

A MICROSCOPIC STUDY OF ORE
FROM THE LUSTDUST GROUP,
OMINICA MINING DIVISION,
BRITISH COLUMBIA.

600274

Geology 409

THOMAS BLAKE RAMSAY

THE UNIVERSITY OF BRITISH COLUMBIA

April 23, 1955.

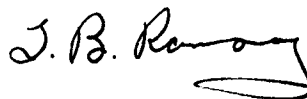
The University of British Columbia,
Vancouver 8, British Columbia,
April 23rd, 1955.

Dr. R. M. Thompson,
Department of Geology,
The University of British Columbia,
Vancouver 8, British Columbia.

Dear Sir:

In partial fulfillment of the course in Geology 409, I wish to submit this report entitled, "A Microscopic Study of Ore from the Lustdust Group, Ominica Mining Division, British Columbia."

Yours truly,

A handwritten signature in cursive script, appearing to read "T. B. Ramsay". The signature is written in dark ink and is positioned above the printed name.

T. B. RAMSAY.

ACKNOWLEDGEMENTS

The work for this report was carried out in the Mineralog-
raphy Laboratories of the University of British Columbia under the
supervision of Dr. R. M. Thompson.

The author wishes to thank Dr. Thompson and Mr. V.
Papezik for assistance rendered during the study of this ore.

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A MICROSCOPIC STUDY OF ORE
FROM THE LUSTDUST GROUP,
OMINICA MINING DIVISION,
BRITISH COLUMBIA.

Purpose and Scope

The purpose of this study is to examine specimens from the Lustdust Group and to identify the minerals present, their mode of occurrence and their paragenetic sequence.

Introduction

Method of Study

Laboratory Procedure.

- (a) Megascopic examination of the specimens.
- (b) Grinding, polishing and mounting of suitable specimens.
- (c) The super-panning and mounting of the concentrate from sludge (gouge) material.
- (d) The examination of the sections under the reflecting microscope.
- (e) The identification of minerals by optical methods, etch reactions and microchemical tests.

Owing to the great variation of hardness found in this suite of minerals, it was not always possible to grind and polish sections to indi-

cate the contacts to advantage.

No particular trouble.

Location of Property

The Lustdust Group of claims is located on Kwanika Creek, north of Tsayta Lake in the Ominica Mining Division of British Columbia, (55 - 126 N.E.)¹. The property can be reached over a truck-and-jeep road from Germanson Lake.

History of Property

Previous to 1953, the history of the property is unknown to the writer. This group is at present owned by the Bralorne Mines Limited and the first extensive exploration of the property was carried out by this company in 1953 under the direction of P. T. Boomer. During the summer of 1953, (July to the end of September), 2,897 feet of diamond drilling and 17,140 feet of trenching were completed.²

At this moment, work completed during the summer of 1954 is not available to the author.

