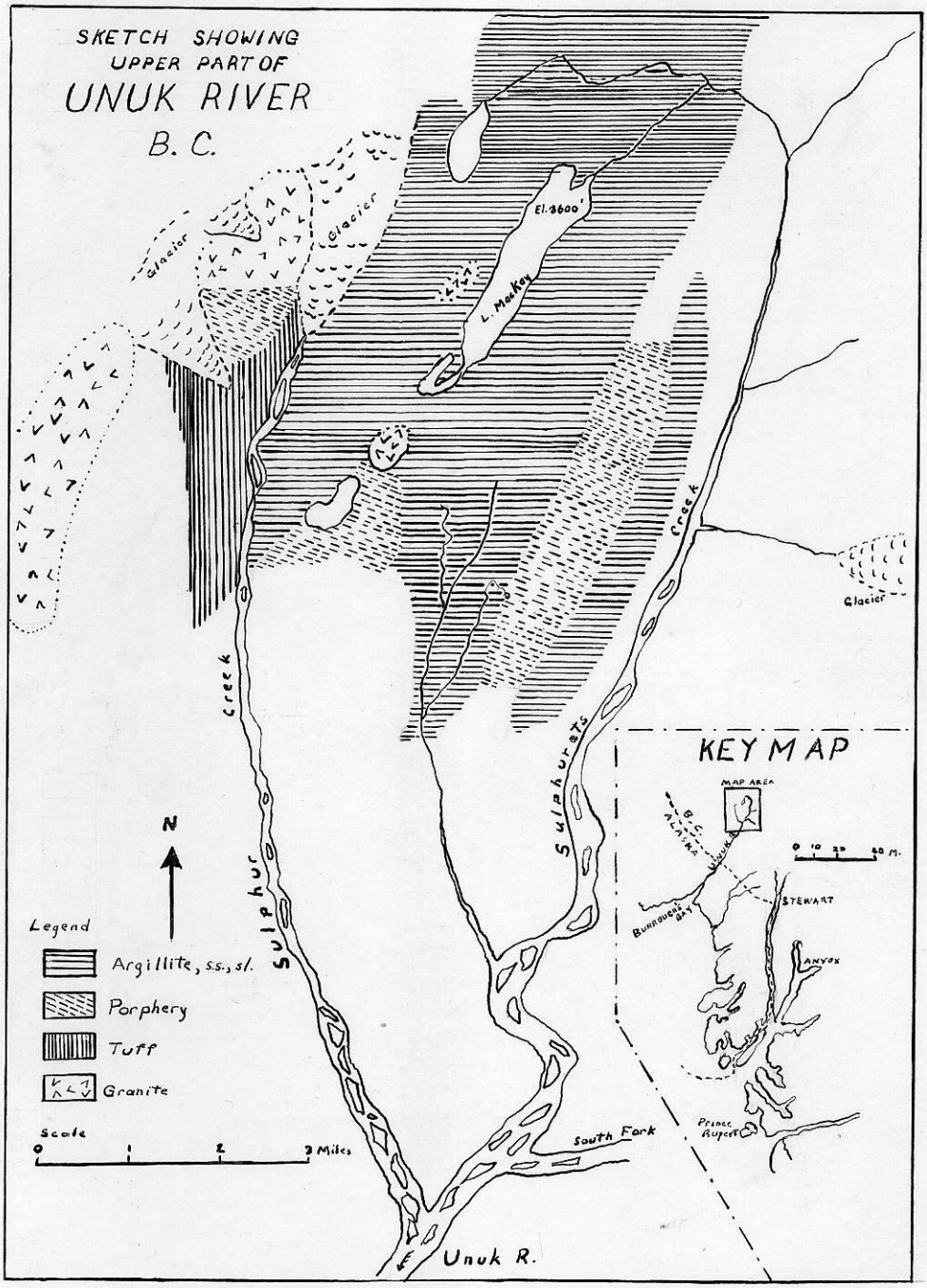
SKETCH SHOWING
UPPER PART OF
UNUK RIVER
B. C.
Glacier
Glacier
El. 3600'
L. MacKay
Sulphurets
Creek
Sulphur
Creek
Glacier
N
Legend
Argillite, ss., sl.
Porphery
Tuff
Granite
Scale
0 1 2 3 Miles
South Fork
Unuk R.
KEY MAP
MAP AREA
B.C.
ALASKA
0 10 20 30 M.
STEWART
BURROUGHS BAY
ANYOX
PRINCE RUPERT

INTRODUCTION

The following report is based on a mineragraphic examination of nine samples of ore from the Unuk River Area. Six of the samples (Nos 2, 3, 5, 8, 11, 13) were from the Unuk Gold Group and the remaining three, (Nos. 20, 21, 23) from the Unuk Valley Gold Group. As these two properties are adjoining, and as the reports of Jos. T. Mandy* indicate the same geological conditions prevail over both, the conclusions reached, in the paragenisis of the minerals, are based on the results of all the sections studied.

The suite of ores, and the assay sheet accompanying them were supplied by Dr. H. V. Warren who supervised their examination. He also gave valuable suggestions in making the determinations.

