Generally poor
A doubtful pass.

GEOLOGY 409

A MINERALOGRAPHIC REPORT OF THE OMINECA ZINC

600278

by

H. Okabe

A report submitted as a partial fulfillment of the requirements of Geology 409. to
a course leading to a B. A.

CONTENTS

ACKNOWLEDGMENT

The writer would like to express his appreciation to the following people who made this report possible: Dr. R. M. Thompson, for his spectrographic analysis: Kayce Campbell for his helpful suggestions: Jim Soles for his specific gravity and X-ray: and Earl Dodson for his photographs.

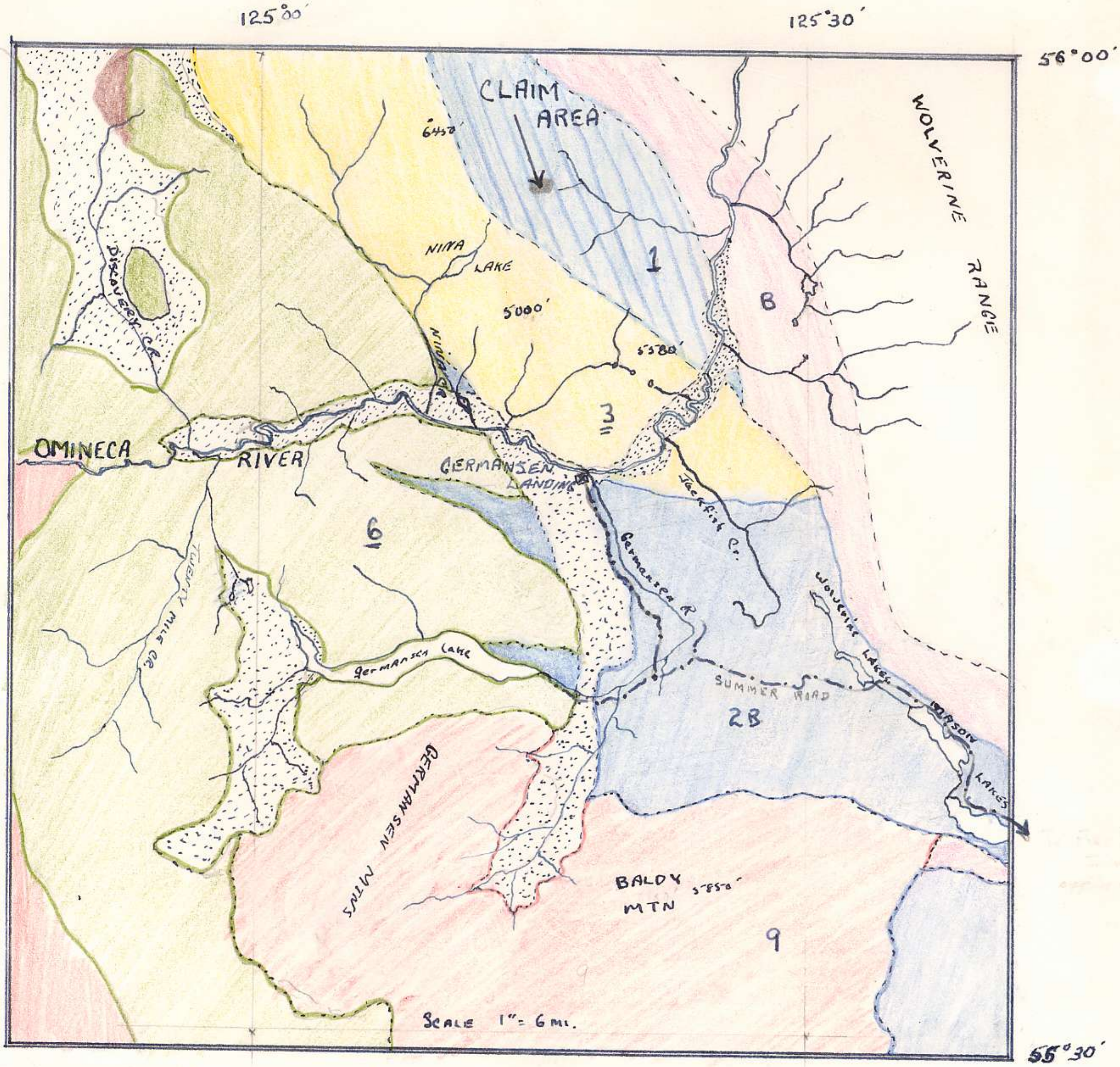
INTRODUCTION

The Vernon System Claim is located roughly 3 miles northeast of Nina Lake, or more specifically 125° 15' long. and 55° 57' lat. The claim covers an area of about 1 sq. mi. and was first staked in September of 1951.

Although this claim was first staked by the Davies Brothers in September of 1951, it wasn't until the following summer that the Kennco Exploration Division sent its crew to make a thorough investigation of the area. Because of its relatively new discovery, no detailed geologic report has been made by the Geological Survey of Canada. Although a private report has been made, it is not accessible to the public. Consequently, as the writer did not see or survey the area, the description given will probably be erroneous. What?

ACCESSIBILITY TO THE AREA

To get to the area (assuming that one is travelling from Vancouver) one can either fly directly in a small plane to Nina Lake or one can travel by boat to Prince Rupert. Then by train to Vanderhoof, and then by car via Fort St. James to Germansen Landing. The last lap from Vanderhoof to Germansen Landing is approximately 140 miles on a relatively good summer road where regular trucking service is maintained (except in winter snows). From Germansen Landing there is a caterpillar road leading westly along the Omineca River (later connected to Takla Landing) to Nina Creek, which is a distance of about 10 miles. From the mouth of Nina Creek it is strictly pack horse trail to Nina Lake, a dis-



MAP SHOWING GENERAL LOCATION OF THE CLAIM AREA & ASSOCIATED ROCKS

- 6 — TAKLA GRP.
- 9 — GRANODIORITE, QUARTZ DIOR., DIORITE
- 2B — CACHE CREEK GROUP: Argillite, slate, greenstones, minor chert & Lms.
- 3 — ANDESITE FLOWS, TUFFS & BRECCIAS