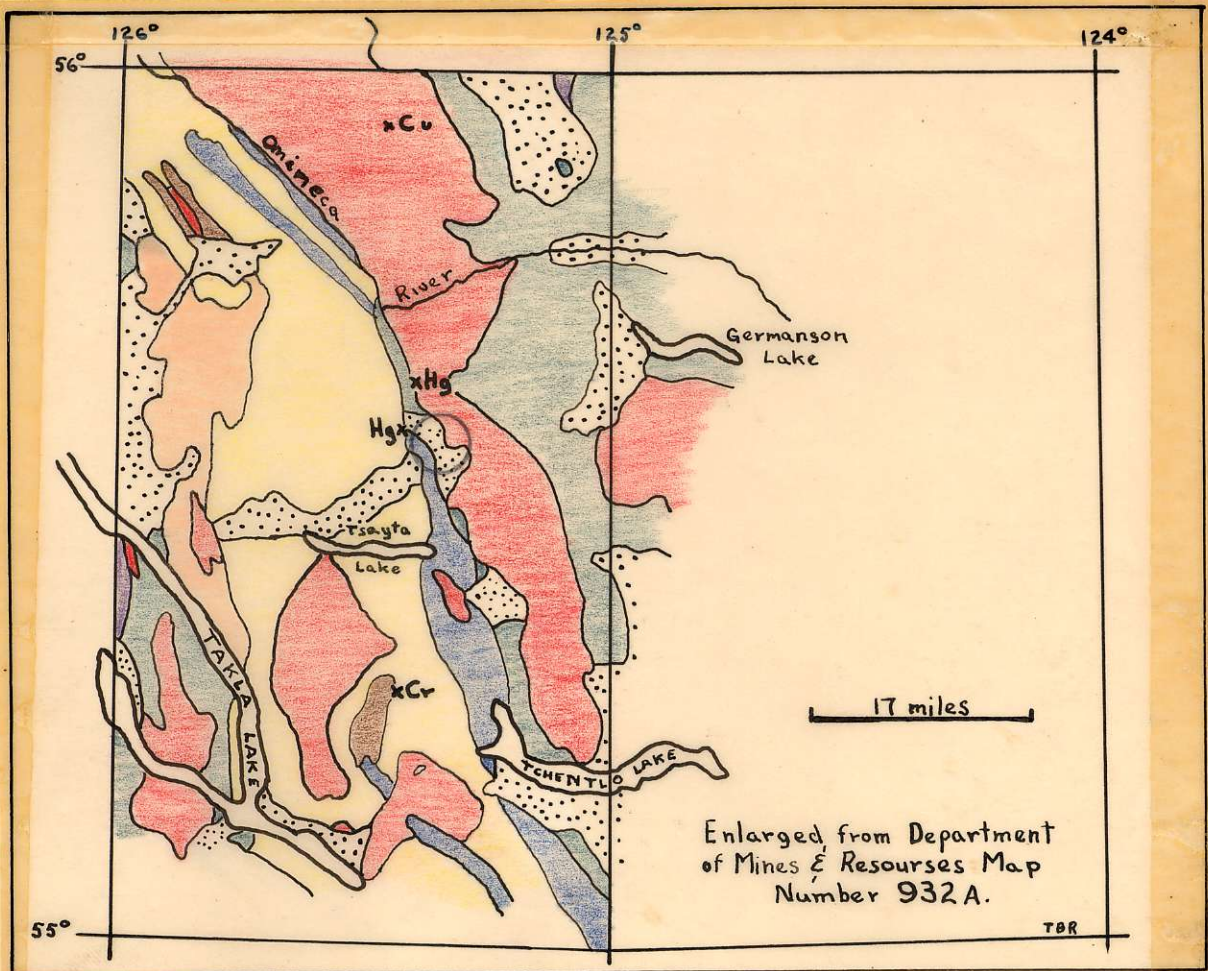
General Geology

Since the specific location of these claims is unknown to the writer and has never been examined by him, the map (Figure 1.) indicates the environment of this mining district.

Included with the specimens from this property are two rocks said to represent the 'acid' and 'basic' types of the claim-area. The

¹ Annual Report, Minister of Mines, Province of British Columbia, 1954, p. 94.

² ibid.



Location & Geology of the Lustdust Group.

LEGEND.

Cretaceous/Tertiary	...	Sedimentary rocks.
Triassic/Jurassic	Sed. & Vol. rocks.
Mesozoic intrusives	...	Ultrabasics.
	...	Acid intrusions.
Permian (mainly)	Sed. & Vol. rocks.
	...	Volcanics.
	...	Limestones.

The faint circle north-east of Tsayta Lake indicates the general position of the claims.

Figure 1.

'acid' rock appears to be a granitic rock which has been silicified and moderately stressed and was probably a felspar porphyry. The 'basic' rock is apparently an intrusive (sill or dyke) showing phenocrysts of amphibole.

Sludge, or gouge, from DDH. #33@338-52' may represent regional or local faulting.

Description of Mineralogy

General

The specimens provided come from two zones labelled Number One North and Number One South. Lateral and vertical relationships between these zones, and the relationships of specimens from the intra-zones, are unknown.

The North Zone specimens are labelled variously as high-silica or high-antimony types. A core specimen of 'sludge' is included with this group.

The South Zone specimens are labelled as high-arsenic, pyrite, zinc and silver types.

Megascopic Examination

Of the ten specimens supplied, all are high in sulfide minerals and show no wall-rock contacts. It is obvious that many of the specimens provided have come from exposed or near-surface zones and are largely weathered with limonitic minerals common to many surfaces.

Minerals identified are:

pyrite
 sphalerite
 stibnite
 arsenopyrite.

Minerals suspected are:

chalcopyrite
 berthierite
 kermesite.

