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REPORT ON THE MOLYBDENITE PROSPECT AT MT. REMUS

Location

The Mt. Remus Prospect is situated on Devil Ravine Creek, about half a mile to the south-west of Mt.Remus, this creek being one which flows westerly into the Fury River. Mt. Remus is considered to be the elevated land to the north of Devil Ravine, while the equally high land to the south has not been named, but Mt. Sumer is now proposed for it.

The Devils Ravine on the North Sketch map is situated to the north instead of the south of Mt. Remus and is being corrected accordingly.

Lease

The prospect is included within the land applied for as a Reward lease (10091/M) of 80 acres by E.A. Nichols. The work carried out on it has been done by the Mt. Remus Prospecting Syndicate.

Access

The best, and in fact the only ready, means of access is from Wilmot. A motor-road extends from Wilmot in a general southerly direction until a point is reached about three miles south of the Moina junction. From this point the road is metalled in portions only as far as the junction with the old V.D.L. road through Middlesex a further distance of four miles. This four miles can only be traversed by motor transport in dry weather only. From the junction of the Wilmot road, the Middlesex road is followed to the west for seven miles to the western boundary of the Middlesex Block. The route then leaves the V.D.L. road and a cart road leads in a southerly direction for four miles to the Pencil Pine Creek bridge. From the Wilmot junction to the Pencil Pine bridge the road is really only a cart track, but can probably be used by motor transport in the dry weather.

From the Pencil Pine bridge a route is followed across open country in a south-westerly direction for seven to eight miles to the Prospect. Near the Heap of Rocks and Back Peak, this route is along that followed by Mr. W. Ross-Reynolds in 1900. It then passes to the south of the above one and along the summit of Mt. Sumer between Devils Ravine and Schist Creek.

The last two miles (from Mt. Sumer down to the prospect in Devils Ravine) has steep grade, but the remainder of the route has easy grades.

From the Pencil Pine the country is very open and practically treeless. The ground is somewhat wet and soft in places, but these places could probably be avoided and more solid ground obtained if necessary for a pack track.

Geology

From the Moina junction the road runs over basalt all the way to the Middlesex road, excepting to the east of Moina, where sandstones etc. probably of Silurian age are passed over. Near the junction with the Middlesex road, boulders of the tubicolar sandstones are shed from the low hills to the east.

Basalt is also passed over between the road junction and the Pencil Pine bridge excepting near the Middlesex homestead where coarse river gravels are in evidence. The south-western extremity of the basalt is reached about half a mile south-west of the bridge.

A belt of mica schists of Proterozoic age is then passed over. These have strikes ranging from 315° to 360° with high dips generally to the east. The mica schists are succeeded to the west by a belt of quartzites of similar age. These have similar strikes and dips and occupy the Heap of Rocks, Mt. Back and Mt. Sumer.

Mica schists again occur to the west and extend as far as the molybdenite prospect.

Between Back Peak and the prospect numerous small and irregular intrusions of quartz porphyry occur. Beyond the fact that they intrude the Proterozoic rocks, there is no other evidence of their age. In other parts of the State, similar igneous rocks were intruded in the Cambro-Ordovician (Porphyroid) and Devonian periods.

Mine Workings

The workings consist of numerous small trenches and open cuts with several longer trenches and one shaft sunk to a depth of 11 feet.

It was stated by Mr. Nichols that all the work had been carried out for a sum of approximately £40. This included the cost of bringing all stores in and carting three bags of ore out from the mine. It is evident therefore that good results have been obtained for the expenditure incurred.

The Mineral Deposits

Numerous narrow veins and larger occurrences have been opened up upon the land applied for as lease 10091/M and will be described below.

On the bank of Devils Ravine about three chains north of the hut, two small open cuts have been made on a vein. The most north-westerly one is situated on the west bank of the creek which here runs from north-west to south-east. The country rocks are mica schists striking at 329° and dipping at 20° to the south-west. The vein has a strike of 33° and dips to the north-west at 65°. Beneath the hill detritus, a three-inch vein of gossan was exposed which at a depth of one foot gave place to soft pyrite. The vein is exposed to a further depth of two feet and is six inches wide. It consists of hard pyrite with lesser quantities of molybdenite chiefly in the form of a vein, one quarter of an inch thick, on the hanging wall.

No. 1 sample was taken across the vein at the north-eastern end in which the molybdenite was said to be more plentiful, and No. 2 sample was taken across the south-western end. The results of the assays are given in the attached table and it will be seen that the molybdenum contents are 1.57 and 0.20% respectively, the vanadium 0.33 and 0.22% and the cobalt 0.22 and 0.30%.

