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REPORT ON BEAVERDELL ORE SAMPLE

by

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BIBLIOGRAPHY

Ore Eposits of the Beaverdell Map Area -
by L. Reinecke - G.S.C. Memoir 79 -- 1915

Mineral Deposits of the Beaverdell Area -
Vol. 23, Economic Geology
Series.

Annual Reports of the Minister of Mines of
British Columbia - 1902 - 1939.

Microscopic Determination of Ore Minerals
by N. Short - U.S.G.S. Bulletin 825 - 1931

REPORT ON BEAVERDELL ORE SAMPLE

I Introduction

This is a brief report on an ore sample from the Beaverdell map-area. An attempt has been made to name the minerals present, their associations and order of deposition in the ore. Megoscopic and microscopic methods were used in the determinations.

Acknowledgments

The writer wishes to thank Mr. E. P. Davis for assistance in the microscopic work and write up, and A. Allan for assistance in cutting, mounting and polishing the sections.

II The Beaverdell Area

Location

The Beaverdell area is situated in the eastern corner of the Interior of British Columbia, about thirty miles north of the International Boundary. It is near the town of Beaverdell on the West Kettle River, about thirty miles east of Penticton.

Topography

The map-area lies nearly entirely in the basin of the West Kettle River. The maximum relief within this area is 3,250 feet. About two-thirds of the area is uplands and the remainder consists of steep sided valleys.

The uplands are rolling with low gradient slopes. The area is drained by the West Kettle and Kettle Rivers, which show signs of recent drainage disorganization, due to uplift.

History

The area first came into prominence in 1850, when gold placers were discovered throughout the area. The first lode claim was staked on Rock Creek in 1884. After 1894, with the development of important producers in the Rossland area, prospectors became active on the West Kettle River area and by 1900 all the more important claims on Wallace Mountain had been staked andworking on them had commenced. The first producing mines were the Sally and Carmi, from which lead and silver ores were extracted. The history from 1900 to 1940 has been varied;- mining activities depending mainly on the price of the metals recovered.

General Geology

The oldest rocks of the district are known as the Wallace Group, Triassic-Jurassic in age, and underlie about one-third of the Beaverdell area, mainly in the higher uplands. The series is a complex of chiefly igneous rocks, both intrusive and extrusive, though the oldest are recrystallized limestones and hornfels. The limestones are in beds and irregular masses. The whole series has been metamorphosed, faulted and the more brittle members brecciated. Contact metamorphic deposits occur in the Wallace Group but are not mined to any extent.

The Wallace Group has been intruded by the quartz diorite West Kettle Batholith, referred to the Jurassic, and this was followed by a second intrusion, the Beaverdell quartz-manganite, in Eocene times. Large exposures of these occur on Wallace Mountain. The ore bodies of the type mined in the district occur in mineralized shear zone in the quartz diorite, and were derived from hot, ascending solutions from the magma of the Beaverdell quartz manganite.

Oligocene volcanics of the Curry Creek Series outcrop in the eastern slope of Wallace Mountain and are in places overlain with Miocene lavas. The youngest deposits occur as a mantle of glacial drift.

<u>Ore Deposits</u>

The mineralized shear zone and mines of the district are situated in a small area on Wallace Mountain. The ores are high-grade silver, the minerals being pyrargyrite, galena, sphalerite, Pyrite and tetrahedrite in a gangue of quartz and sericite. Secondary native silver, calcite, chlorite and kaolin also occur. With some exceptions, in the case of pyrite and quartz, the minerals occur only as cavity fillings.

The ore bodies are tabular in shape, and values are irregular along the strike. Displacement by faulting is common. The zone of oxidation is shallow, oxidized material having been largely removed by glacial action.

III MINERAGRAPHY

The Ore Sample

The sample was suppled by Dr. H. V. Warren of the University Geology Department. It was labelled Beaverdell ore. The mine in the Beaverdell area from which this sample came was not named. Comparing the final results with other work done in this area it is apparently from the Wallace Mountain area.

Procedure

The sample was first inspected with a hand-lens. As many minerals as possible and their relation to each other were noted. It was then cut on the diamond saw by A. Allen so as to give the best possible section.

Twelve sections were cut; from these six were selected for study. These six were mounted in gum damar enclosed in a brass form and backed with plaster of paris.

These sections were then polished on the laps in the polishing laboratory. By the use of finer and finer abrasives the sections were given a smooth, flat, unscratched surface.

These sections were then placed under a microscope and inspected. Etch tests were tried on the different minerals to identify them. Those minerals, whose composition was dountful, were tested micro-chemically for their chemical composition.

Pyrite

Pyrite was identified by colour and hardness. The mineral is granular, massive, with no crystal outlines being observed. Confirmation by etch testing proved the mineral negative to all re-agents.

The pyrite has been fractured, and fractures have been filled with sphalerite, galena, tetrahedrite and quartz, thus placing pyrite as the earliest mineral in the paragenetic sequence. This is illustrated by figures 2 and 5 annexed.

Arsenopyrite

Arsenopyrite is distinguished by its hardness and colour. It occurs in fine needles and crystals (see fig.5) associated with the pyrite.

Quartz

This mineral was identified by hardness, colour and appearance when viewed with the electric arc lamp. Quartz is the second mineral to come in. It occurs in two forms;-

(1) As vein material cutting the fractured pyrite and containing small irregular fragments of the pyrite;

(2) As hexagonal crystals in the galena (see fig. 6) and sphalerite (see fig.3).