This report is not to be considered a final and complete analysis of the ores but it does give an indication of the minerals and their possible paragenisis.

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*Jos. T. Mandy--Reports of British Columbia Minister of Mines 1934, 1935

LOCATION OF THE AREA
(see sketch map page 1)

The Unuk River Area is situated in the region of latitude 56 degrees 30 minutes and longtitude 130 degrees 30 minutes. The Unuk River drains across the Alaskan Boundary into Burroughs Bay, which is 124 miles north westerly from Prince Rupert by air and 175 miles by steamer. The two properties are between Sulphur and Sulphurets Creeks which comprise the headwaters of the Unuk River. These are another 50 miles from Tide Water. On account of the roughness of this lower Unuk River, the trip from Burroughs Bay is usually made by aeroplane. The area may also be reached from Stewart which is 85 miles distant over the mountain divide.

GENERAL GEOLOGY

This area lies in the eastern contact belt of the Coast Range Batholith. The batholith plunges easterly under the overlying sediments and volcanic complex. The contact is in British Columbia, four miles from the

International Boundary and it has a north westerly strike. Many stocks and bosses intrude and metamorphose the later sediments and volcanics.

Structurally the area appears to be a northerly plunging anticline.

GEOLOGY OF THE HEADWATERS OF THE UNUK RIVER

As can be seen from the accompanying map (page 1) the batholith has been exposed to the west of the properties.

The volcanic members are andesitic tuffs and porpheritic lavas of Jurassic age.

The sediments are mainly argillites and sandstones overriding the volcanics, but in places seem to be intercalated with them. These sediments are also thought to be Jurassic

Two dioritic stocks have been intruded into the sediments and volcanics. There has been pyritization and silicification of the tuffs in the workings of the properties and quartz stringers have been exposed. Pyrite has been observed both in the country rock and in the quartz.

There has been little fracturing and less shearing in this northern region of the area. The fractures follow the dip of the sediments which is 60 degrees to the west.

Mandy has observed that the heaviest mineralization occurs at the contact of the tuffs and porpheries, but why this is so has not as yet been explained.

Weathering has resulted in oxidation of the higher domes.

DESCRIPTION OF THE POLISHED SECTIONS

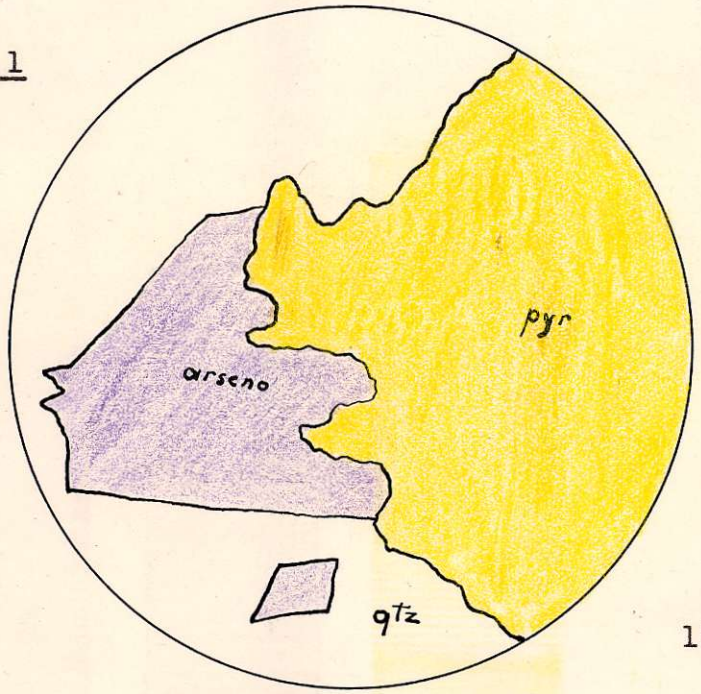
One polished section was made of each specimen except No. 23, which has two, but as these are identical in every way they are considered as one.

Specimen Number 2

Minerals identified were:

Pyrite--occurs as well defined crystals in quartz. Is fractured by the later minerals. It is closely intergrown with arsenopyrite in many places. (View 1)

View 1



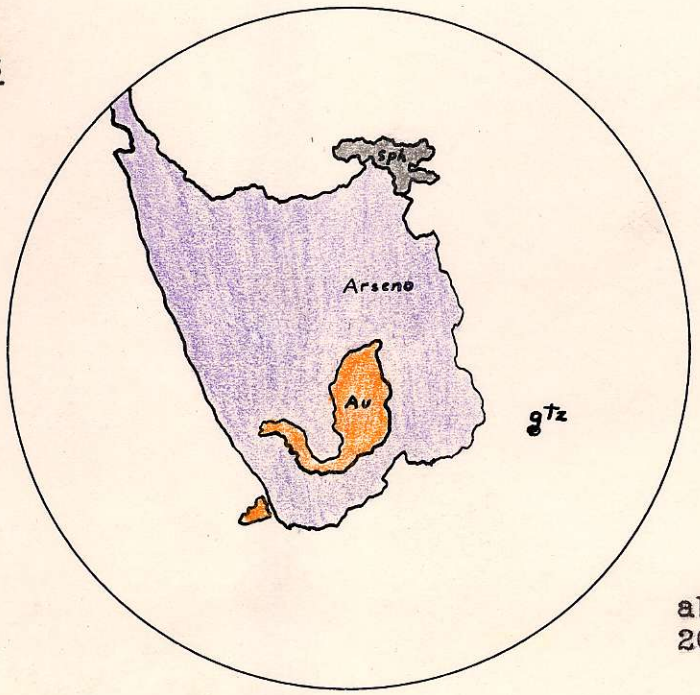
175 X

Arsenopyrite--diamond shaped crystals of this mineral are characteristic. It appears in quartz alone and with the pyrite and sphalerite. It also is fractured in many places but the crystals seem to have smoother borders than the pyrite.