In some cases, the weathering suggests that iron-rich minerals, other than pyrite, have contributed to the limonite 'box-work' common to most specimens.

The gangue minerals are predominantly quartz, though carbonates are suspected to be present in some specimens.

Microscopic Examination

Description of Individual Minerals.

Pyrite, FeS_2 : Pale yellow in color.
 Difficult to polish.
 Pitted.
 Hard.
 Isotropic.
 Tarnished by HNO_3 , negative to other reagents.

Arsenopyrite, FeAsS :

White in color.
 Difficult to polish.
 Pitted when poorly polished.
 Hard.
 Anisotropic, blue to brownish yellow.
 Rhombic cross-sections common; also massive.

Sphalerite, ZnS :

Grey in color.
 Poor reflection.
 Easily polished with scratches.
 Isotropic.
 Red internal reflection - best on poorly polished surfaces.

Berthierite, $\text{FeS.Sb}_2\text{S}_3$:

White (somewhat pinkish).
 Good reflection.
 Polished easily with cleavage (2) showing.
 Hardness about 'D'.
 Anisotropic - strong, see stibnite.
 Lamellar twinning in all occurrences.
 Etches Aq. R. eff. stains brown.
 HNO_3 stains irid.
 KOH stains irid.
 Microchem positive for Fe and Sb.

Stibnite, Sb_2S_3 :

White in color.
 Polishes easily - scratches.
 Soft - 'B'.
 Anisotropic - blue to brownish.
 Lamellar twinning prominent.
 Reacts for KOH (yellow).

Kermesite, $2\text{Sb}_2\text{S}_3.\text{Sb}_2\text{O}_3$:

Grey in color.
 Polishes easily.
 Soft - 'B'.
 Etch characteristic - yellow with KOH.
 Occurs in sheaf-like bundles and radiating fibres.
 Associated with stibnite.
 Anisotropic - red-brown to dark.

Chalcopyrite, $\text{Cu}_2\text{S.Fe}_2\text{S}_3$: (very small, in the cleavage of stibnite and kermesite)

Yellow.
 Soft - difficult to determine.
 Anisotropism - not observed.
 Appears negative to all reagents (including KCN) except
 HNO_3 (tarnishes) and Aq. R. stains brown.

Unknown 'A'.

Two small crystalline grains were noted embedded in the stibnite. These appear to be fairly soft, take a smooth polish, are definitely pleochloric (pale to lemon-yellow) and the mineral is strongly anisotropic.

Pyrite is common to most of the sections examined. It is usually massive, often fractured - both with and without rotation - and occasionally occurs as square cross-sections in quartz. The pyrite is associated with the other sulfide minerals and is also free in the quartz gangue. In one section it appears as though this mineral has been streamed out.³ The pyrite and arsenopyrite are closely associated, with pyrite eating into some arsenopyrite rhombs and tongues of arsenopyrite extending into the pyrite. Some arsenopyrite-pyrite contacts suggest partial rim-replacement of the pyrite by the arsenic mineral. Blebs and small masses of sphalerite and berthierite appear as unsupported nuclei (in two dimensions) in pyrite and may indicate internal replacement, however numerous indications of rim-invasion of pyrite by these minerals point to surface replacement. The few stibnite contacts suggest that there has been no interaction between these minerals and the pyrite. No association with the chalcopyrite was observed.

Arsenopyrite is also common to all sections occurring both as masses and as free rhombs in sulfide minerals and in the quartz gangue. In places it may have been replaced by sphalerite and berthierite. In a number of sections it is apparent that the arsenopyrite has replaced pyrite.⁴

Berthierite is usually common in sections containing stibnite and kermesite. It appears to be replacing pyrite and may be replacing arsenopyrite. Berthierite is intergrown (graphic texture) in sphalerite and has developed along the cleavage of stibnite and kermesite. Usually

³ Appendix, p. ii.

⁴ Appendix, p. i.

where associated with arsenopyrite and pyrite, berthierite often surrounds these minerals without apparent reaction. In other sections, lath-like crystals of berthierite are surrounded by stibnite.

Stibnite is not represented in all specimens. Where it does occur, however, it is extensively developed. This mineral is often intergrown with berthierite. Chalcopyrite is present as short narrow grains along the cleavage. The stibnite-sphalerite contact is not uncommon and some contacts indicate that the stibnite is replacing the sphalerite.