The vein quartz has been fractured and the fractures filled with galena (see fig. 1).

Galena

Galena was identified by its white silver color hardness, cleavage pits on the polished surface and etch tests. It occurs as irregular masses filling the fractures of earlier quartz (see fig. 1) and pyrite (fig. 2). It is apparently contemporaneous with the sphalerite. This conclusion is drawn from the fact that the sphalerite and galena have a definite smooth contact with the sphalerite (see fig. 2). It has been strongly attached and replaced by the later ruby silvers (see figs. 11 & 12).

Sphalerite

Sphalerite was identified by its dull grey color, hardness and orange internal reflection. Etch tests are of little value in determining this mineral since it does not react differently with any chemical solution. It is contemporaneous with the galena and veins the earlier pyrite (see fig.2).

Tetrahedrite

Tetrahedrite was identified by its hardness, by micro-chemical tests and by its lack of reaction with etching solutions. It is fairly common in the sections and is closely associated with the later ruby silvers, which tend to surround and replace it (fis. 7,9,10, & 11 illustrate this).

The tetrahedrite is apparently associated with the galena, probably with a late stage of the galena minerl-isation (see figs 7 & 12).

Pyrargyrite

Pyrargyrite was identified by its only red internal reflection, both in the polished section and in fragments taken from the section, by micro-chemical test for antimony distinguishing it from proustite which contains arsenic, and by its softness.

It is very closely associated with the tetrahedrite and galena, both of which it attacks and replaces (see figs. 9,10,11 & 12 respectively).

Etched tests also assist in distinguishing this ruby silver as follows:-

(1) Treated with $HgCl_2$, the mineral darkens with a brownish tinge;

(2) Treated with KCN it blackens quickly.

Another distinguishing factor, is the fact that when small fragments of this mineral are placed on a glass slide and viewed under a microscope, the whole fragment shows the ruby red internal reflection. This test helps to distinguish it from polybasite, which only shows the internal reflection at the edges of the fragments.

Myargyrite

The presence of this mineral, associated with pyrargyrite, was suspected from the beginning for two reasons:-

(1) To quote Short,- "Myargyrite is always associated with pyrargyrite";

(2) Irregularities in etched tests of pyrargyrite, as follows:-

(a) With $HgCl_2$ there is no effect, whereas pyrargyrite darkens with a brownish tinge;

(b) With KCN, the ruby silver and myargyrite darkened quickly but fine scratches appeared on portions believed to be myargyrite.

The two minerals are contemporaneous. The myargyrite was deposited with the pyrargyrite as it surrounded and replaced the tetrahedrite, since they both have the same chemicals in them, only in differing amounts, and the excess antimony and sulphide may have come from the tetrahedrite.

Polybasite

Polybasite was identified in only one section (see fig. 2). It was determined by its poor internal reflection, both in the section and in small fragments. Micro-chemical tests gave copper in association with the mineral. Short claims that all samples of polybasite contains some copper.

Etched tests are of little use in distinguishing polybasite from myargyrite and pyrargyrite.

Polybasite is later than the ruby silver or myargyrite and seems to be associated with pyrrhotite.

Pyrrhotite

This mineral oocurs in small irregular patches in Section 2. It is distinguished by its hardness and brownish yellow color. It is associated with the polybasite and is probably earlier than that mineral.

Paragenesis

1. Pyrite
   Arsenopyrite
   Quartz

2. Sphalerite
   Galena

3. Tetrahedrite
   Pyrargyrite, myargyrite

4. Pyrrhotite
   Polybasite

(1) In some reports on this property the authors have claimed two generations of quartz;

(a) at the beginning of period 1.

(b) at the beginning of period 2.

This author does not believe the quartz crystals which occur in sphalerite and galena represent early quartz veins. No crystals were found in the so-called later pyrite

(2) In other reports the sphalerite is given as being earlier than the galena or doubtfully as contemporaneous. This author believes the sphalerite is associated with an early phase of the galena mineralization.

(3) Tetrahedrite is more closely associated with pyrargyrite and myargyrite than with the galena.

(4) Polybasite and Pyrrhotite are later phases of mineralization.

IV
Conclusions

This is not a true epithermal deposit. The low temperature minerals which are ~~sometimes~~ usually secondary are associated here with high temperature minerals. Ruby silver myargyrite is associated with tetrahedrite, and polybasite, with pyrrhotite. These low temperature minerals are considered primary because of their close association with the high temperature minerals, and they form even, regular boundaries with these minerals.