Gold--three pieces were found associated with arsenopyrite. Two are seen in View 2. The largest measured .00312 inches (/ 200 mesh) and the smallest .000625 inches (- 200 mesh). From View 2, it would appear that the smaller piece of gold was later than the arsenopyrite. The larger piece likely has the same relationship but it is seen only in one dimension here. As the assay for this specimen shows 4.04 ounces gold and 3.12 percent arsenic, this relationship between the gold and

arsenopyrite may hold true for the rest of the specimen.

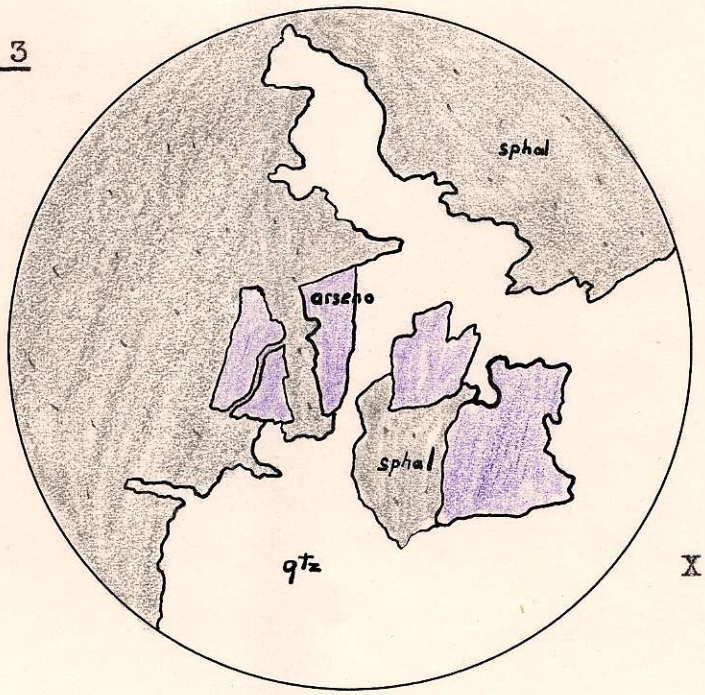
View 2



about
200 X

Sphalerite--this mineral is the most abundant sulphide in the specimen. It forms irregular bodies in the quartz. It fractures arsenopyrite (View 3) and pyrite. It surrounds these minerals in places. Sphalerite in every case contains numerous small blebs of chalcopyrite.

View 3



X 175

Chalcopyrite--found scattered throughout quartz. It is intimately associated with galena and sphalerite.

Galena--found in quartz in irregular forms. Fractures pyrite. It is in sphalerite in places.

Bornite (?)--it is thought that some bornite is present in the sphalerite but the small size of the blebs prohibited an accurate determination of the mineral with the equipment used in the examination.

Quartz--is scattered throughout the section and appears to have been the last formed.

Specimen Number 3

This section is mostly all quartz.

Primary Quartz--in the hand specimen definite brecciating of primary quartz can be seen. Under the microscope the borders of the primary quartz have been assimilated by the "secondary" quartz*. Rarely is pyrite seen in this quartz.

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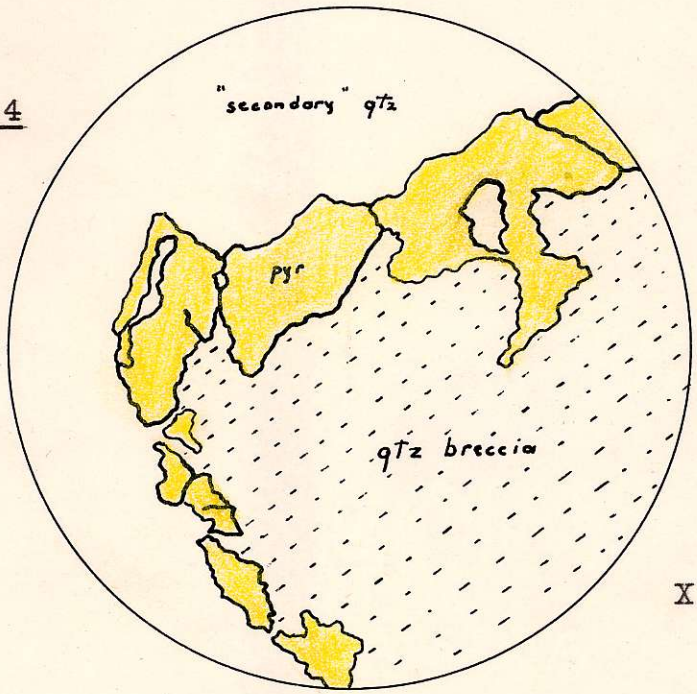
*"Secondary" quartz in this case means a second period of mineralization. It is used in this report as a convenient term for briefness only.

