

DEPARTMENT OF GEOLOGY  
UNIVERSITY OF BRITISH COLUMBIA

Summer Essay

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5th Year Geological Engineering.

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Skeena

English 25  
Presentation 43  
Notes 17

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P R O S P E C T I N G

I N T H E

U N U K R I V E R D I S T R I C T .

by

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P R O S P E C T I N G  
I N T H E  
U N U K R I V E R D I S T R I C T .

INTRODUCTION :

THE MINING INDUSTRY:

The industrial and community life of the mining town of Anyox will soon be terminated. Its mines, mill and smelter have operated for years on marginal ores, and, since they can no longer produce their metals profitably, the Directors of this large mine have decided recently to cease operations.

The closing of this great mining town and plant will indicate to many that commercial minerals have a wasting and unreplenishable resource. For individual deposits this is not to be denied, but it is a misleading half-truth as far as the mineral industry of the country is concerned. Mining in Canada is quite as permanent an industry as lumbering or farming. Up to the present time, only rich and easily accessible mineral concentrations have been mined. As these are exhausted, higher prevailing prices will turn marginal mineral concentrations into ore. Also extended transportation facilities and comprehensive mining methods will turn the

attention of the industry to the hinterland and deeper into the earth's crust, where extensive areas are known to have geological conditions similar to those prevailing in present mining districts.

The mining industry differs in almost every respect from other basic industries, such as farming and lumbering, and probably as much in the initial stage as anywhere else. The farmer and the lumberman each produces direct from his particular section of the earth, which in its undeveloped state was easily found and possessed.

PROSPECTING :

On the other hand, to acquire a suitable mining property, it is first necessary to find where Nature has hidden away her valuable minerals. Heavy vegetation, mountain talus, weathering and other agencies make this an exceedingly difficult task, which is constantly becoming more so, as those deposits with outstanding physical features become located. Thus the search is demanding in a progressive degree the services of a skilled specialist, known as a prospector.

Having had the opportunity to prospect in company with one of these specialists, the past summer has been spent in the hills, acquiring some of the arts of the trade, and, at the same time, directing into this initial stage of mining the knowledge obtained during the previous year at the University.

CHOICE OF PROSPECTING AREA:

GEOLOGICAL CONSIDERATIONS:

While the decision to go prospecting was a comparatively simple one to make, it was soon apparent that the choice of a prospecting district involved many complicated details of major importance. In the first place, it must be geologically favorable to concentrations of valuable minerals, and, since we had decided to follow the present fashion in metals and look preferably for gold and silver, it was essential that geological conditions would favor the deposition of these.

Most minerals are the products of igneous activity, or have been derived from minerals so formed. (G. A. Young, Economic Geol. Series #7, Page 3.) Our attention was directed, therefore, towards the known igneous masses. The Coast Range batholith is the dominant geological feature of the Coast Range of B.C. It is an elongated narrow mass of granite rocks, which stretches from the Fraser River to the Southern Yukon. (S. J. Schofield & O. Hanson, Memoir 132, Page 8.) It was decided to prospect somewhere along the contact of this batholith with the surrounding formations. Since the mineral content of the two flanks of the batholith are different, (S. J. Schofield, Trans. Can. Inst. of Min. and Met., Vol. XXIV, 1921.) we chose the Eastern one, which contains deposits of galena, tetrahedrite sphalerite, pyrite and other minerals with which gold and silver are associated.

TRANSPORTATION :

Now, while our attention was directed towards an

extensive field, the general lack of transportation eliminated most of it from further consideration. Those sections, however, in which means of transportation were established, or could be economically built, were widely separated; and a choice between them involved other factors in which the element of chance entered largely. If a district had easy access, and a proven property in operation, it would have been intensely prospected; while, on the other hand, one not yet boasting of a producer, and moderately inaccessible, might yield results to our efforts more easily and quickly. Considering the merits of the different districts from these angles, we finally decided to prospect the Unuk River Area.

PERSONAL AND OTHER ASPECTS :

While the decision was based on the reasons given, the personal element was not entirely lacking in this matter. My partner had already spent several years prospecting in the Portland Canal area, and, being acquainted with the regional characteristics of ore occurrences, he wished to remain in or near a field in which he had great confidence.