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Drawing of Sections

Geol 9

Beavendell Area

A.T. Anderson

QUARTZ Q

pyrite P

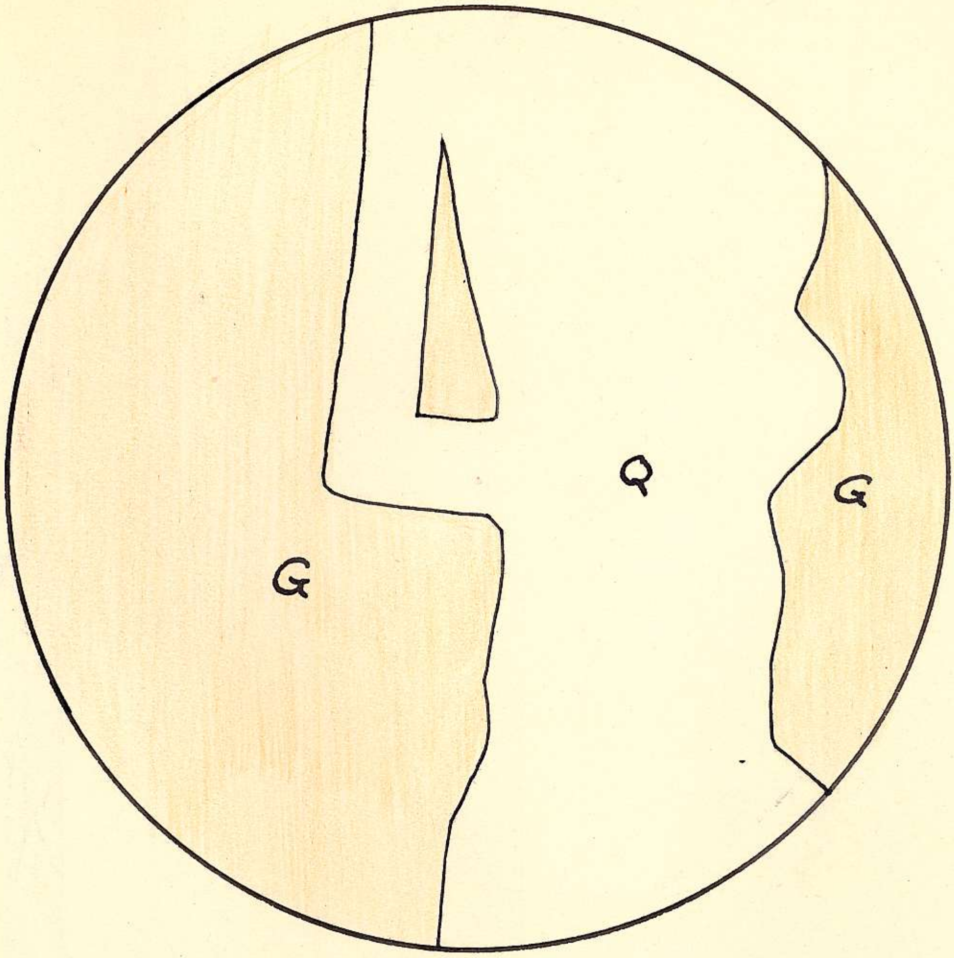
galena G

sphalerite S