Kermesite occurs as sheaf-like bundles in sections with stibnite and has much the same relation to the other metallic minerals as has stibnite. The sphalerite-kermesite relationship is indefinite. It appears that the chalcopyrite lenticules in the kermesite are a few microns larger than in the stibnite. The kermesite is an alteration product of stibnite. It is to be noted that this alteration has not affected the included berthierite or chalcopyrite.

Sphalerite is associated with most minerals and was observed in all sections. This mineral appears to be replacing pyrite, and perhaps arsenopyrite, and is intimately related to berthierite and may have been partly replaced by stibnite. The blood-red internal reflection of this mineral, in conjunction with the mercury claims in the general area of this prospect, led the writer to suspect the mineral livingstonite. Microchemical tests, however, proved negative for mercury. It is therefore suggested that the sphalerite of this property is approaching the 17% maximum (in solid solution) of iron in sphalerite.

Chalcopyrite occurs as lenticular bodies in cleavage traces of sphalerite and kermesite. It is not reactive to potassium cyanide or to

silver nitrate and the possibility that this is gold is not to be completely discarded. The suspect chalcopyrite in the megascopic examination is possibly the staining of pyrite by the weathered products of berthierite.

The unknown mineral occurs as two pleochloric crystalline grains in stibnite.⁵

The super-panned gouge material was mounted in a briquette. Examination under the microscope indicates that no free gold is present. Sulfides identified were pyrite, arsenopyrite and stibnite.

No gold or silver minerals were identified. It is possible that these elements are associated with the arsenopyrite, berthierite and/or stibnite.

The relative amounts of minerals present in these specimens is difficult to determine owing to the variation of minerals from specimen to specimen. The most abundant minerals seem to be the stibnite-berthierite group, followed by arsenopyrite and pyrite.

Paragenesis

Examination of the specimens indicates that pyrite was the first mineral to be deposited and that this deposition continued concurrently with the later arsenopyrite. It appears as though the early pyrite suffered fracturing and was, in part, rotated as well as lensed (streamed) out. A period of pyrite-arsenopyrite deposition is indicated with the arsenopyrite continuing after the pyrite and partly replacing the iron sulfide. It is not impossible that a sulfide-free phase of quartz deposi-

⁵ See: Description of Minerals, p. 6 and Appendix, p. vi.

Diagrams showing time and contact relations between minerals.

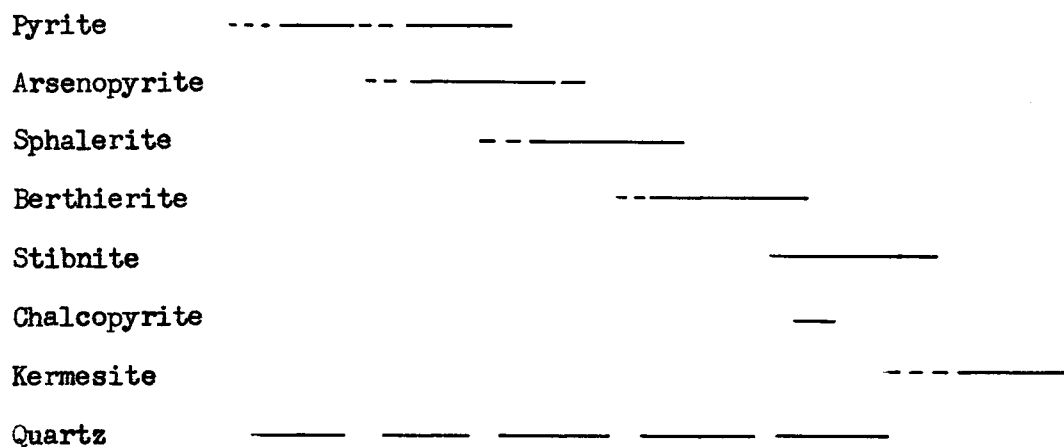


Figure 2.