Pyrite--in crystals in the "secondary" quartz. Rims the brecciated quartz (View 4) and in fractures in the breccia. Appears to have been fractured and carried by the "secondary" quartz solution.

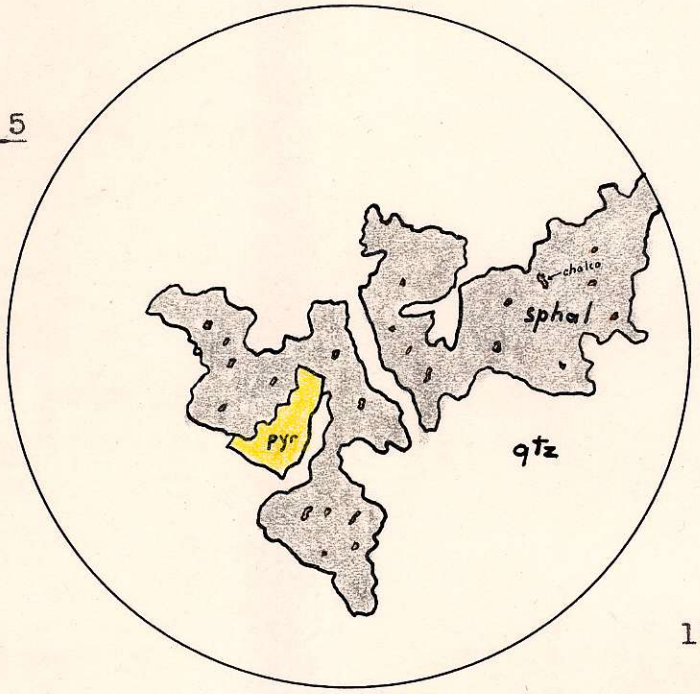
View 4



X 175

Sphalerite with Chalcopyrite blebs--fractured by "secondary" quartz (View 5).

View 5



175 X

"secondary" Quartz--fractures the pyrite. It was probably a hydrothermal solution which surrounded the primary quartz breccia.

Specimen Number 5

This specimen contains more pyrite than specimen No. 3. Galena is also present but otherwise has same conditions prevailing in it as in Specimen No. 3.

The minerals are:
primary quartz, pyrite, sphalerite, chalcopyrite, galena, "secondary" quartz.

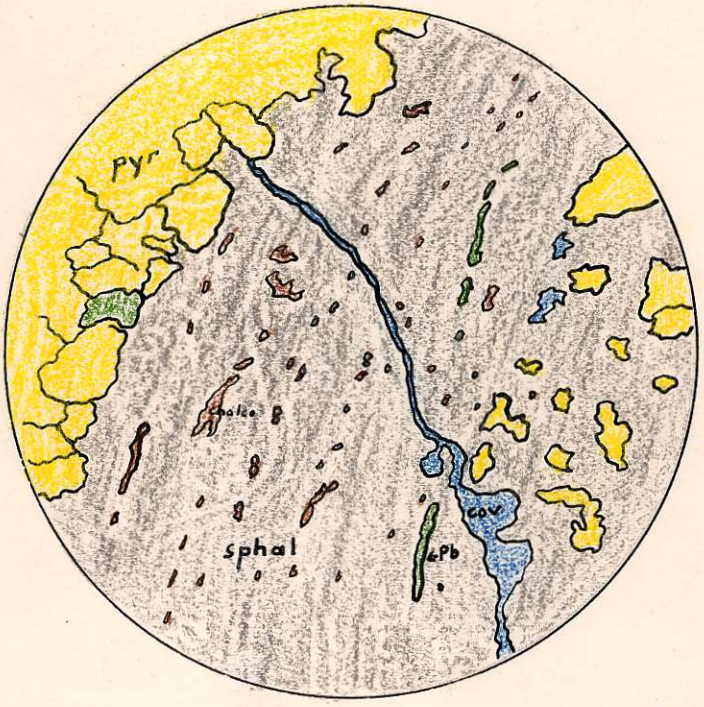
Specimen Number 8

Pyrite--is shattered and appears to have been born along in sphalerite and quartz.

Arsenopyrite--crystals in quartz.

Sphalerite--in this section sphalerite appears as flow like streams (View 6) between the pyrite and also carrying pyrite in it. The chalcopyrite blebs have been elongated in this section and give the appearance of flow lines. The "secondary" quartz in places seems to have forced the sphalerite ahead of it. This may be due to recrystallization.

View 6



200 X

Chalcopyrite--is seen in the quartz and also surrounding pyrite.