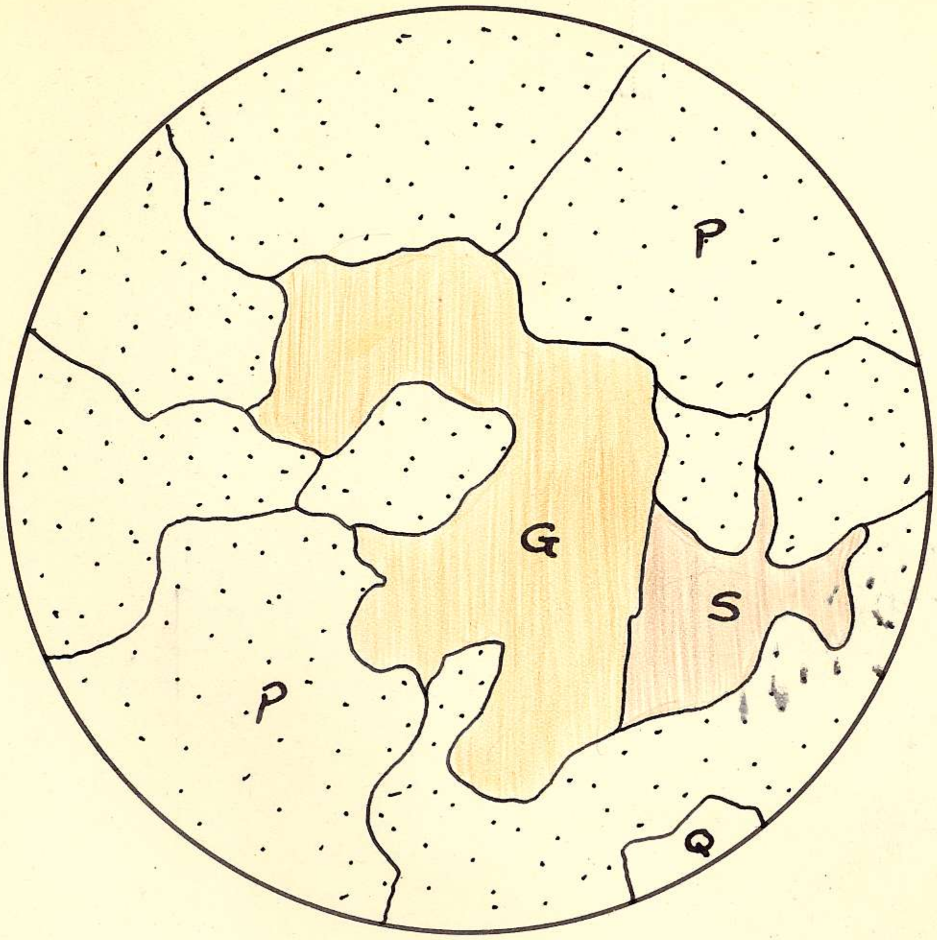
ruby silvers R

tetrahedrite T

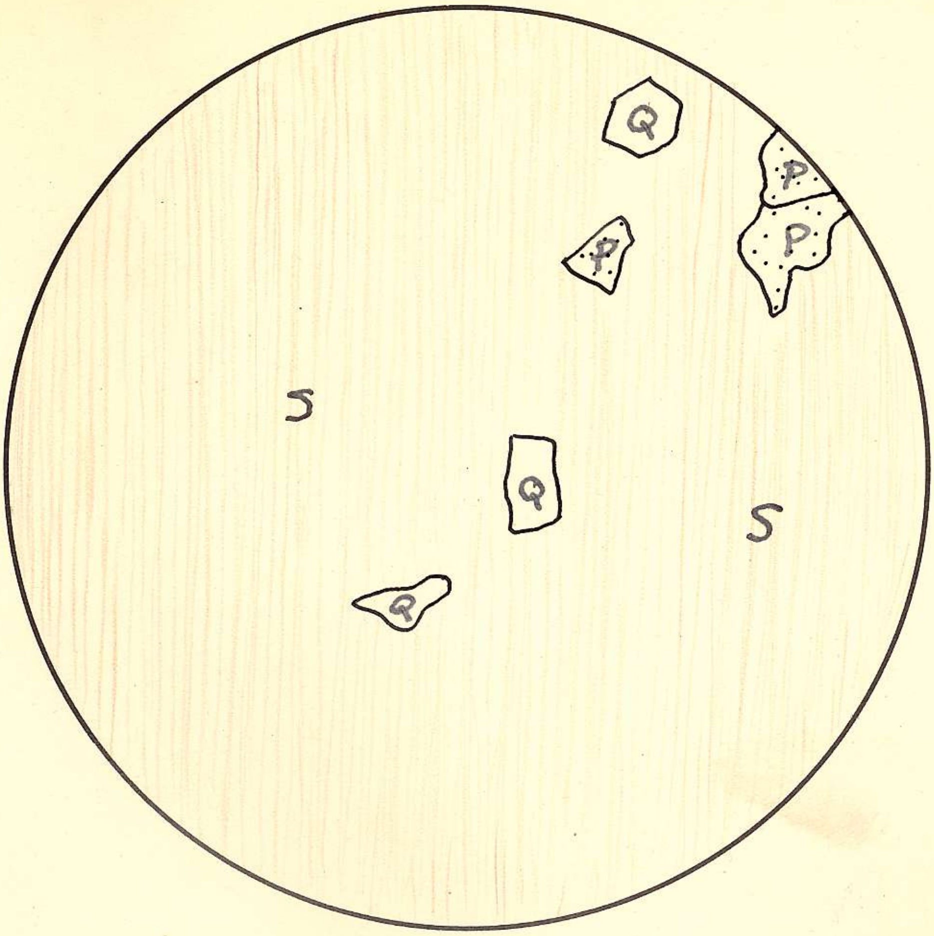
arsenopyrite A



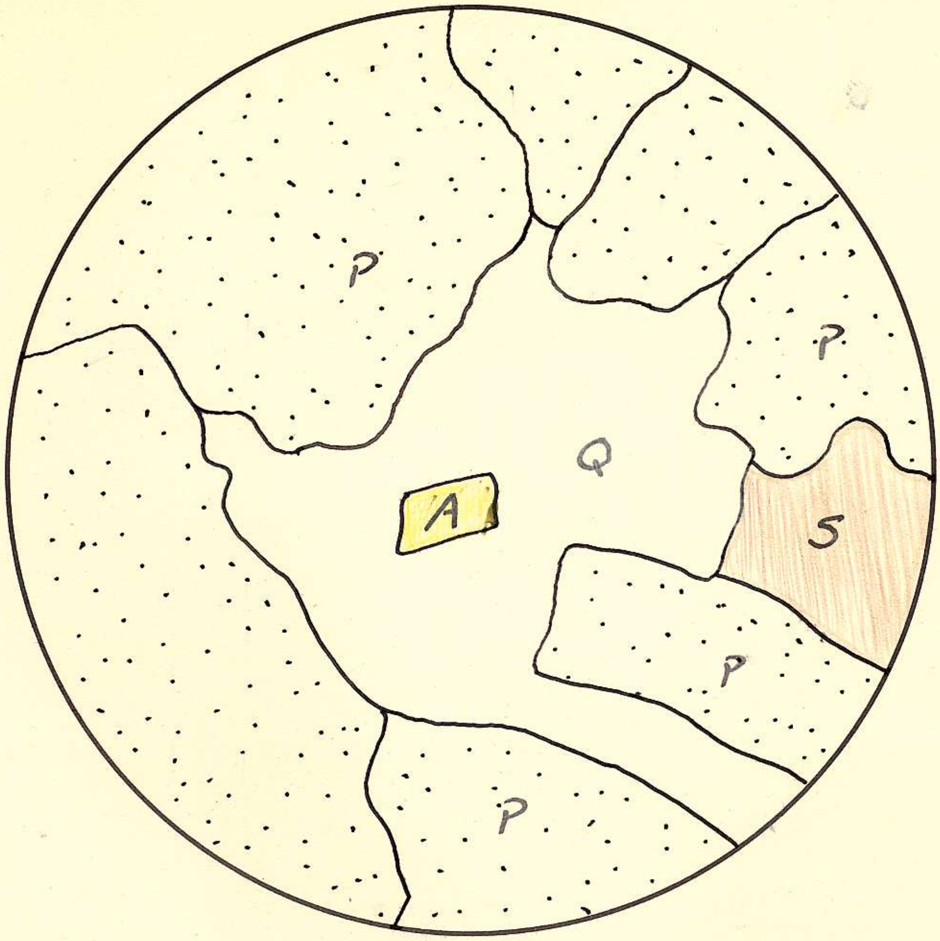
Fractured quartz with galena filling,