- 1 — MASSIVE LIMESTONE, MINOR ARGILLITE, SLATE & Chert.
- B — METAMORPHOSED PRE CAMBRIAN ROCKS

tance of about 8 miles along the creek. From the lake it is another 3 miles in a northeasterly direction, a relatively easy walking distance to the claim area.

It is evident that parts of the area that cannot be reached by road or water, then, is provided with good trails over which pack horses can be taken.

TOPOGRAPHY AND DRAINAGE

The topography of the area is generally rugged and mountains of the area are relatively high. The mountains, however, do not exceed much more than 6500 feet. The highest unnamed mountain within 10 miles radius of the lake is 6 miles due north and it is 6540 feet. (Between this highest mountain and the lake there are a few 5000 foot mountains) About ½ mile southeast from the lake a mountain rises rapidly to a height of about 5000 feet and extends about 4 miles long southeasterly. elevation / valley floor? The lake is situated on the 2000 foot elevation between these mountains. The lake is about 3 miles long and ½ mile wide and forms part of the valley that trends northeasterly. The claim area is within this valley around the 3000 foot level. There is then a relief of about 2000 feet between the valley and mountains. The relatively moderate relief of the area forms a very suitable drainage network, numerous small creeks are well within the claim area and drain into the lake directly, or it may flow into the main drainage system, namely, the Omenica River. This river is wide and deep enough for navigation of small boats during the summer.

GENERAL GEOLOGY

The Nina Lake area minerals are deposited in the Paleozoic rock formation or more specifically rocks of the permian age. The permian rocks are known as the Cache Creek group and this group in turn is sub-divided into three formations. The first of these is largely composed of andesitic flows, tuffs and breccias with minor basic intrusions (greenstones): Chlorite and hornblende schists; and minor argillite chert and limestone. The second formation is largely composed of chert, argillaceous quartzite, argillite, slate and minor limestone. The last formation is almost entirely composed of massive limestones, with minor amounts of argillite, slate and chert.