THE UNUK RIVER DISTRICT :

LOCATION AND SIZE :

The Unuk River District of B.C. lies North and Northwest of the Portland Canal area. To the Southwest it is delimited by the International Boundary which crosses the Unuk River 24 miles from its mouth, where it empties into Burroughs Bay on the Behm Canal. The entrance to this canal is 40 miles



North of where the Portland Canal, which is the Southernmost boundary of Alaska, indents the Northern Pacific coast.

HISTORY :

Some fairly extensive mining development was accomplished in the Unuk District, between the years 1900 and 1903. Most of the work was spent on the present crown-granted Globe and Cumberland groups and on the placer grounds. A wagon road, 42 miles in length, was started from Tidewater, and all but seven miles completed. Only desultory work had been done since then, until the summer of 1932, when the Unuk Valley Gold Syndicate located their claims between the North Fork and Sulphur Creeks. The Premier Gold Mining Company have been actively developing these claims during this present season.

GENERAL GEOLOGY :

The district has not yet had a detailed geographical or geological survey. A geological cross section, exposed by the Unuk River Valley across part of the Coast Range, consists of two parts : on the West, a wide belt of Mesozoic granitic masses, formed during the same general period, and grouped into one great unit, the Coast Range Batholith, which, on the East, intrudes partly metamorphosed and probably Paleozoic sedimentary rocks in which ore deposits have been discovered. (F. E. Wright, U.S. Geol. Sur. Report to Can. Gov. 1905.)

CORELATION WITH THE PORTLAND CANAL GEOLOGY :

It was the section to the East of the Batholith that we had decided to prospect. Although the sedimentary rocks

had been determined as probably Paleozoic by Wright, we hoped to find a Mesozoic series of sedimentary and volcanic rocks, since they underlay large areas to the South in the Portland Canal area. Here they have been determined by Hanson to belong to the Hazelton Group. (G. Hanson, Memoir 175, Page 4)

From the standpoint of proven ore, the Porter, Idaho, Prosperity Premier and Big Missouri are the outstanding properties in the Portland Canal district. They are situated correspondingly from South to North on the same volcanic belt of the Hazelton Group, which continuing North of the Big Missouri, has also in process of active development the important properties of The Hercules, Troy, Salmon Gold and the Portland. The Northern limit of this belt has not been defined yet, and we had hoped to follow it or locate it at the headwaters of Sulphide Creek. This belt will be called the 'Premier Volcanic' zone in this essay.

A C C E S S :

Access to the Unuk district from the West is possible by three routes: by air to Mackay Lake, by river boat up the Unuk, and by foot from the Portland-Bowser River pack trail.

Mackay Lake does not clear of ice until the summer is well advanced, due to its high altitude of 3,600 feet; and for the same reason freezes over early in the fall. Thus, while flying affords at present the most practical route to that part of the district reasonably close to the lake, it



*Picture taken summer 1935.*



*Picture taken summer 1925.*

*By comparison with upper picture, ice has retreated to the approximate position of the dotted line in 10 year interval.*

would not be suitable for any large-scale mining development.

The route by river is made in a flat-bottomed river boat, using oars, poles, lines and an out-board type of motor. This mode of travelling demands the services of men with "white-water" experience, who can line their boats through some stretches of the river channel. Appropriate equipment and essential experience, however, makes this route quite practical as far as the International Boundary, and at certain times of the year, boats may ascend past Sulphide Creek Forks on Sulphur Creek.

Access to the Unuk country on foot from the Portland Canal district is seldom attempted through the high glaciated mountain passes in the rugged range separating the river basins. Two important considerations led us to choose this route. In the first place, travelling by plane or river boat would have been comparatively expensive; while at the same time our schedule would have been dependent upon ice conditions of Mackay Lake, or dates upon which river boats were available.