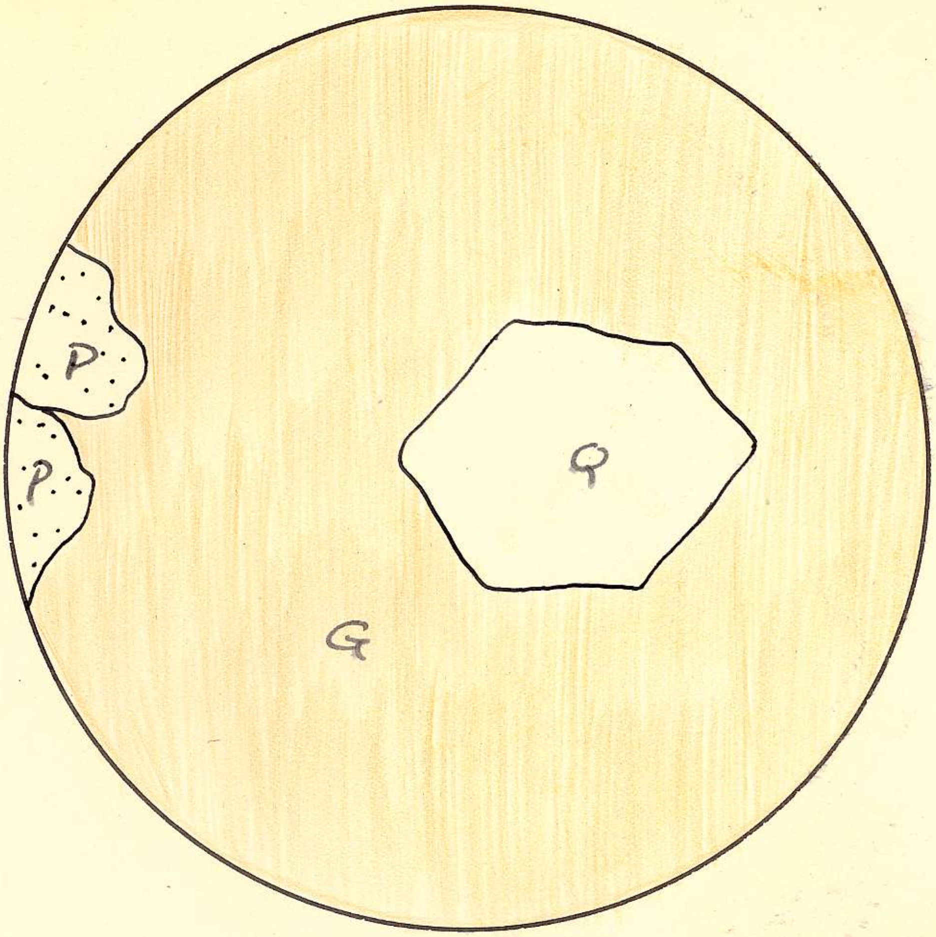
Straight contact showing galena and sphalerite as contemporaneous minerals.



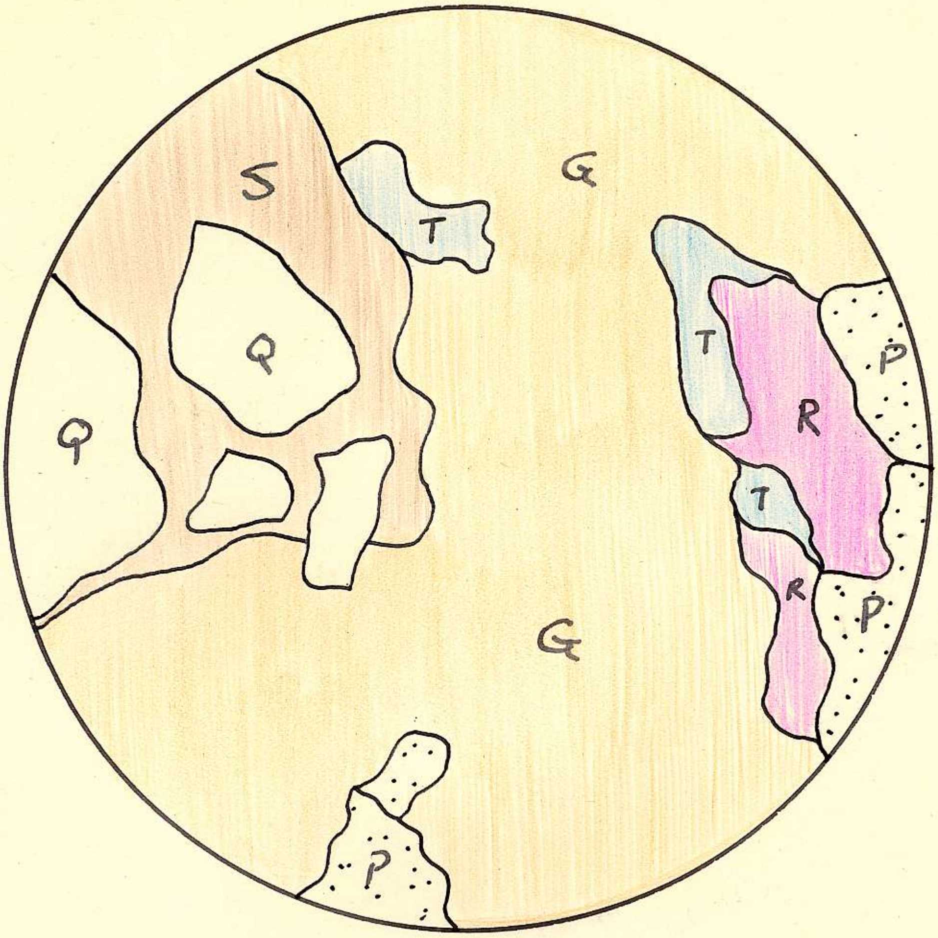
Quartz crystalls and sphalerite.