The strata of the Cache Creek group as originally laid down, consisted apparently of limestones, shales, cherts, conglomerate, andesitic flows, tuffs, breccias, and agglomerates. These rocks were subjected to dynamo-thermal metamorphism as a result the limestones were recrystallized and most of the original bedding were obliterated. The argillites and slates resulted probably from the metamorphism of the shales.

The Vernon group of claims is in the formation which is almost entirely composed of massive limestone. This sedimentary formation strikes northerly and dips gently to the west about 12 degrees. The area is covered with a light overburden ranging a few feet in thickness. However, this overburden isn't heavy enough to cover all of the formation as small outcrops a few feet in diameter are exposed along a fault zone. The party concerned was able to follow the few exposed parts for a distance of about 700'. The trend of the fault strikes northwesterly and mineralization is believed to have occurred after the faulting.

MINERALOGRAPHY - MEGASCOPIC

Hand Specimens

Although the seven hand specimens that were examined are from the same area, they exhibit some marked differences. Therefore, it would be better to deal with them separately. Out of the seven specimens six of them can readily be broken down into three groups of two specimens each. The first group is characterized by the fact that it contains purple fluorite. The second group consists of calcite stringers cutting across the massive sphalerite. The third group consists of rocks that exhibit a highly weathered surface.

(a) The first group

The massive hand specimens about 2" x 4" x 3" contain besides the fairly well crystallized purple fluorite, well crystallized grayish calcite which shows good cleavage and shows close association with the fluorite. The specimen also contains tae zinc minerals -- the yellow sphalerite, the red-brown sphalerite and the hydrated zinc silicate. The yellow sphalerite in the specimen is not abundant and only a few small concentrated clusters are found either in the calcite or in contact of calcite and the darker sphalerite. The small grains of the darker sphalerite exhibit a high lustre and are scattered throughout the specimen occasionally showing massive connentratian. The fresh surface of the specimen showed minute amounts of galena, whereas, the surface which was exposed to weathering showed a whitish, chalky coating that covered most of the specimen. This white coating when exposed to the fluorescent lamp showed a bluish white fluorescence (an indication that the mineral is probably hydrated zinc sulphate). Also preserved on the weathered surface are minute box work structures, which is highly indicative of a leaching process.

(b) <u>The second group</u>

The hand specimen of this group is also massive, about 2" x 3" x 3". This group contains no fluorite or hydrated zinc mineral. Otherwise, it is practically the same as the first group except that this specimen shows calcite stringers cutting across the massive dark sphalerite.

(c) <u>The third group</u>

The hand specimen of this group is the largest one of the entire lot, measuring about 8" x 6" x 5". The specimen is covered almost entirely by the secondary minerals that have been leached out of the ore. The once white hydrous zinc mineral, in parts, has taken a yellowish tinge.

The first surface shows the same mineralogy as the second group except that this specimen shows no calcite stringers.

One hand specimen that is about 1" x 3½" x 4" does not come into the fore-mentioned group as it has no sphalerite, dolomite, calcite or fluorite. Therefore, I have treated this hand specimen as a separate unit. The matrix of this rock appears argillaceous and has large inclusions of galena. This specimen when viewed under the binocular microscope showed evidence of compact banded formation with small pyrite grains dessiminated throughout. The galena inclusions show cleavage traces that are twisted and oriented in different directions. It appears as though the mineral was deposited first and then later subjected to metamorphesis.

MINERALOGRAPHY - MICROSCOPIC

Minerals in Polished Sections

Galena:

In polished sections this mineral shows a distinct galena white color with a smooth polish, triangular pits along the cleavage lines, high reflection, cubic cleavage, hardness of "B", and is isotropic. The above properties are generally sufficient to suspect that the mineral is galena, but in order to confirm it an etch test was carried out. It was found that the reaction was negative with $HgCl_2$, KOH and KCN. With $FeCl_3$ the mineral tarnished iridescent, with HCl tarnished brown, and with HNO stained black. To further the confirmation, a micro-chemical test carried out for Pb and the reaction showed positive.