#### JOURNEY INTO THE UNUK COUNTRY :

##### PROSPECTING ON THE ROUTE:

On June the 27th we set out on foot from the end of the truck road at the Big Missouri, arriving at the East side camp of the Salmon Gold group the same day. While waiting for supplies to reach us by pack train, we prospected the surrounding country. Its outstanding geological feature is the



*Needle-like peaks. Looking east across Summit lake.*



*Looking west across the Salmon glacier. Under the arrow is a horn-like peak. On the mountain side under the cross, the belt of quartz porphyry and quartz diorite dykes appears.*

Salmon Gold granodiorite stock, which is intruded into, and nearly severs the Premier Volcanic Zone. Tongues of granodiorite project from its margin into the volcanics, which are of an andesitic nature and intrude the Tide Lake argillites. Bodies of porphyry occur locally along the margin of the stock. They are probably some differential phase of the stock magma, whose margins cooled more quickly than the main body, and imparted to them their fine-grained ground mass. Another marginal rock is a large quartz sill-like body, which appears to be a differentiated part of the stock magma. These rock formations were prospected, and some open cutting and sampling done on large pyritic zones. They, however, returned only gold and silver traces.

On July 9th, a pack train brought in our supplies, and we moved with it to the Portland group, which is the most Northerly property on the Premier Volcanic Zone. The mineralization here was galena, sphalerite and pyrite in a replacement zone at the contact of the sediments and volcanics. Pyritic specimens were said, by the owner of the group, to carry good gold values. Pyrite, as a rule, does not contain gold values on the Salmon Gold group adjoining the Salmon Gold stock, and, as mentioned above, other pyritic specimens from close to the same stock did not give any gold values. Pyritic ore from close to a stock in the Unuk district was also void of gold. Considering that such properties as the Premier, B.C. Silver, and Portland Groups, which are not associated with stocks, carry pyritic gold ore, it may be more than a coincidence that pyritic ores, so far encountered close to stocks in this region,

have contained no gold.

The Portland group is at the edge of a glacier coming down from a high mountain chain, underlain by the Premier Volcanic Zone intrusives. The glacier has cut a deep gorge, in the walls of which the contact of the Premier Volcanic Zone and Tide Lake argillites can be seen. This natural cross-section shows that the argillites are cut by, and dip away from the volcanic zone.

E Q U I P M E N T :

To proceed farther from this camp, all provisions and equipment had to be back-packed. Because the route ahead was difficult and hazardous, we did not wish to relay packs over it; and so our provisions and equipment were limited to what we could conveniently pack along with us. Our equipment consisted of :-

- 1 - 6 x 7 $\frac{1}{2}$  silk prospector's tent.
- 2 - Pioneer brand sleeping bags.
- 2 - 2-lb. prospectors' picks.
- 2 - Ground sheets, with inserted eyes to be used  
as ground sheets or flies.
- 2 - Pack boards.
- 1 - Small medical kit.
- 1 - Brunton compass.
- 1 - Aneroid.
- 1 - Camera.
- 1 - Rifle.

- 1 - Life line.
- 2 - Staffs for testing snow bridges over glacier  
crevasses.
- 1 - Frying pan.
- 1 - Small pot.
- 2 - Aluminum cups and plates.
- 2 - Spoons.
- 1 - Fork.
- 7 - Sample sacks.
- 1 - Cake of soap.
- 1 - Towel.
- 1 - Boys' size pole-ax.
- 1 - 6" flat file.

Such items as jack knives, mineral glasses, matches, maps, diaries, mackinaws and two pairs of extra socks were also included.

Our provisions were estimated to weigh as follows :-

Flour	25 lbs.
Bacon	1 slab, 10 lbs.
Sugar	4 lbs.
Tea	1 lb.
Rice	6 lbs.
Salt	1 lb.
Rycrisp	2 lbs.
Baking Powder	Small can.

These items furnished us with packs of about 50 lb.



each. We anticipated being away from our base camp for about twenty days, and, since we were going into a country whose game possibilities we did not know, it became necessary that these provisions would last us for that length of time.