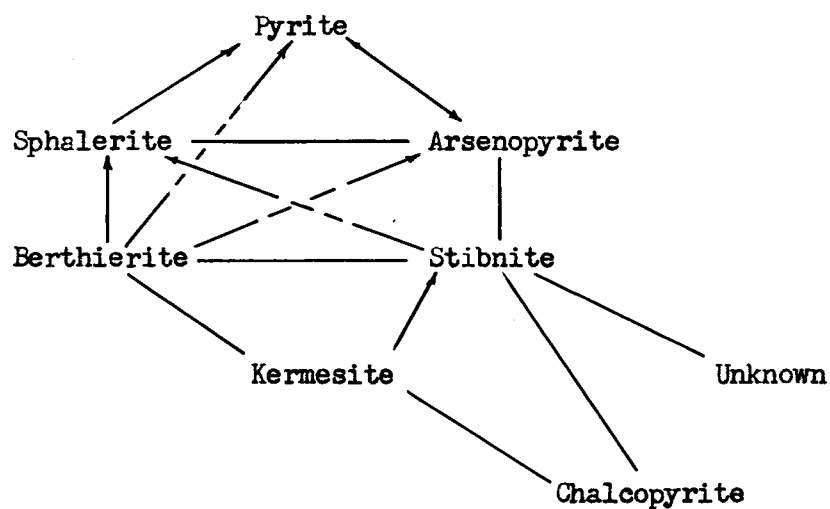


Figure 3.

tion occurred previous to the arsenopyrite-pyrite phase.

The berthierite and sphalerite appear to be slightly later than the two first-mentioned minerals and were more or less contemporaneous. The sphalerite may have selectively replaced the pyrite and possibly came in ahead of the berthierite-sphalerite phase. The stibnite was introduced later than the sphalerite which it may, in part, replace. Berthierite continued to be deposited during the deposition of the stibnite but was probably restricted to the earlier phases. Chalcopyrite (?) occurred later in the stibnite deposition. The development of kermesite probably post-dated the stibnite. The gangue quartz appears to have been deposited throughout the mineralization of this suite but interruptions of deposition probably occurred.

Summary

The early mineralogy of this claim suggests that deposition took place under fairly high-temperature conditions - perhaps mesothermal tending towards hydrothermal. Minerals deposited during this period were probably pyrite, arsenopyrite and the later sphalerite. Pressure conditions were not determined but it is unlikely that these were very great. The sphalerite and berthierite deposition may represent falling temperatures in the mineralizing solutions. The stibnite minerals are epithermal types. This late mineralization took place at temperatures of less than 200 degrees. It was not determined if a barren stage occurred previous to the antimony mineralization.

It is not definite, but this deposit may represent early open-space filling (vein or fissure) which continued during deposition with probable replacement occurring during the later phases. The presence of

a Mesozoic batholith in the general environment of these claims suggests that mineralization took place at this time.

The presence of both stibnite and arsenic in the mineralogy suggests that careful consideration must be given to the choice of refining methods if excessive losses are not to occur.

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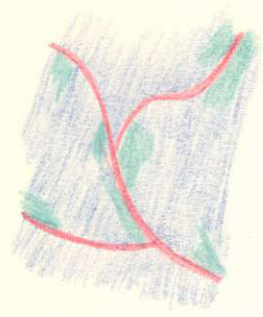
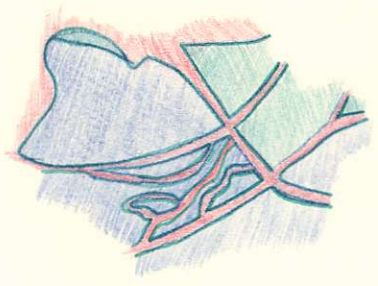
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APPENDIX