Sphalerite:

This mineral takes a good polish and shows up white in the microscopic field when it is associated with the carbonates (see photo). The mineral is isotropic under crossed nicols, but under the arc lamp some grains showed internal reflection. It has a hardness of about "C" and no cleavage was visible. Etch reactions showed negative to everything except HNO_3 and Aqua Regia. This followed by a micro-chemical test provided sufficient proof of the mineral to be sphalerite.

The red sphalerite and yellow sphalerite give similar optical data and etch reactions. But in order to find the actual composition of the two sphalerites a spectrographic analysis was carried out by Dr. R. M. Thompson.

The results of the analysis are tabulated below:

OMENICA ZINC

Mineral	Yellow Sphalerite	Red Sphalerite
Sb	nil	nil
As	nil	nil
Bi	nil	nil
B	present	nil
Cd	medium	weak
Co	nil	nil
Cu	medium	trace
Au	nil	nil
In	nil	nil
Fe	trace	trace
Pb	trace	trace
Mg	trace	trace (in electrodes)
Mn	medium	trace
Hg	weak	weak
Mo	nil	nil
Ni	nil	nil
Li	trace	trace
Ag	trace	trace
Te	nil	nil
Sn	barest trace	nil
Ca	nil	nil

From the above analysis it is evident that there is hardly any difference except that the yellow sphalerite, which is of later deposition, carries more Cd, Cu and Mn.

Bitumen :

This mineral takes a poor polish, has a grayish yellow reflection, a hardness around "B " and an appearance of a? black coat in normal light. The mineral shows varying anisotropism as some grains showed four extinctions in one revolution. Others showed two extinctions, and still others showed isotropism. An etch reaction carried out showed negative to all reagents. This followed by a micro-chemical test gave negative results to everything except iron.

Because the mineral showed unique properties it was difficult to determine the mineral. The mineral was only determined after taking the specific gravity of it and by taking an X-ray. powder photograph. The specific gravity of the two grains ~~came out~~ were 1.86 and 1.84 respectively. The X-ray taken on a very minute grain did not show any appreciable pattern. This was probably due to the amorphous form in which bitumen can exist. Although the specific gravity for bitumen is a little high, it is sufficient to assume that the mineral is bitumen if we take into consideration that the specific gravity of the mineral has been increased by the Fe content. However, to erase any doubts, the grain was subjected to open flame and a trace of smoke given off confirmed the mineral to be bitumen.

Size shape, relation to other minerals?

Pyrite:

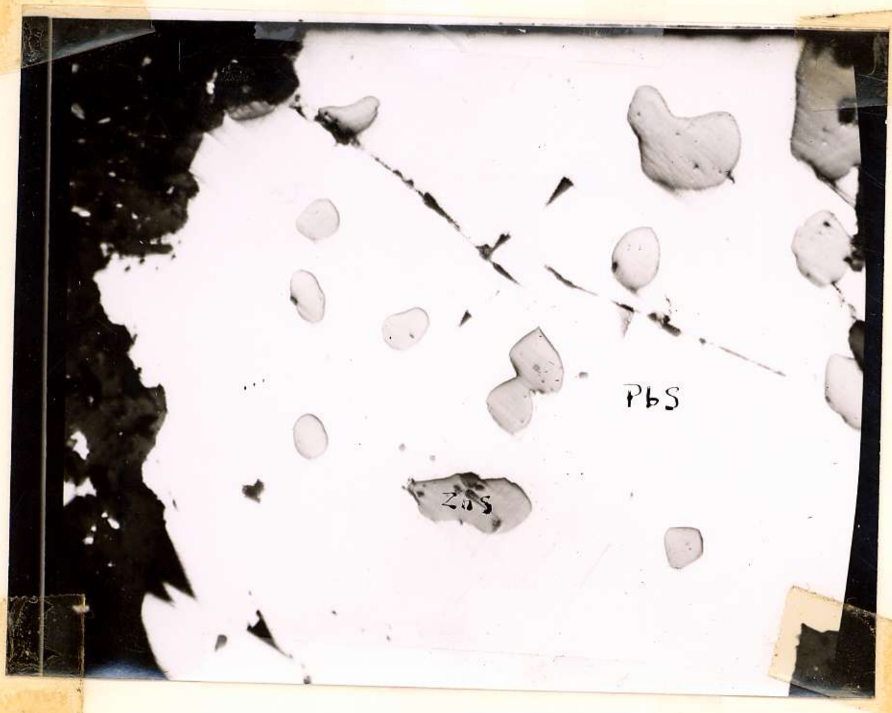
This mineral takes a rather poor polish, has a hardness of around "E", and has no anisotropism. An etch test carried out showed negative to all reagents except HNO_3 . To confirm it a micro-chemical test was carried out and the grain gave a positive test for iron.