Gold--in all, 14 pieces of gold were examined:

7 were in pyrite fractures with galena

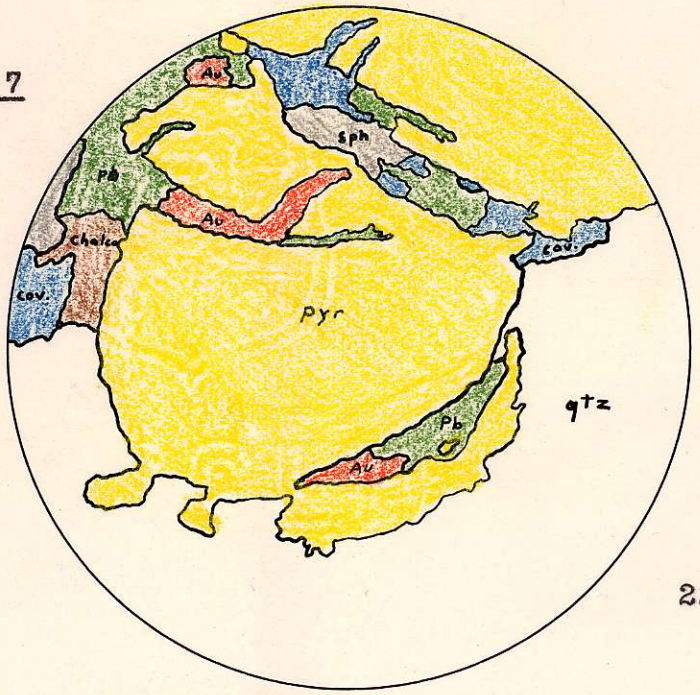
6 were against pyrite in galena

1 was in galena alone

All the gold was below 200 mesh. In this section the gold appears to be definitely associated with the galena but also bears a distinct relation to the pyrite as in only one case was the gold found in galena alone.

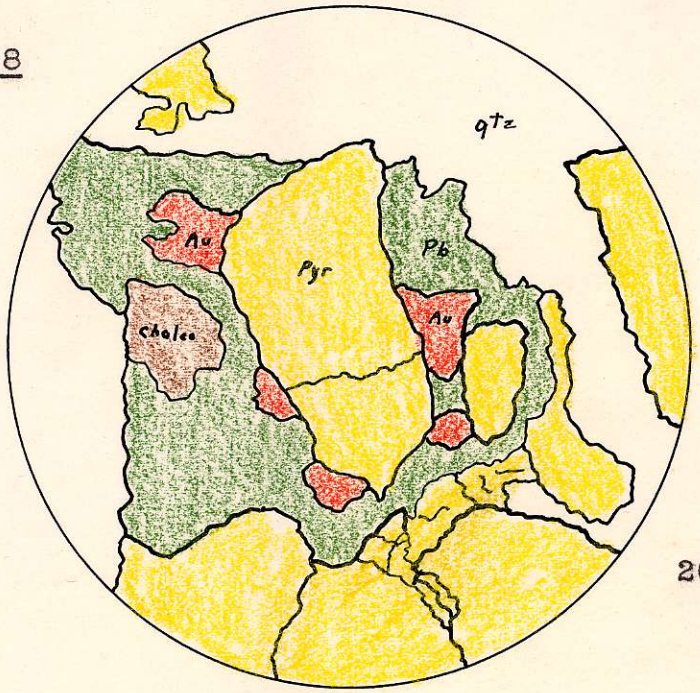
Views 7 and 8 show this association.

View 7



225 X

View 8



200 X

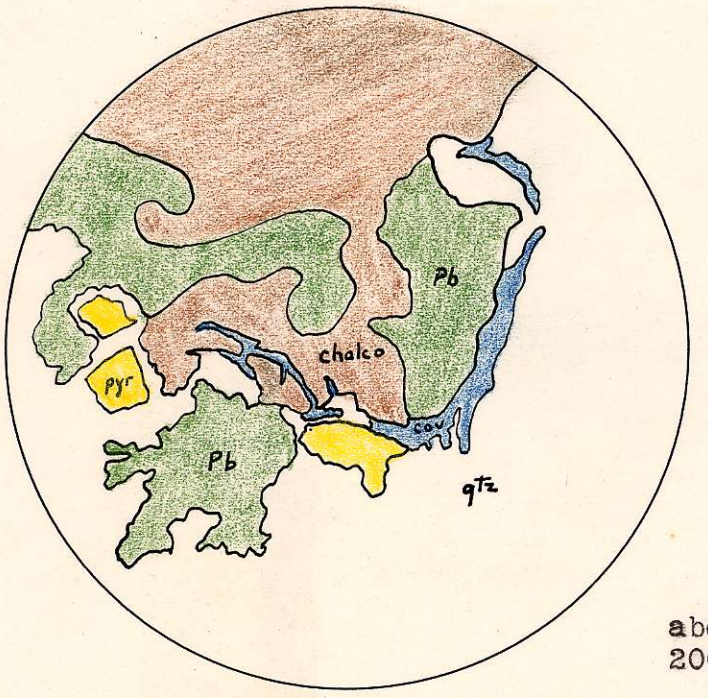
Galena--occurs alone in quartz and as irregular bodies in pyrite. Appears to have same age as chalco. for the borders of the two minerals are very smooth.

Quartz--interstitial between the other minerals.

Covellite--the amount of covellite is small and fills fractures in sphalerite (View 6) and chalcopyrite (View 9). It rims galena in many places and is found between shattered pyrite grains. It probably is the result of secondary mineralization.