TOPOGRAPHY AND GEOLOGY :

The following day we moved with our packs along the side of the mountain chain containing the Premier Volcanic Zone, which has here become an intervening barrier between the Bowser River and the Unuk River districts. A laterally extending pendant glacier covered the contact, and, although we climbed to elevations of over 4,200 feet, it prevented us from prospecting the volcanic zone. Abundant float of volcanic nature, heavily mineralized with pyrite, however, indicated to us that we were paralleling the Premier Volcanic Zone. We camped that night in the last of the timber beside the Frankmackie Glacier, which flows East from the Unuk Divide ice fields.

It rained very heavily next day, and, visibility being very poor, we did not attempt to cross the divide, but prospected in a Westerly direction up the South side of the Frankmackie Glacier. The sediments pertaining at camp site soon gave place to the Premier Volcanic Zone. The glacier afforded a natural cross-section here, and the sediments again appeared to be intruded by the volcanics, and to be dipping to the East from them. Proceeding farther West, we found that the Premier Volcanic Zone was narrow here, being only about



*View showing rugged, horn-like peaks to the east of what was formerly Tide lake, whose water line is clearly defined on the flanks of this mountain range. This lake was impounded until about 8 years ago by the Frankmackie glacier which flows east from the Unuk divide until it's eastward progress is halted just to the left of the picture by this bulwark of mountain peaks.*

1½ miles wide. The sediments on its Western flank dip to the West. It would appear, therefore, that the Zone occupies an axial position in a sedimentary anticline.

This area is very rugged and contains many valley glaciers, pendant glaciers, ice-caps and snow-fields with mountain peaks reaching elevations close to 10,000 feet. Many of these have sharp pinnacles and horns, which may indicate the maximum depth attained by the ice in this region.

#### D R A I N A G E :

The drainage has in general a North-South trend, along with the grain of the country. The valleys of streams and larger glaciers occupy synclinal, instead of the more general anticlinal positions in the sedimentary rocks. This is due to the harder volcanic tuffs, andesites and breccias that have been intruded and extruded along the anticlinal axes.

#### CROSSING THE DIVIDE :

It was not until a week later that we were able to cross the divide. In many places a thin covering of snow made the crossing of the glacier crevasses dangerous, and it was imperative that we selected a route to evade, where possible, these ice conditions. Low-lying clouds prevented this, and we returned to our base camp. Finally, in good weather, we travelled West up the Frankmackie Glacier, which is a lateral one from a larger glacier extending in a North-South direction. We crossed this latter glacier in a Northwesterly direction, and entered the South Fork valley of the Unuk River

by means of a lateral glacier flowing Westerly.

GEOLOGY ON THE NORTH SIDE OF THE FRANKMACKIE GLACIER :

The formations have already been noted on the South side of the Frankmackie Glacier. On the North side, the Eastern edge of the Premier Volcanic Zone appeared approximately opposite to its position on the South side. The zone is wider on the North side, and its <sup>western</sup> contact with the sediments is under the large North-South trending glacier. This glacier will be called the "Star" glacier.

THE STAR GLACIER :

This glacier, overlying the Western flank of the anticline intruded by the Premier Volcanic Zone, and probably occupying a synclinal position in the sediments, continues for 20 miles from where we crossed it to the headwaters of the Leduc and Chickimin rivers. To the North it continued into unmapped country, and later we estimated this distance to be about 12 miles. It is divided in this direction into two parallel branches by a high, narrow ridge, the nose of which is quartz porphyry. This has withstood the erosive action of the ice, and protected the softer sediments behind it.

FORMATIONS ON THE DIVIDE :

The Premier Volcanic Zone appeared to continue Northerly along the East side of the East arm of the Star Glacier, except for a bay of sediments whose dip was Westerly away from the zone. A granitic formation underlaid the West



*Showing two pyritic N-S trending zones and pegmatite dykes at the head of Cabin creek.*



*Showing placer ground on Sulphide creek.*


side of the West arm of the Star Glacier. There was not much ground free from ice on the West side of the Star Glacier, but observations from the Unuk River side of this ridge indicated that it was formed from sedimentary rocks. The Western contact of the centrally located porphyry mass was under the ice; but sediments contacted it on the East, and it would appear to be some differential phase of the granite, along whose margins we found other igneous masses of various textures and compositions. Samples of pyritic mineralization from these intrusions did not have any gold content, and in this respect the granitic stock is similar to the Salmon Gold stock. The physical features of the two stocks are also similar in that each forms a high flat tableland with steep, precipitous flanks.