PRIMARY MINERALS IN DECREASING ORDER OF ABUNDANCE

Metals	Gangue
Sphalerite - 35%	Dolomite - 30%
Galena - 15%	Calcite - 12%
Pyrite - 2%	Fluorite - 6%

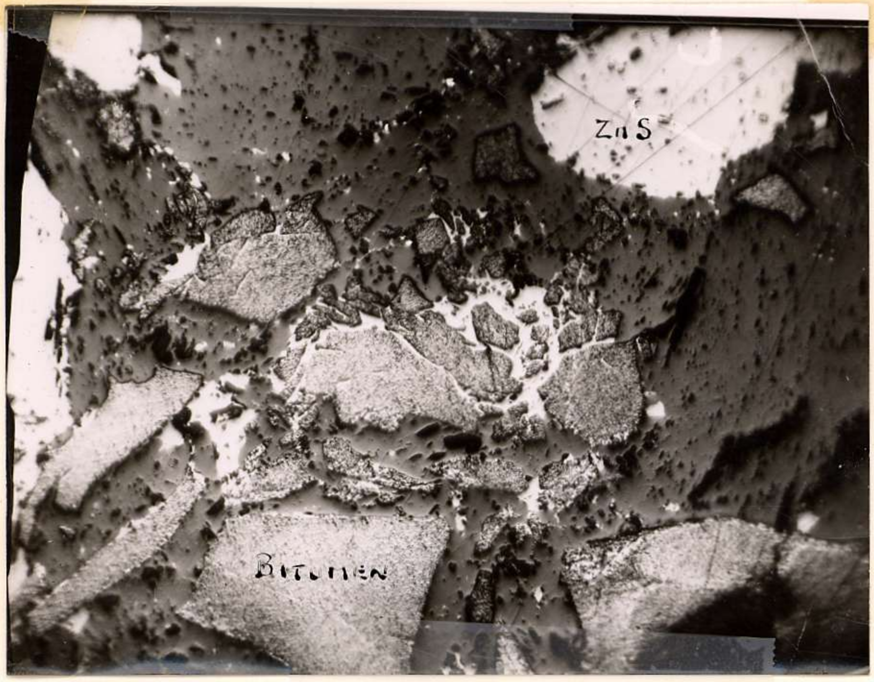
The percentages of the above metals come from one polished section, which is presumed to be representative sample of the suite. Why one?

The percentages of the gangue minerals come from representative hand specimens which have undergone a $CuNO_3$ staining. (See plate 1)



overexposed

The above photo shows galena replacing the sphalerite and only sphalerite blebs are present. or vice versa.



upside down!

This photo shows sphalerite stringers cutting across the Bitumen. The sphalerite is presumably replacing the carbonates which were originally present between the fractured grains of the Bitumen and not the Bitumen.