Bornite--in some places this mineral is found in minute quantities (largest piece measured was .00156 inches in diameter)

View 9



about
200 X

Specimen Number 11

This specimen is mostly all quartz with crystals of arsenopyrite and pyrite scattered throughout the section. Sphalerite and chalcopyrite are distributed irregularly in the quartz.

Specimen Number 13

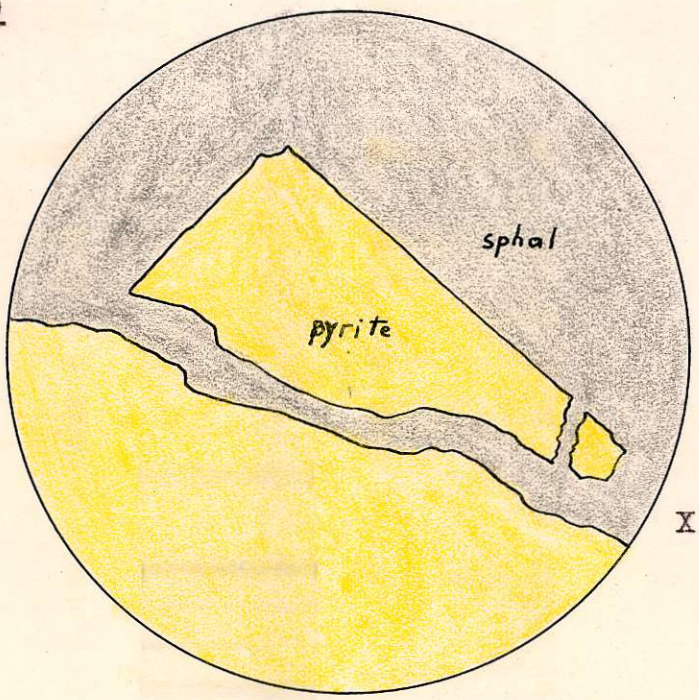
This sample is composed mostly of sphalerite and galena.

Pyrite--Same relationships as in previous sections.

Sphalerite--definitely fractures pyrite (View 10).

Thus showing it to be the younger of the two.

View 10

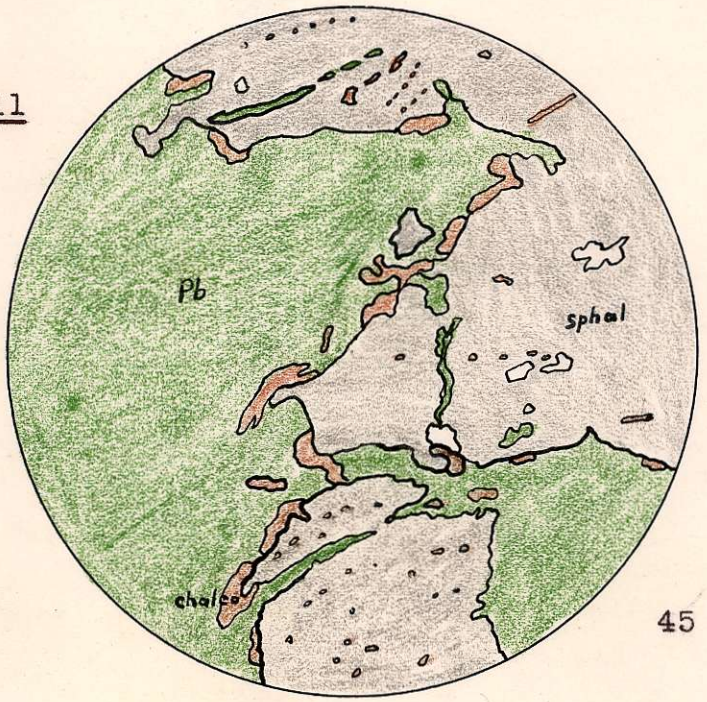


X 150

Chalcopyrite--a large mass (one-half inch) is found surrounded by shattered pyrite. Otherwise it bears all the previous relations, including the rimming of sphalerite (View 11).

Galena--in this section galena is definitely later than sphalerite (View 11). It contains tetrahedrite in irregular blebs. Replacement of the galena, by secondary lead minerals, has occurred.

