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Your file Votre référence

Our file Notre référence

August 18, 1986

Mr. J. Hearst,
Canova Resources,
Suite 1500, 609 Granville Street,
Stock Exchange Tower,
P.O. Box 10362,
Vancouver, B.C.
V7J 1G5

Dear Jim,

Please find enclosed a Summary Table of geochemical results from core and outcrop samples collected from your Yellowjacket property, Atlin, B.C.

The drill core that you kindly sent me has been examined by Dr. D. Harris utilizing the microprobe. The coloured photographs enclosed are taken from this core and a mineralogical description is given with the photos.

The composition of Yellowjacket "vg" is very homogeneous even though its habit may differ. For example, the coarse gold, gold associated with pyrite and the micron-sized gold disseminated through quartz all have similar fineness values. The gold fineness is calculated by $F_T = \frac{Au}{Au+Ag} \times 1000$ and its value is 767. Since your "vg" contains 23.3% Ag it should be referred to as electrum while other "vg" samples from the Atlin camp have less than 20% Ag and thus they should be referred to as argentiferous gold. In any event, Atlin gold contains no copper or other trace elements as detected on the microprobe.

Some workers have suggested that gold of high fineness indicates that you are vertically high in the vein system, since, with depth the gold to silver ratio changes. So ideally, the fineness values become lower or alternatively the silver content increases as you go deeper. Not very much work has been done in Canada to prove or disprove this and so with your further cooperation in supplying "vg" samples we hope to study this from deep drill core samples.

The gold compositions change from vein to vein and within the same vein. For example, "vg" from the Lakeview vein has a $F_T = 769.7$ and when associated with hessite (Ag_2Te) it jumps to 809. The remarkedly similar value of 769 compared to 767 for the Yellowjacket may mean that the gold is from the same vein system, i.e. the Yellowjacket and Lakeview are connected. If this is so, then you may be on a very strong and well developed quartz vein system which may be continuous along strike and vertically for kilometers (i.e. Motherlode System?).

See Cream Silver

Canada

The Yellowjacket electrum occurs as native micron size grains in quartz or as large irregular grains. It occurs on fractures and shear planes which expose green chromium mica. Electrum is also associated with the exterior of pyrite grains (see photos). The mineral gersdorffite (NiAsS) which at Yellowjacket contains up to 3.7% Sb is present, however, in this sample gold is not associated with gersdorffite. On the Anna claims, gold is intimately associated with gersdorffite. In fact, it appears that the Fe, Co rich gersdorffite is being replaced by a "filigree" textured gold having a fineness of 844.

We have examined the gold nuggets from four creeks in the Atlin camp. The cores of these nuggets yield compositions of Au and Ag which range from argentiferous gold to electrum. They also contain no copper and inclusions of sulphides are very rare. Many nuggets have associated quartz and gangue minerals. Shapes are highly variable. Some of the larger nuggets appear to be folded around quartz vugs. I believe that the nuggets are very locally derived and are primary. They have compositions and textures similar to the gold-electrum found in the host quartz lodes. The reason that Atlin nuggets are coarse to jewellery grade is because the gold is of that size in the quartz veins. I have enclosed a copy of an article describing lode gold samples from the Motherlode district of California. It is obvious from these photos that large concentrations of gold do form in vugs or pockets and that with their release into the surficial environment they could easily form into hugh nuggets (like the 36 oz. example that John Harvey recovered from McKee Creek). This type of "pocket" gold could have been the reason for your "unfortunate" drill "burning" and loss of water during your initial drill program on the Yellowjacket!

Systematic exploration and prospecting should continue in the Atlin camp without discouragement. With the understanding that bonanza-pockets or vugs and intermittent native gold (electrum) concentrations will be present in the quartz veins, one may use a pathfinder elemental assemblage (Au, Ag, As, Ni, Co, Bi, Sb, Te and Pb) and mineralogy to zero in on the sporadic gold distribution within the veins. The broadest geochemical pathfinder element would appear to be arsenic and perhaps barium closer to the auriferous veins (see sample 104N 859525). Please note sample 104N 859503 which I collected from surface outcrop away from the drilling area on the Yellowjacket. Ted Yardley led the property examination. I enclose a sample of this material so that you can track down this outcrop. Perhaps some of your own lithogeochemical sampling (i.e. arsenic) will also help to determine its location on the property. This material contains the highest arsenic and antimony contents of any sample of similarly altered rocks that I have collected from the Atlin district. It also contains 64 ppb gold and the associated minerals pyrite and gersdorffite. This outcrop must be associated with an auriferous quartz vein which is not exposed and which may splay from or be parallel to the main Yellowjacket structure and vein. Please compare its trace and whole rock compositions with other similar drill core samples as reported in the summary data table.

I have also enclosed the now polished piece of drill core that you sent me. The coloured photos provided were taken from the off-cut of this "vg" example. I would like to keep the microprobe mounted bits of core since further study may be required.

From my limited examination of your property, the geochemistry and mineralogy done to date, I will speculate the following:

1) Economic gold mineralization is generally restricted to the quartz-veins themselves which are surrounded by a broad, pervasive, alteration envelope of carbonates. They are present in order of abundance as Mg, Fe and Ca rich carbonates as one proceeds away from the strongest veins.

2) The veins occur at contacts between ultramafics, andesites-greenstones or dykes plus local faults and/or shears are generally present. There is no indication in these systems of intrusions being present or playing a part in the ore genesis.