PARAGENETIC SEQUENCE

```
ARGILLITE  --------------
PYRITE              --------
DOLOMITE    -----------------
BITUMEN                ----------
SPHALERITE                        ---------
GALENA                                     --------
QUARTZ?                    -------------------------
FLUORITE                                         ---------
CALCITE                                                ----------
```

CONCLUSION

The original sediments were probably dolomitic limestones and calcareous argillite metosomotism took place in both. In the calcareous argillite the galena replaced all the calcareous mineral. After mineralization the argillite was subject to dynamo-thermal metamorphesis which resulted in the flow banded argillite. This evidence of post-ore metamorphosis is seen in the distoriton of the cleavage trace in galena and secondly in the warp in the flow banding around the galena in certain parts indicates that the banding deviated from the more resistant galena formation.

In the dolomitic limestone the red sphalerite was ~~just~~ first to replace the carbonate. This was followed by galena replacing the red sphalerite, then this was followed by yellow sphalerite, fluorite and calcite. The presence of quartz probably resulted after metamorphosis of the original rock which was probably impure. The evidence of the quartz crystallizing out after metamorphosis is indicated by the fact that only minor amounts of quarts which is present is completely surrounded by calcite.

Doubtful talk.

The mineralisation of the dolomitic limestone shows simple mineralogy and shows a common replacement texture which is typical of the mesothermal deposit.

BIBLIOGRAPHY

G.S.C. Memoir 252 - Fort St. James Map Area,

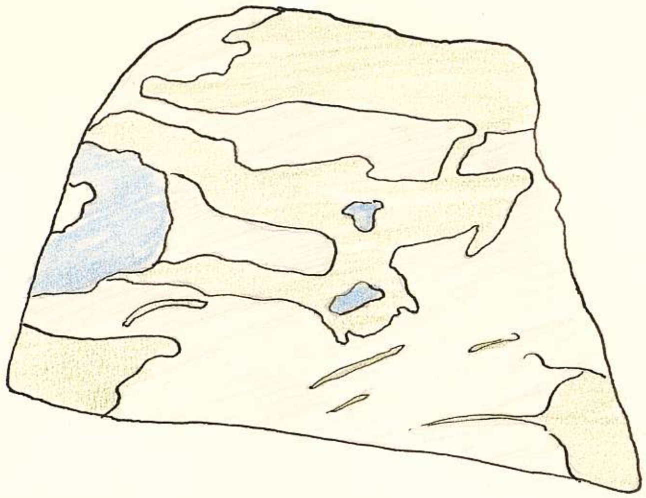
Prospecting Possibilities in Part of the Omenica Mining Division, B.C.
Can. Min. Journal, Volume 66, No. 4. pp 217 - 222 (1945)

Glacial Geology of North Central B.C. , Am. Journ. Sci., Vol. 246,
May 1948, pp 283 - 310

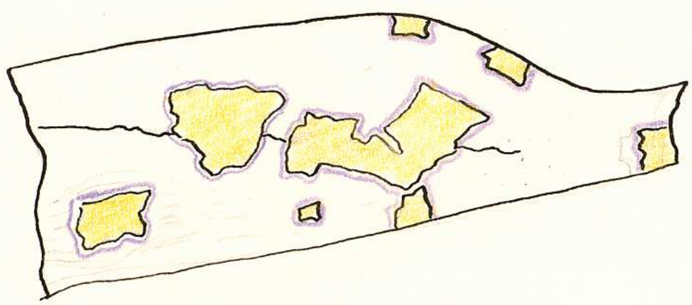
Prospecting in the Northern Part of Omenica District: The Miner,
Vol. 7, No. 2, Feb. 1934, pp 52 - 54

Manson River Place Deposits; Omenica District, G.S.C. Summary Report,
1933, pp 9 - 29