About 16 feet south-west of the above, another open cut and trench exposed the same vein which was exposed along its length for six feet and to a depth of nine feet. The strike was 54° and the dip 70° to the north-west. To a depth of eight feet the vein was oxidised to limonite, beneath which the soft friable pyrite was exposed to a depth of one foot. Near the surface some unoxidised veinlets showed molybdenite freely. No. 3 sample taken across the friable pyrite gave on assay a return of 1.33% molybdenum, 0.39% vanadium and 0.31% cobalt.

About three chains to the south-west, a small trench in the north bank of the creek exposed a formation two to three feet wide consisting of mica schists, irregular quartz veins, and molybdenite chiefly along joint planes on the footwall. The strike was 40° and the dip at a high angle to the north-west. Although this formation has a similar strike and dip to the one described above, it is somewhat different in nature and is a short distance off the line of the above and it is therefore assumed to be a parallel vein, although if there is any change in strike it may be the continuation of the above.

No. 4 sample was taken across the north-eastern end of the cut, the material being schist with molybdenite through it. The assay results were molybdenum 0.65%. vamadium 0.19%, and cobalt 0.18%.

To the north of the first-mentioned open cut, the vein of pyrite can be seen crossing the bed of the stream. A small vein also occurs in the bed further to the north-east, but cannot definitely be regarded as the continuation of the above vein. Other parallel veins of gossan up to a few inches in width occur to the north-west of the one exposed in the open-cuts.

Several chains upstream but not on the line of the above, very narrow veins of pyrite are visible in the schists in the bed of the creeks, but do not appear to enter the porphyry which junctions with the schists.

About a chain to the south-east a vein (two to three inches in width) of pyrite and molybdenite crosses the bed of a small creek entering Devil Ravine from the south.

In the creek flowing past the hut and 25 feet up-stream from its junction with Devil Ravine Creek, a small trench has been cut on a vein bearing 46°. It ranges in width up to two inches and contains pyrite and molybdenite in black micaceous schist.

Six to seven chains up the same creek (to the south-west of the hut) a small trench in the schists has exposed a vein of pyrite ranging in width up to three inches. The strike is 300° and the dip is 70° to the south-west. Molybdenite did not appear to be present with the pyrite.

To the south-east of the hut, a considerable amount of oxides of iron (possibly gossan) occurs at the surface and has been opened up in numerous places. On the west bank of a small creek flowing northerly into Devils Ravine Creek and about five chains south east from the hut, a small open cut has exposed flat dipping weathered schists together with limonite and a small amount of black hematite, but no pyrite or molybdenite.

Some two chains to the south-east, a considerable amount of gossan occurs at the surface, but a shallow shaft did not expose any veins going down into the schists.

To the east of the above two places, one or more lines of gossan occur along a length of several chains. At the eastern end a shaft has been sunk to a depth of 11 feet. In the northern end of the shaft, a vein of gossan with a little quartz was exposed. The recorded strike was 218° (but it may be nearer 270°) and the dip to the north west at a high angle. Two other narrow veins occur on the south side and have a smaller angle of dip and junction with the larger vein. On the north eastern side of the shaft a smooth plane apparently cuts off the gossan, but the hanging wall of the latter was not exposed in the shaft and so the relations between the gossan and the plane cannot be determined. To the north east of the shaft trenches expose gossan resting on, but not going down into, the schists. The schists have the same general strike and dip (to the south west) as they do on the other side of the plane in the shaft and so the plane cannot be definitely determined as a fault.

To the west or south west of the shaft a trench across the continuation of the gossan vein was filled with water and therefore not available for inspection. It was stated that a gossan vein was cut, but it would appear that the trench was to the south of the line of the two foot vein. An east-west trench six feet west of the above was cut along a large outcrop of gossan. It revealed a body dipping at a low angle to the south-east, but not properly opened up to determine its relations, and a vein below it with a strike of 80° and a dip of 80° to the north. This latter vein may correspond with one of the smaller ones in the shaft.

The main line of gossan appears to run to the north of these trenches in the direction of the open cut on gossan first referred to above.

Constituent	Sample				
	No. 1	No. 2	No. 3	No. 4	No. 5
	%	%	%	%	%
Molybdenum	1.57	0.2	1.33	0.65	45.67
Vanadium	0.33	0.22	0.39	0.19	4.38
Cobalt	0.33	0.30	0.31	0.18	0.63
Copper	Nil	Nil	Nil	Nil	
Sulphur					38.24
Iron					8.20
					97.12

Nature of the Ore

At the surface (excepting in beds of creeks) the veins are represented by gossan (limonite) resulting from the oxidation of the pyrite. Beneath the gossan, the vein consists of friable pyrite apparently with some molybdenite, while deeper still the vein consists of hard solid pyrite and molybdenite. Pyrite and molybdenite are the only metallic minerals visible while the analyses prove the presence of iron, molybdenum, vanadium and cobalt, but no copper.