View 11



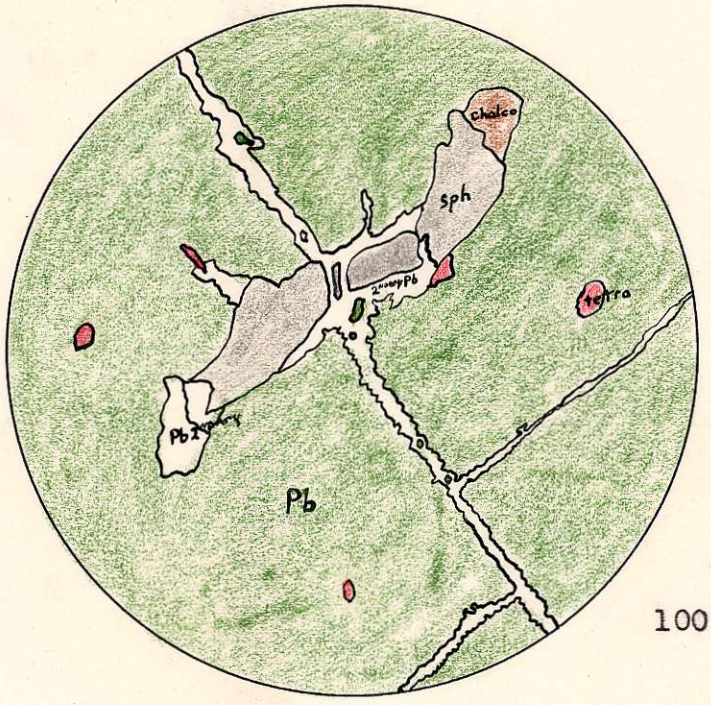
45 X

Tetrahedrite--this mineral is likely the source of silver as shown in the assay of the section (page27). Thus galena, if found in quantity, will likely give high silver returns. View 12 shows the character of the mineral.

Quartz--same as in previous specimens.

Secondary Lead Minerals--anglesite and some cerussite are probably the minerals replacing the galena along the cleavage fractures (View 12). These also follow fractures in the sphalerite but do not appear to effect the sphalerite borders as they do in galena.

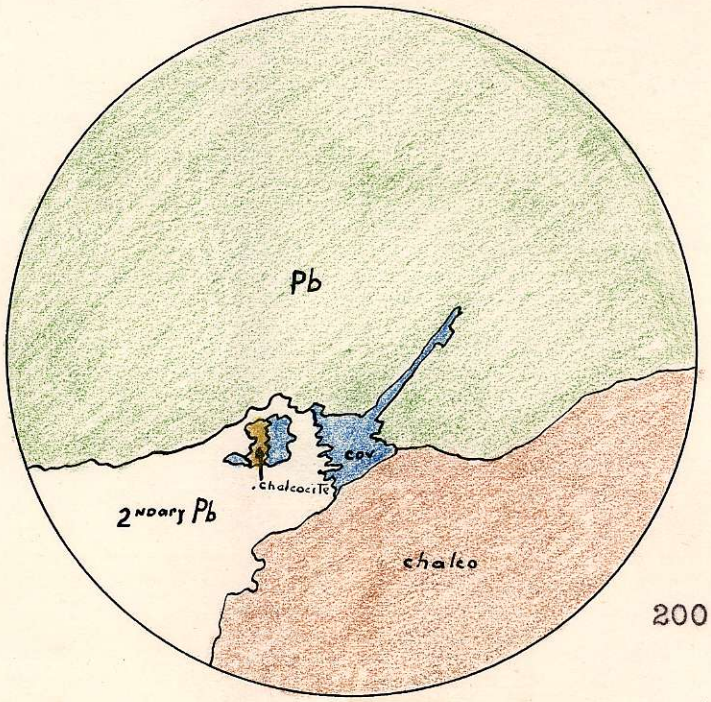
View 12



100 X

Covellite and Chalcocite--the covellite definitely is later than galena as it follows galena fracture or cleavage (View 13). The chalcocite was not definitely determined because of the small size. It was enclosed in the covellite.

View 13



200 X

Specimen Number 20

This section is similiar to Specimen No. 13 except there is a greater amount of tetrahedrite present. This seems to bear out the fact that the silver is in the tetrahedrite. Two assays show values in silver of 59.28 ounces

and 26.32 ounces per ton for this specimen, while specimen No. 13 only showed an assay of 3.68 ounces.

Specimen Number 21

This specimen seems to have been in a shear zone as the pyrite is crushed and intermingled with sphalerite which itself has the same flow like characteristics seen in View 6. Galena with tetrahedrite, chalcopyrite and quartz show no preferential characters for each other nor for the pyrite.

Calcite--may be present between other minerals.

Secondary Lead Minerals--are also associated with the galena and calcite.

Specimen Number 23

This sample has two polished sections but as they are similiar in all respects they are considered as one. It resembles previous specimens.

This section contains mostly sphalerite.

Minerals found were:

pyrite
sphalerite and chalcopyrite
galena and tetrahedrite
some quartz found

SUMMARY OF THE MINERALS AND THEIR PROBABLE PARAGENISIS

Primary Quartz--SiO_2-- contained some pyrite. Later it was fractured and brecciated (View 4). Appears partly assimilated by "secondary" quartz.

Pyrite--FeS_2--rims the primary quartz showing it to be later than the quartz. The pyrite in the primary quartz may be due to deposition in a fracture and the subsequent sealing of the sulphide by the "secondary" quartz. Another suggestion is that the pyrite originated first in the primary quartz. Then by later hydrothermal solutions the quartz was assimilated and pyrite was set free in the new solutions. It was then concentrated in the "secondary" quartz.

Arsenopyrite--$FeS_2.FeAs_2$--found intimately associated with pyrite (View 1). It is also alone in quartz as well defined diamond shaped forms. It is the same age as pyrite.

Sphalerite--ZnS--found in irregular bodies in quartz. Surrounds pyrite and fractures arsenopyrite (View 11), denoting it to be later than these two sulphides. Throughout the whole suite the chalcopyrite blebs are characteristic in the sphalerite.