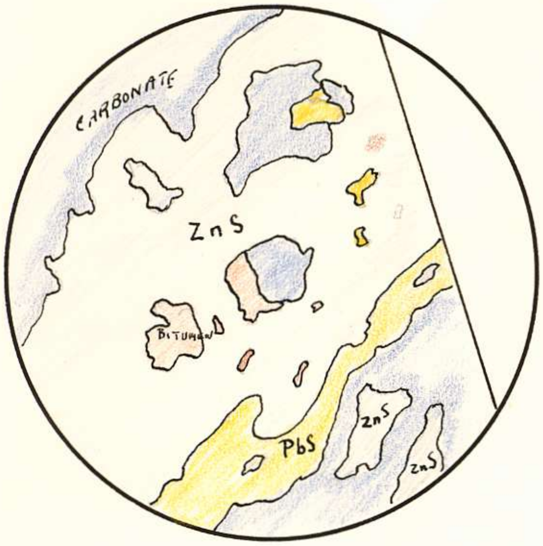
Plate 1



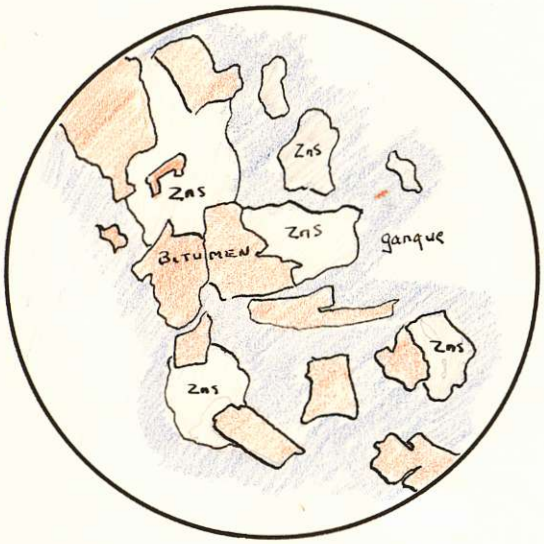
Hand specimen stained with copper nitrate to show relation of Dolomite, Calcite, and Sphalerite



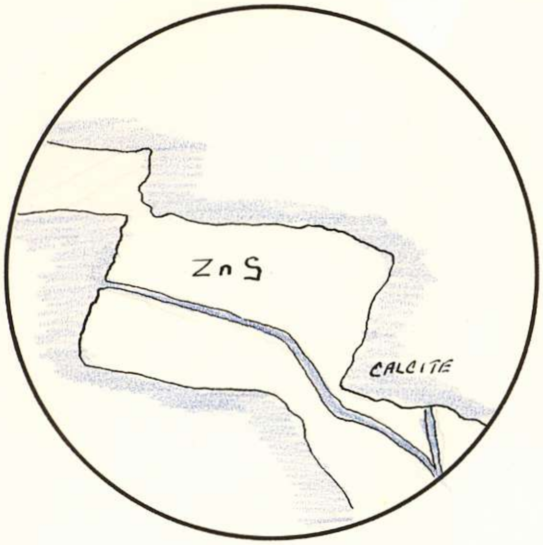
Polished Section showing replacement of Argillite with Galena



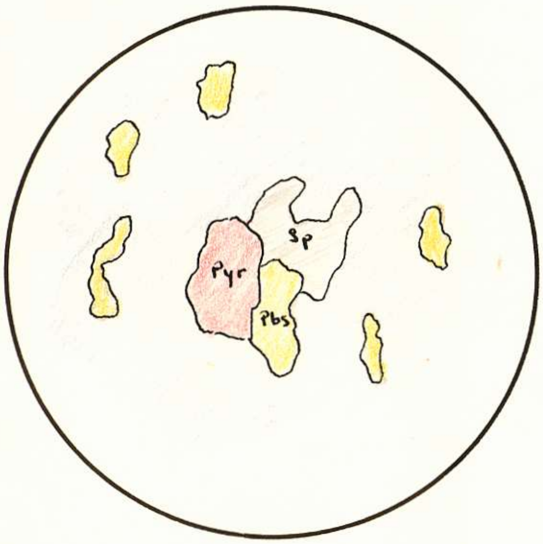
Showing replacement of the carbonate by sphalerite and its association with galena and bitumen.



Showing replacement of the carbonate by sphalerite and its association with the brecciated bitumen.



Showing calcite stringer cutting across the late sphalerite (yellow).



Showing relation of the pyrite, galena, and sphalerite.