The pyrite is usually a pale coloured variety with occasionally a more brassy colour, but it is evident from the assays that chalcopyrite is absent and the pyrite contains no copper. The molybdenite has the usual appearance and properties typical of that mineral except that it does not appear to occur in the usual flakes, but is arranged along joint planes etc. This gives it a general appearance of graphite.

Samples Nos. 1 to 4 were of ore, but No. 5 was molybdenite selected so as to contain as small an amount of pyrite as possible. No. 5 serves to identify the mineral as molybdenite with a slight admixture of pyrite.

The question as to how the vanadium and cobalt occur is a difficult and interesting one. Apart from the pyrite and molybdenite the only other minerals which might contain these metals were small amounts of oxidised minerals in Samples Nos. 1 and 2. One of these was a dark powder resembling tenorite and the other dark green powder representing an oxidised product of the tarnished pyrite. As these oxodised products were apparently absent from Nos. 3 and 4 and certainly from No. 5, it would appear that they cannot account for the presence of the vanadium and cobalt. A microscopic examination of the rough surface of the ore does not reveal the presence of any other mineral likely to contain one or both of these metals. The only conclusion is that the vanadium and cobalt occur in either the molybdenite or pyrite or both. Further specimens from the veins may provide further evidence and the above conclusion would need modification or alteration accordingly.

The analysis (No. 5) of the molybdenite shows that it consists of approximately 76% of molybdenite and 17% of pyrite. The vanadium content is 4.38% and cobalt 0.63% and these metals must be more or less associated with or included in the composition of the molybdenite. The series of analyses of the five samples proves however that there is no quantitative relation between the content of vanadium and cobalt and that of molybdenum.

It would be more usual (although not proved in this case) for the cobalt to be associated with the pyrite.

<u>Value of the ore, marketting, etc.</u>

Samples Nos. 1 to 3 represent the composition of the vein opened up in the two open cuts on it. The average content of these is molybdenum 1.03%, vanadium 0.31% and cobalt 0.31%. Sample No. 4, of probably a different vein, gave a result of 0.65% molybdenum, 0.19% vanadium, and 0.18% cobalt.

Ore of this grade could not be marketted and concentration would be necessary. The molybdenite would be concentrated by flotation and the product obtained would approximate to that represented by sample No. 5 which contains 76% molybdenite. It seems obvious that all the vanadium and cobalt would not be obtained with the molybdenite and so it might be necessary to obtain a pyritic concentrate which would possibly contain the remainder of the above two metals.

Molybdenite ores are usually marketted on the basis of 85% molybdenite and the London price (c.i.f.) on September 25th was 37/6 to 39/6 per unit which is equivalent to £159 to £167 per ton. In a few cases molybdenite concentrates with 65% molybdenite and 25% pyrite will be accepted but the price would of course be lower. Enquiries would have to be made as to the quantities of vanadium and cobalt, which would be allowed to be present in such ore with and without penalties. (It is an unusual ore and so this information is not readily available.

The question cannot be decided at this stage as to whether marketable vanadium and cobalt can be produced. Vanadium ores are produced chiefly from Peru, South Africa, and U.S.A. They are used chiefly for the production of ferro-vanadium which is quoted in U.S.A. at $3.15 to $3.65 per lb. of contained vanadium f.o.b. works. The English quotation (c.i.f.) for vanadium ores with grade of 16-20% vanadium is a nominal one of 45/- to 50/- per unit.

Cobalt ores are marketted in U.S.A. at a price of 2 cents per unit per lb. for ores with 4 to 6% and 3 cents per unit per lb. for ores with more than 6% cobalt e.g. 5% ore would be worth $10 per ton and 6% ore $18 per ton f.o.b. shipping port. (this applies to U.S.A.). Metallic cobalt as quoted in England at 10/- per lb.

The problem of the concentration of the ore and marketting of the products obtained would need careful consideration when sufficient ore reserves are opened up and the nature of the ore can be determined satisfactorily.

Conclusions and Recommendations

The work carried out by the Mt. Remus Syndicate has exposed several narrow veins of pyrite and molybdenite and also what appears to be a gossan capping to a larger vein. Of the pyritic veins, the most important is that opened up in the two small open cuts and which ranges in width up to 6 and 8 inches.

These veins appear to be genetically associated with the numerous ramifying dykes of porphyry which intrude the schists and the area is thus a favourable one for the occurrence of mineral veins.

Although no large deposits of commercial importance have been found, the area is geologically a favourable one for mineral deposits and further prospecting is justified. This should include, in order of preference:-

1. Sinking to greater depths on the gossan vein exposed in the shaft to determine the nature of the vein beneath the gossan,

2. Surface prospecting along the strike of the known veins to determine if any increase in width to workable dimensions occurs,

3. Surface prospecting for other veins.

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