Chalcopyrite--$CuFeS_2$--besides occuring in sphalerite it appears alone in quartz and rims the sphalerite when in galena. This seems to indicate that although it began to cool at the same time as sphalerite it continued to form after the sphalerite had all crystallized.

Galena--PbS--definitely later than sphalerite (View 11) and appears to carry the gold and silver values.

Tetrahedrite--$3Cu_2S.Sb_2S_3$--found only in galena as irregular blebs of from + 100 to - 200 mesh. It probably contains the silver as previously indicated. It is contemporaneous with galena.

Gold--Au--of the 17 pieces seen 14 of them were in galena and all but one were associated with arsenopyrite. Thus the conclusion is that it is of the same age as the galena but bears some relationship to the early sulphides, especially pyrite.

"Secondary" Quartz--SiO_2--this is the gangue mineral and appears to be the last of the hydrothermal minerals to crystallize. It fills the interstitial spaces remaining, but seems to overlap the chalcopyrite and galena in age.

Secondary Mineralization

Covellite--CuS--is found in a fracture of chalcopyrite (View 10) and appears as long stringers in quartz. The amount is small but it appears to be after quartz although this is not definite. Therefore covellite and its included copper sulphides may be of hydrothermal origin though it usually is a secondary mineral (Dana)

Bornite--Cu_5FeS_4, Chalcocite ---Cu_2S--these minerals are in such small quantities in the covellite that their identification is not certain.

Cerussite--$PbCO_3$, Anglesite--$PbSO_4$--these two are definitely secondary minerals after galena, for small islands of the galena are seen in the cleavage fractures, which have not as yet been assimilated by the secondary lead minerals. That these are cerussite and anglesite has not been positively proven.

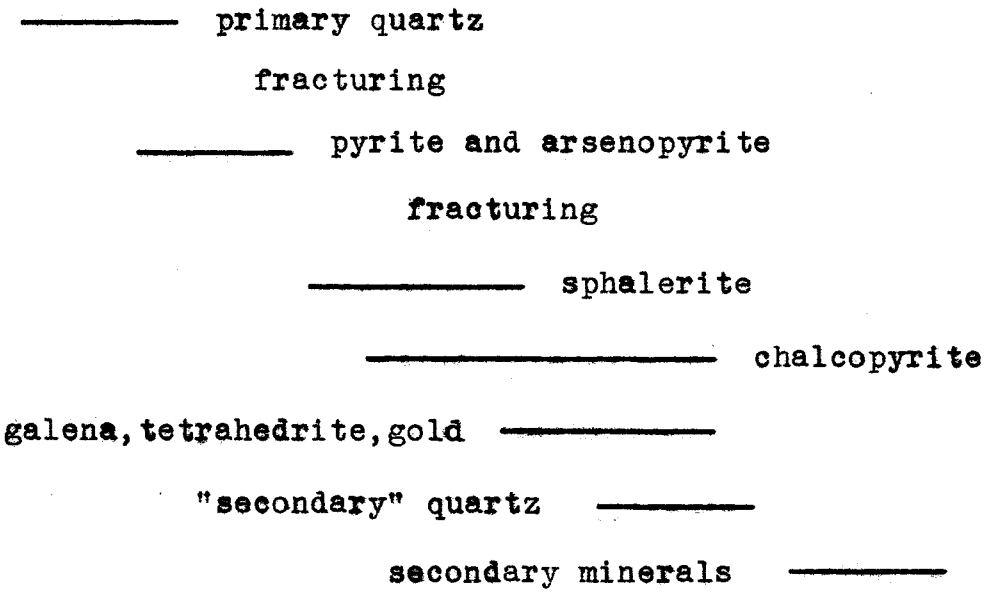
Calcite--$CaCO_3$--is found with the cerussite and anglesite in small amounts.

Unidentified--one mineral in specimen No. 2 perhaps consists of thin layers of sphalerite in quartz, but it is different in appearance to the proven sphalerite in the same section.

The reason for the small amount of secondary minerals is accounted for in that the Unuk Valley Area has only recently been glaciated.

The gouging out of the valley by the glaciers resulted in the removal of any weathered rock which may have been present previously. Thus secondary enrichment has only begun on the fresh rock now exposed.

DIAGRAM OF PARAGENISIS



LIST OF SPECIMEN ASSAYS

Spec. No.	Oz.Au	Oz.Ag	%Pb	%Zn	%Cu	%Fe	%As	Insol.
2.	4.04	2.24	1.8	1.9			3.12	
3.	0.36	0.64	1.0	2.2	Tr	8.9		65.9
5.	0.49	0.57	0.2	3.2	Tr		0.97	
8.	5.55	8.77	6.0	8.8	.06	8.4	0.23	54.2
	9.56	14.28	10.6	11.2	.06	9.5	2.78	40.7
11.	6.87	5.56	1.5	1.9	.07	6.2	3.38	75.0
13.	1.14	3.68	2.2	4.4	.75	6.8	1.23	63.4
20.	0.08	59.28						
	0.16	26.32						
21.	0.40	1.90						
23.	0.40	1.08						