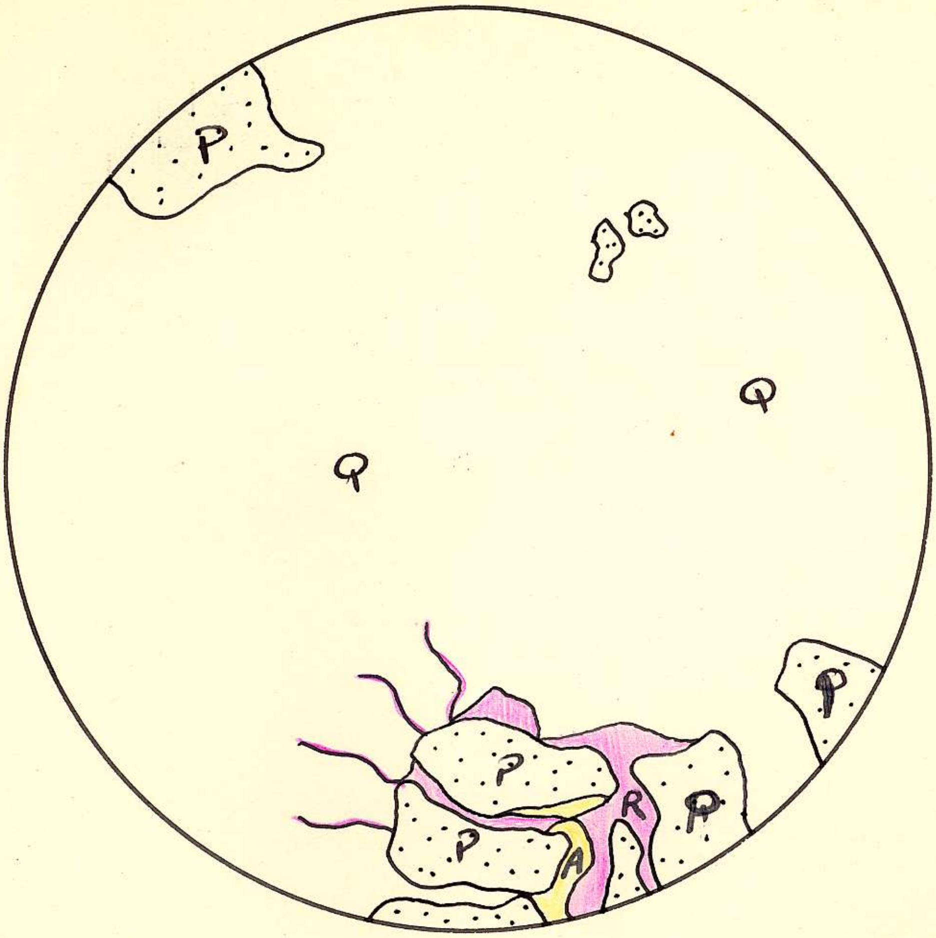
Arsenopyrite in quartz



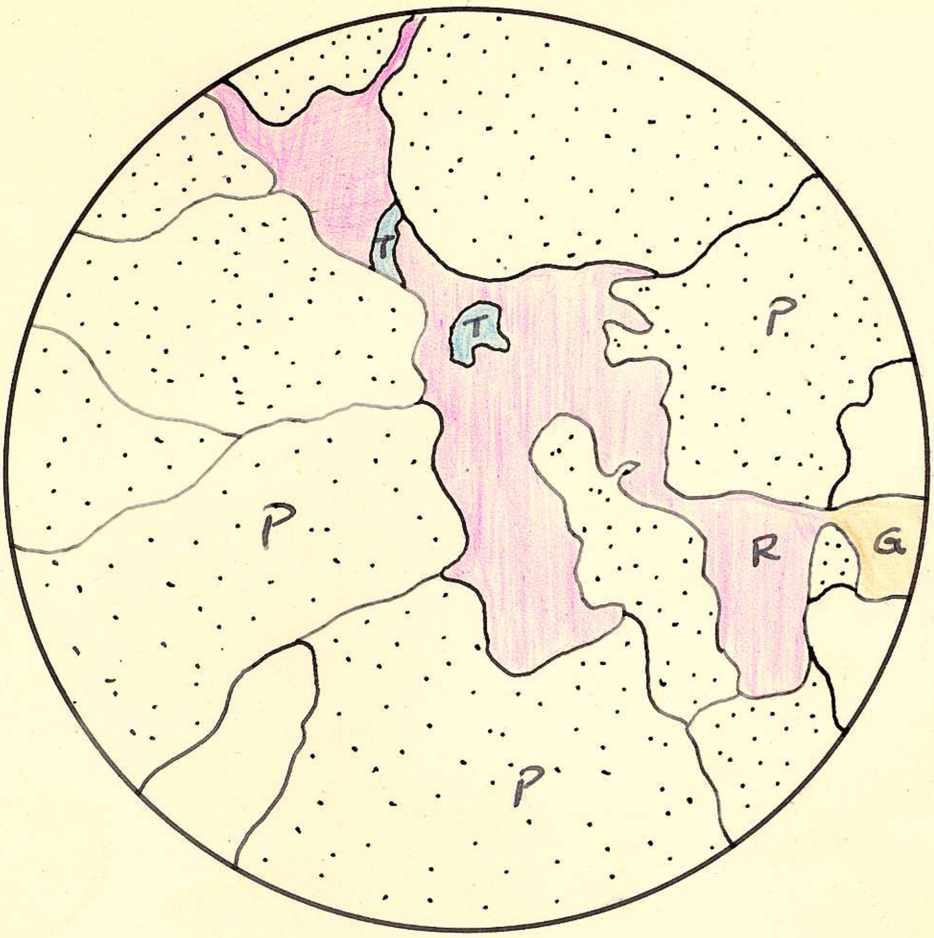
Quartz crystal in galena.