OBSERVATIONS OF THE UNUK RIVER DISTRICT :

MINERAL DEPOSITS :

We spent the next few days along the edge of the granitic stock, prospecting some of the streams coming down from the high plateau country underlain by the stock. The country rock appeared to be a much metamorphosed sediment, and, locally near the stock, there were igneous masses in which occurred large North-South trending pyritic zones. Several quartz and brown calcite veins were located in the metamorphosed sediments. The calcite was replaced in some instances by steel galena, sphalerite and tetrahedrite. In places it was necessary to excavate oxidized material for several feet, before uncovering these minerals. A similar replacement in a lime-



The symbol  on the map is the position from which the above picture was taken, looking south towards the International boundary up the South Fork.

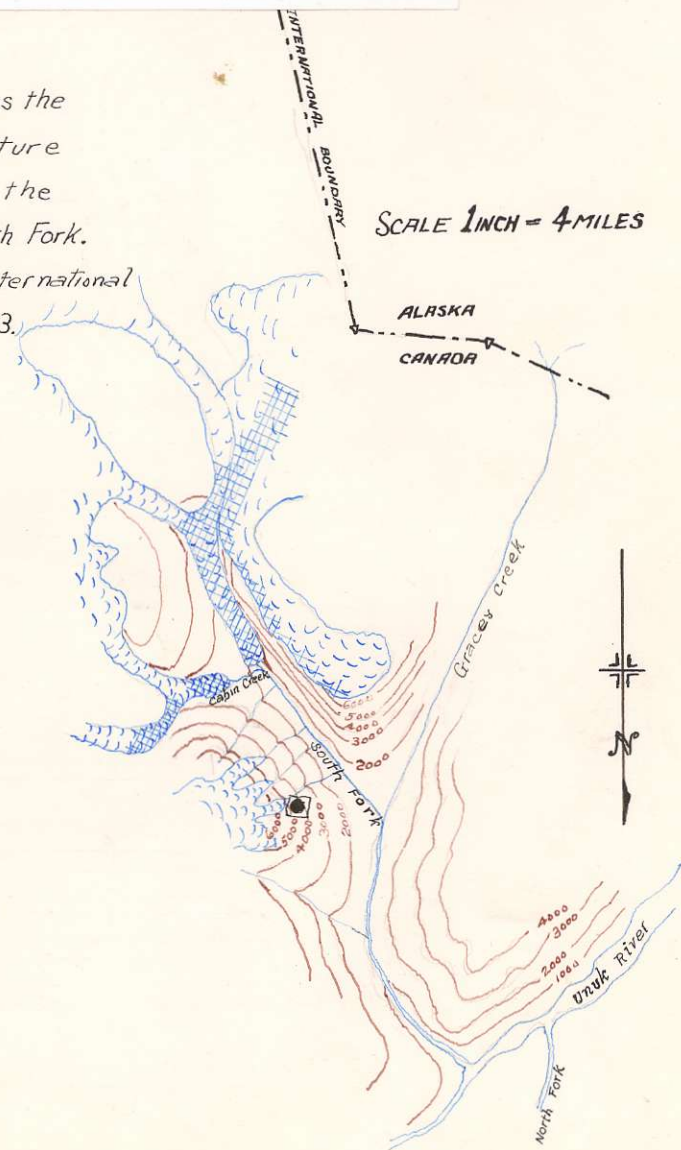
The map is a copy of an International boundary commission map of 1903.

Comparison of the picture and the map shows the retreat of the ice (marked by cross-hatching) during the last 32 years.

The glacier at the head of the South Fork has retreated over 4 miles during this time.

Cabin creek does not show in the picture due to the flank of the mountain to the left of the camera position.

It's confluence with the South Fork is near the X marked in the valley.



stone deposit was located also.

