

THE SILVER LEAD DEPOSITS OF ROUND HILL

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INTRODUCTION

Some fifteen miles south west of Sheffield, on either side of the Forth Valley, occurs an interesting suite of mineral deposits which, in the past, have been extensively mined. These metallic minerals originated from a granite mass, portion of which is today outcropping in the Forth Valley, and were injected into the surrounding rocks in characteristic zonal arrangement. It is of the silver lead deposits, occurring near Round Hill, that this report deals.

From the evidence of detailed structural mapping, the occurrence of known and possible lodes is discussed and recommendations made for future organised prospecting.

The area mapped consists of a rectangle, some 15,000 feet by 3,000 feet, and lies on either bank of Claude Creek, which flows in a north westerly direction to join the Forth River. It includes the workings of the former Round Hill and Round Hill Extended Mines. Although various minor adits were examined it is unfortunate that the main workings of the Round Hill Mine are now inaccessible.

Time spent in the field amounted to seven weeks - February 23rd to March 22nd and April 12th to May 3rd, 1948.

ACCESS

From Sheffield there are two roads leading to Round Hill. The high level road through the rail head Roland and the low level road through Mt Claude junction near the post office at Cethana about a mile north west of the Round Hill Mine. This junction is about fifteen miles from Sheffield by either route and while the grade is better by Claude Road, the surface of the Staverton Road is generally superior. Beyond the mine the road winds across the area to continue to Lorinna some five miles farther south. Beyond the mine also, a narrow metalled

road, Cockatoo Road, branches in a south westerly direction and runs parallel to Claude Creek along the southern boundary of the area examined.

Although the undergrowth is not generally heavy, secondary growths of bauera and bracken and the extremely rugged topography, make access to many parts of the area difficult.

PREVIOUS LITERATURE

The following publications of the Geological Survey include descriptions of the Round Hill District :-

- 1881 Thureau, G. - Report on North Western Mineral Deposits.
- 1885 do. - Report on the Mount Claude Silver-Lead Mining Company's Mines.
- 1893 Montgomery, A. Report on the Mineral Discoveries in the Neighbourhood of Bell Mount.
- 1913 Twelvetrees, W.H. - The Middlesex and Mt Claude Mining Field (Tas. Geological Survey Bulletin No. 4).
- 1919 Reid, A.H. - The Mining Fields of Moina, Mt Claude and Lorinna (Tas. Geology Survey Bulletin No. 29).

When Thureau visited the area in 1881, very little development had taken place and beyond recommending that open cut methods of mining should be adopted, he reaches no definite conclusions. Thureau again visited the mine in 1885. He reaffirms his suggestion of open cut mining, suggests the discontinuance of work in the Main Adit (Water Tunnel) and although stating that the ore is not contained in "proper Lodes" but in irregular pockets, veins and bunches, has some faith in the prospect.

Eight years later, Montgomery inspected the property and his report deals mainly with the abortive water tunnel and is consequently not optimistic.

In 1913, Twelvetrees made a geological survey of the whole mineral district and included in his report a detailed account of the various Round Hill workings. The Main or No. 2 Adit had then been driven

190 feet and he considered the position there a favourable one and formulated a general developmental rule "drive on the anticlinal axes and sink in centre country".

Reid, in 1919, covered much the same area as Twelvetrees and also gives a detailed account of the Mine. At the time of his visit the Main Adit had been extended to 800 feet, and Upper Adit immediately above it extended to 500 feet and much ground between these levels had been stoped. His conclusions are that geological conditions are decidedly favourable for ore deposition along the anticlinal folds.

Now although these latter two authors described fully the existing mine workings and various small adits and gave a general account of the structure of the host rocks, they made no attempt at detailed structural mapping and hence their conclusions can only be expressed in general terms.

PHYSIOGRAPHY

The dominant topographical feature is Claude Creek which has cut a deep gorge in the floor of an existing glacial valley in its efforts to keep pace with the erosive powers of its parent stream - the Forth River. High to the north of the creek tower the steep slopes of Mt Claude and of Round Hill and Brazen Nose, themselves offshoots of Mt Claude, while to the south is a less precipitous hill which is unnamed on the maps but known locally as the Cockatoo.

In tracing the evolution of the topography, it is necessary to go back as far as the Early Devonian when the great overthrust faulting occurred which threw up the Conglomerate mass which is now Mt Claude. Along this fault the beginnings of a stream occurred. The next important event of which there is evidence is the Pleistocene Glacial Period when a large glacier was formed in the valley of the pre-existing stream. There is ample evidence of the passage of this glacier. On the side of the hill above the Lorinna Road beyond Claude Creek are

some excellent examples of glacial pavements. Here the Tubicolar sandstones and white conglomerates are smoothed and polished and across their surface are glacial striations. Huge erratics of West Coast Range Conglomerate measuring up to 30 feet cubes occur in the stream bed and on the hill slopes. The valley walls in the vicinity of the Mine are U shaped down to 1,136 feet.