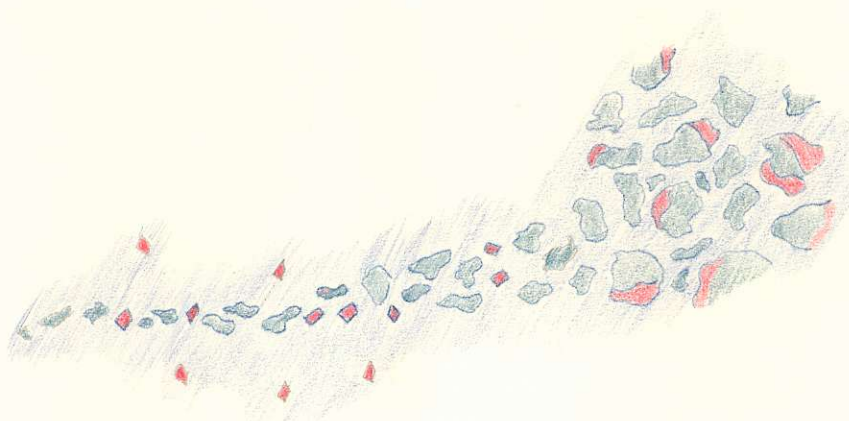
Pyrite 

Arsenopyrite

Quartz

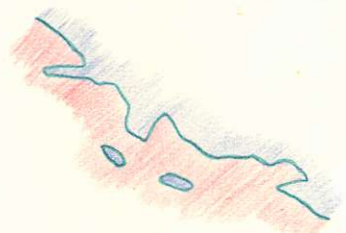
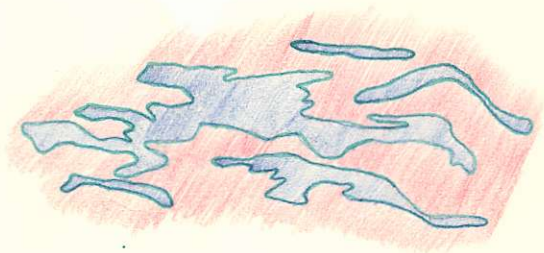
Scale?

Sketches showing the early fracturing of pyrite, filling with quartz and the replacement of the pyrite by arsenopyrite.



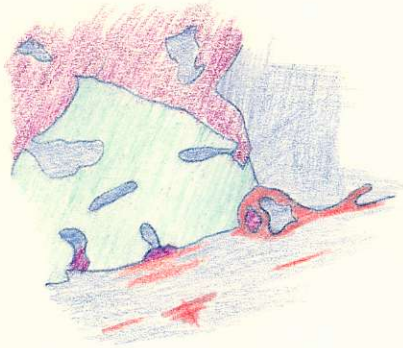
Pyrite
Arsenopyrite
Quartz

Generalized sketch showing the broken nature of the pyrite and how it has been streamed out. The arsenopyrite appears to be replacing the pyrite in the main mass but forming rhombic members in the predominantly quartz portion of the section.



Berthierite
Sphalerite

Sketches showing berthierite - sphalerite contacts
suggesting contemporaneous deposition.



Pyrite

Arsenopyrite ...

Sphalerite

Berthierite ...

Sketch showing the replacement of pyrite by arsenopyrite and berthierite. There are indications that the sphalerite and berthierite are more or less contemporaneous - with the sphalerite invading the pyrite.

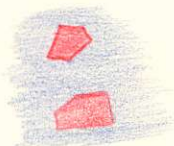


- Berthierite
- Chalcopyrite
- Kermesite



Sketch showing the developement of chalcopyrite (?) and berthierite along the cleavage of kermesite.

A similar developement of chalcopyrite and berthierite is found in stibnite.



A.

Berthierite ...

Unknown



B.

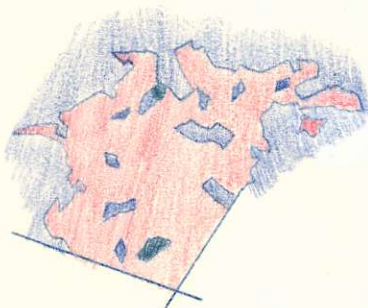
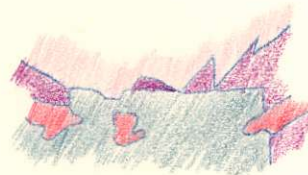
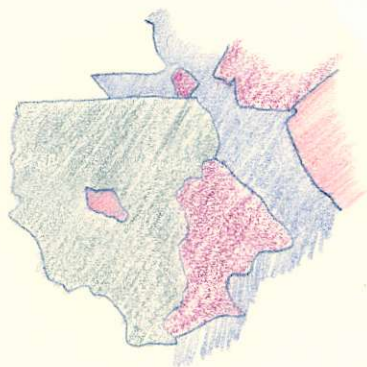
Stibnite

Chalcopyrite ...



A. Sketch showing the only observed occurrence of the unknown.

B. Chalcopyrite in the cleavage of stibnite.



- Pyrite 
- Arsenopyrite 
- Sphalerite 
- Berthierite 
- Quartz 

Sketches showing common relationships between various minerals.