GEOLOGY, TOPOGRAPHY AND COMMUNICATION:

Our prospecting led us down the South Fork to its confluence with the Unuk River. We turned up the river to Sulphide Creek, which we followed to one of its main headwaters. During this time we passed over an intrusive volcanic belt. Also in one section at a high elevation, we encountered a large body of volcanic breccia. This was underlain in a roughly conformable nature by the sediments, as near as I was able to determine. The inference was that the volcanics and sediments were of the same age. Since we had encountered no game, we were dependent on what food we carried, and consequently had no time to devote to such interesting features.

In general, the topography of the country was similar to that of the Portland Canal area, although the wider valleys afforded natural benches, along the streams, on which roads or trails could be constructed more easily and more cheaply. The mountain sides are steep, and the rugged peaks hold pendant glaciers and snow fields.

TIMBER AND GAME :

The valleys and hill-sides are densely wooded, and the underbrush, of alder, devil's club and berry bushes, is almost impassable, especially in those localities where snow slides take place during the Winter. The trees, consisting of balsam, spruce and hemlock, average larger, and would give a better grade of lumber than those in the Portland Canal.



Game at certain times of the year appeared to be plentiful. Spoor of moose, black and grizzly bear, was everywhere in evidence on the river bars, and game trails were well established. However, bird life, such as grouse and ptarmigan, was scarce. There were plenty of goats at high altitudes, and fish in the main streams; but the water was too muddy to allow any fishing. Marmots were very scarce, probably due to the number of grizzly bears in the district.

SULPHIDE CREEK AREA:

Sulphide Creek area proved to be well mineralized with pyrite; but no lead or zinc mineralization was found in the upper reaches of the stream. There is so much pyritic material in this creek basin, that this material has been concentrated on the stream sand bars, and in places attains a thickness of an inch. Since little time was available to us in this section, we were unable to do ~~much~~ prospecting.

RETURN JOURNEY :

After arriving at the headwaters of the South branch of Sulphide Creek, we were reasonably certain that the East branch would cut the extension of the Premier Volcanic Zone. The South branch country is underlain by sedimentary rocks, but a large, well-oxidized mountain at the headwaters of the East branch might well be volcanic. We did not have enough provisions to remain away from our base much longer. The weather was very threatening, and we could not risk that the summit might become impassable for several days on account of fog, if



*Looking towards the Leduc pass on the Star glacier.*



*Returning by way of west arm of Star glacier.*

we stayed until provisions were exhausted. So we travelled up the glacier, feeding the South branch of Sulphide Creek. This glacier is the West arm of the Star glacier. We noted contacts of the stock and sediments, which appeared to be little metamorphosed on this side of the stock. The divide was reached in the evening at an elevation of 5,750 feet, and some time later we were back tracking from the quartz porphyry point, mentioned earlier in the essay. We travelled until midnight, and reached our old camp in the timber on the South side of the Frankmackie Glacier, and returned next morning to our base camp at the Portland group.

C O N C L U S I O N :

We had traversed a large portion of the Northeast part of the Unuk District during the short time at our disposal, and had acquired a superficial knowledge of the climate, geography, geology, accessibility etc. of an area about which little is known. However, unless fortune favored one with an outstanding ore occurrence, as we had hoped, or directed ~~him~~<sup>us</sup> to the more usual well-hidden types of mineralization, the time was all too short to successfully prospect or do much geological work in such a large area. We had gathered, however, much information that would be very valuable in returning to a field whose mineralization and general geology indicated that the mining industry might be well established in this hinterland at some future time.

The same colors were used on this map to distinguish sedimentary and volcanic rocks both in the Portland Canal and Unuk River areas.

However, while Hanson has determined these Portland rocks to belong to the Mesozoic-Hazelton series, Wright reported the Unuk sediments as probably Paleozoic. It appeared that the Hazelton series continued unbroken into the Unuk area; but intervening ice fields required that a route be chosen farther to the East to make certain of this point.

On the other hand, both Paleozoic and Mesozoic rocks may be present. A sand-stone area, reported to be Westerly from MacKay Lake, may indicate their contact.

Volcanic areas, marked near the large stock in the Unuk, are probably differential phases of the stock magma, and belong to the Coast Range intrusives.