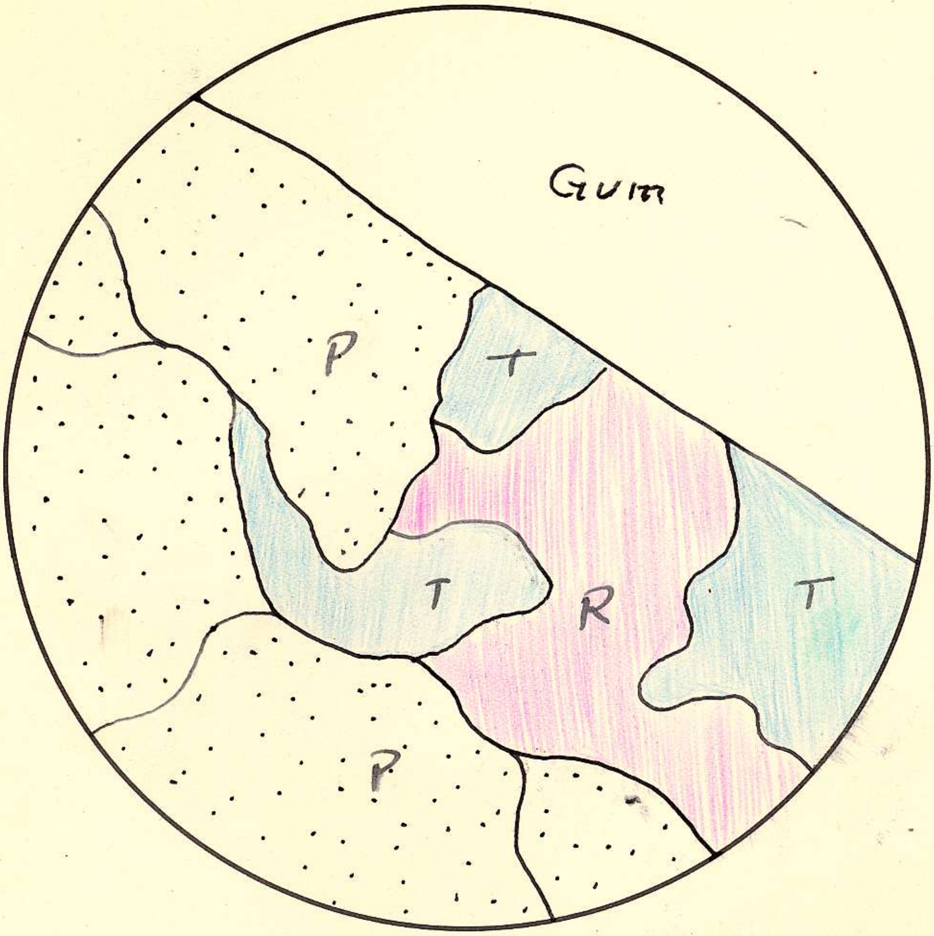
Showing that ruby silvers, tetrahedrite
and galena are ofthe same generation,