3) Green-chromium rich mica, magnesite to quartz-carbonate and talc alterations are always obvious but these altered rocks contain very little pyrite and basically no gold enrichment.

4) The elemental assemblage Au-Pb-As-Bi and minor Te-Sb is obvious within the quartz veins themselves. This group is consistently present within the Atlin Terrane and Cache Creek Group units, similarly, Au-As-Hg enrichment may be present in altered samples and A-horizon soils thus forming a somewhat broader halo around mineralization.

5) My data also shows the removal of Mg plus Ca, CO_2 and K enrichment during the process of carbonatization of the ultramafic rocks. Pb, Cu, Zn, Co, Ni and Cr remain relatively unchanged during these hydrothermal processes. Thallium, palladium and platinum were never detected in any important concentrations in any of the ultramafic rocks analysed to date.

6) Hydrothermal alteration and the veins themselves would indicate a process of gold mineralization dominated by a Si, CO_2 and Ca rich fluid which generally contains relatively little S. The fluid, perhaps driven by pressure and high heat flow (Teslin Suture Zone - Nahlin Fault) found fault zone dilatancy or permeated weaknesses and fratures prevalent at ultramafic contacts. The enhanced permeability allowed the fluid(s) to intimately interact with the ultramafics causing extensive Ca-metasomatism. The complexity of the gold precipitation mechanisms appear to involve a number of depositional and sulphide replacement processes. It is difficult to compare from vein to vein or even within one vein but the reduction of sulphur activity due to sulfide precipitation would appear to initiate gold precipitation. The original source of the gold in solution is unknown but it is not necessary to assume that it is derived from local ultramafic rocks as most workers would believe. There is no doubt that some of the Ni, Co, etc. can be leached from the ultramafic hosts and be precipitated with sulphides in the veins. However, this cannot explain the pervausive and persistent existence of Au-As-Bi-Te-Sb in these type of quartz veins over such a large and varying geologic and tectonic area. Deep seated sources of Au and the characteristic elemental and mineral assemblage might suggest that tectonic controls are most important in explaining these mesothermal gold mineralizing events.

7) Much of our work would suggest that there are strong similarities to the Motherlode district style of gold mineralization. Namely, gold is present usually as visible gold concentrations which may reach spectacular "pocket" bonanza concentrations within the vugs in quartz veins.

At present, we are dissolving large quartz vein samples from various prospects (including yours) in cold hydrofluoric acid. This will allow the heavy mineral recovery of all gold associated ore minerals as well as maintaining the actual shape(s) of the visible gold itself. This will allow more systematic investigations to proceed since cutting slabs and thin sections in the search for "vg" meets with limited success. I will keep you posted on our findings.

I hope that this summary will be of benefit to you in your development of the Yellowjacket Prospect. Thank you again for the opportunity of visiting your property and for the "special" samples which you sent.

Yours sincerely,

S.B. Ballantyne

SBB/mab

Summary Data Table, Yellowjack Prospect

	Au ppb	Ag ppm	As	Sb	Ba	Zn	Cu	Pb	Ni	Cr	Co	S%
D.D.H. #2 78 ft. logged 0.032 opt Au 0.01 opt Ag 6 inch core sample number 104N 859617 altered trachyandesite basalt	21	3	37	1.6	120	76	280	65	100	330	40	0.02
D.D.H. #2 160 ft. logged 0.012 opt Au 6 inch core sample sheared basalt: pyrite on fracture number 104N 859518	23	20	104	4.5	70	120	83	200	36	41	45	0.72
D.D.H. #2 211 ft. 6 inch core sample green-chrom-mica, altered quartz-Sul.-carbonate (Ca-Fe) number 104N 859520	14	1	43	6.2	30	52	26	16	1200	1500	67	0.24
D.D.H. #2 217 ft. logged quartz-stockwork plus carbonate-chromites preserved 6 inch core sample number 104N 859521	19	1	76	6.6	20	55	29	5	1400	1400	71	0.16
D.D.H. #3 84 ft. logged 0.01 Au 0.13 Ag 6 inch core sample quartz-magnesite number 104N 859522	7	1	66	2.5	10	53	48	9	2100	960	100	0.02
D.D.H. #3 103 ft. logged 0.008 Au 0.370 Ag 6 inch core sample quartz-talc-magnesite number 104N 859523	3	1	12	1.1	0	48	26	7	990	1400	55	0.00
D.D.H. #3 162 ft. logged 0.004 Au 0.160 Ag 6 inch core sample quartz-magesite-carbonate-sulphides present: number 104N 859524	5	1	85	2.1	50	59	33	1	1300	1700	81	0.58
D.D.H. #3 163.5 ft. logged v.g. in quartz vein. 6 inch core sample of sulphide wall rock to vein - no qtz vein left in box. quartz-talc-carbonate number 104N 859525	100	1	38	1.4	1400	70	390	5	110	360	37	1.30
D.D.H. #4 104.9 ft. logged 0.12 Au 0.35 Ag 6 inch vein sample quartz-magnesite-carbonate-number 104N 859526	1	1	11	1.9	20	60	78	1	1400	2100	80	0.00
D.D.H. #5 60 ft. logged-lost drill bits quartz-magnesite wall rock to quartz vein with visible gold-pocket number 104N 85957	1	1	4	1.9	30	83	77	5	1700	2800	110	0.03
Outcrop Pine Creek northside at Yellow Jacket-green-chronium-mica-carbonate-magnesite sample 104N 859503	64	3	1010	113.0	70	120	18	97	1200	1400	60	0.37