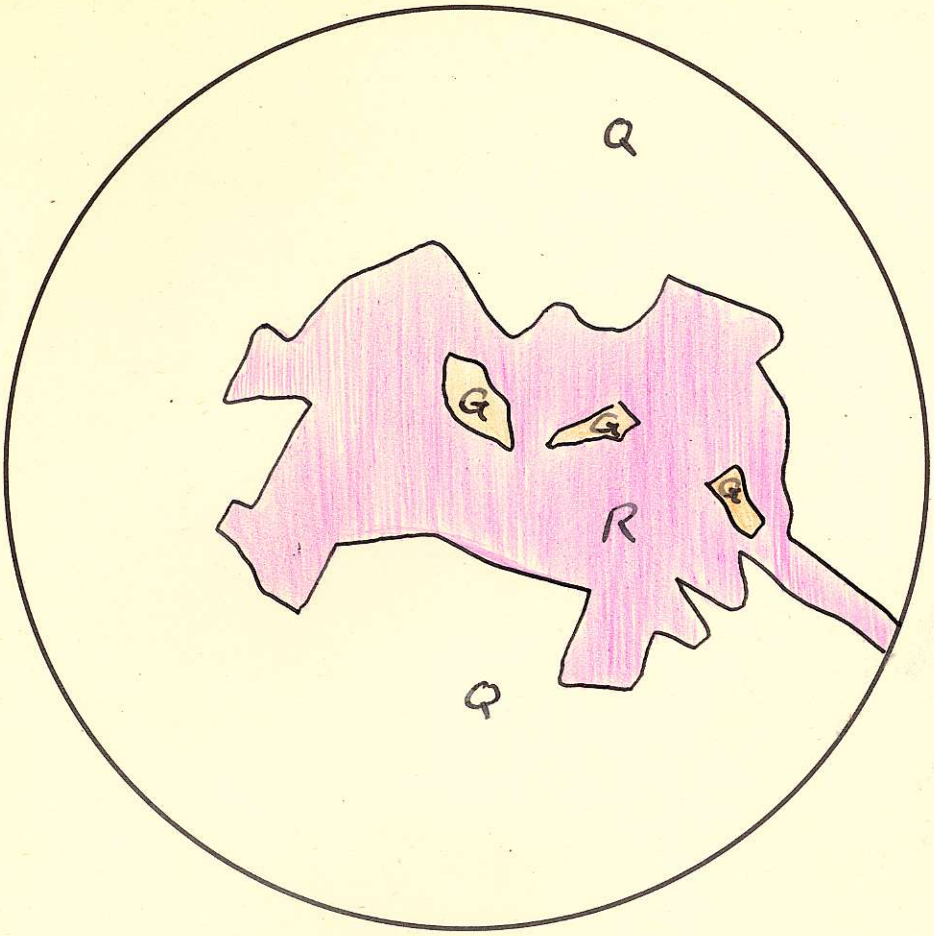
Ruby silver vein in quartz.



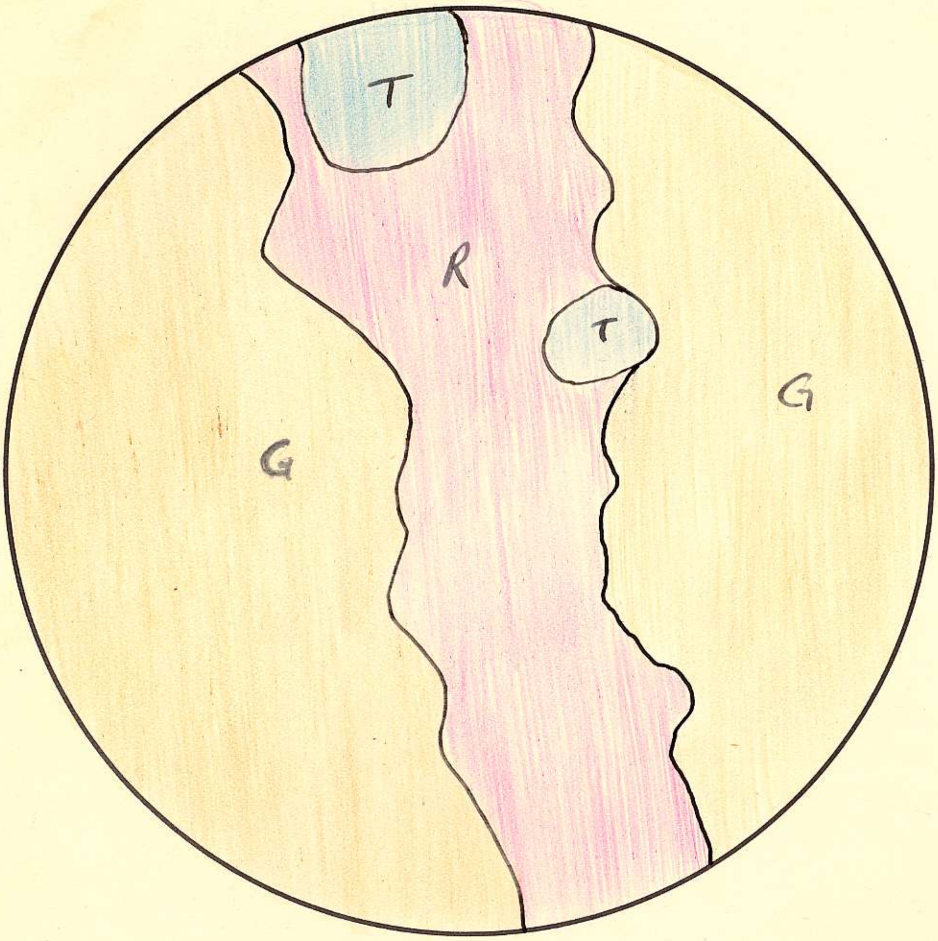
Tetrahedrite islands in sea of ruby silvers



Contemporaneous ruby silvers and tetrahedrite.



Ruby silvers replacing galena.



Island and sea of tetrahedrite and ruby silvers respectively in galena.

Ruby silvers and fractures of pyrite and quartz.