After the melting of the Pleistocene Ice-cap, isostatic adjustment caused an uprising of the land surface and gave the streams added cutting power. Claude Creek is still in this youthful stage of erosion and is contained in a steep V shaped valley, the sides of which are often almost sheer. Waterfalls occur along the course of the stream and in one instance there is a perpendicular drop of 70 feet. Falls and rapids abound near the base of the conglomerates as the stream is able to erode the underlying porphyroids much quicker than the harder conglomerates.

Because of its extremely rugged nature, the topography as a whole is distinctly favourable for mining. As any ore bodies are likely to occur in the vicinity of Claude Creek, the steep valley sides would allow for a certain amount of development by means of adits.

Claude Creek is a perennial stream and the rapid fall of its bed would permit of the development of power from water. Dams could be constructed at several convenient points.

SURVEY METHODS

Because of the influence of structure on ore deposition it was considered necessary to make a close instrumental survey of a comparatively small area. Using, at first, a Cooke, Troughton and Simms 5" Vernier Theodolite and a 100 ft. steel band every visible outcrop was mapped and all accessible workings examined. Later a Director No. 7, Army Type, was substituted for the Theodolite. This instrument reads down to 30" and is

much lighter and more compact than a Theodolite and hence more suitable for survey in rugged country. In some instances, as along the bed of Claude Creek, it was necessary to use compass and Abney Level. The main mine workings are at present inaccessible and details of these were taken from the mine plans.

The start point of the survey was the North-East corner peg of old section 11595/M - 20 acres - which can be found above the road, about 100 feet north of the bridge across Redwater Creek. The original bearing was taken by compass and the original height established by a series of aneroid readings between this peg and the known height of the Roland Railway Station. Very few old lease corner pegs can now be located but the survey tied in with various road cuttings etc. on old lease boundaries.

MAPS

In order to show the details of structure it was found necessary to draw the plans on a rather large scale, 200 feet to 1 inch. Consequently three structure plans have been prepared, the central or more important area and the Eastern and Western portions. On these plans are shown 50 foot contours, strikes and dips of strata, anticlinal axes, the Claude Creek Fault and Geological Boundaries as well as the usual topographical features and minor workings. Four sections at intervals across the strike of the quartzites have been prepared as well as a plan showing the main Round Hill Mine Workings.

GEOLOGY

The rocks outcropping in this neighbourhood all belong ^{to} the Lower Palaeozoic and although the different stratigraphical boundaries can be determined and their relationship, one with the other, established, the exact age of the various series is still a matter of argument. Briefly then there are three typical Tasmanian Series here represented, viz., the so-called "porphyroids", the West Coast Range Conglomerates, and the Tubicolar Sandstones. There is no doubt from evidence gathered in various parts

of the State that the West Coast Range Conglomerates succeed unconformably the "Porphyroids" and that the Conglomerates in turn are overlain by the Tubicolar Series. The age of the Conglomerates, however, has been variously estimated by geologists to be from Cambrian to Silurian. No fossil evidence which would assign any of these beds to any particular system was discovered during this investigation. In this report, therefore, all rock types will simply be called Lower Palaeozoic, remembering however that they occur in the following succession :-

Tubicolar Sandstones.
Possible Unconformity

West Coast Range Conglomerates
Unconformity

"Porphyroids".

Intruding all these rocks is a series of quartz porphyry dykes which have been assigned to the Lower Devonian.

Porphyroids

It has been the custom for many authors to group a series of sheared tuffs, breccias and lavas with intrusions of porphyritic material in the one series and assign them a definite age. Consequently there has been great difference of opinion as to this age, depending on whether the schists and slates were considered or whether the intrusive members were studied. It is clear from the field evidence here that the pyroclastics and lavas underlie the Conglomerates, but that the intrusions took place after the consolidation of the Tubicolar Series, as the same porphyry dykes intrude this latter series also. Thus although the schists themselves may be assigned to the Cambrian, the porphyry intrusion probably occurred in the Lower Devonian and may be derived from the same magma which supplied the mineral solutions and portion of which outcrops as a granite in the valley of the Forth some miles to the south.

The porphyroids are not of great interest as far as the object of this report is concerned but as they outcrop in the vicinity of the area investigated a

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brief description of them is included. The best outcrops of this strata may be seen in road cuttings South of Cethana where a series of schists and phyllites occur. Green talc schists, purple hematitic schists, black phyllites and chloritic schists and light coloured quartz and quartz sericite schists can all be seen outcropping within a few hundred yards. These have been intruded at intervals by porphyry dykes varying in width from a few feet to a few inches. The origin of these schists is not definite as intensive shearing has occurred but they appear to be stratified and certain of them have the appearance of sheared tuffs. Well developed cleavage can be distinguished striking at about 300° with vertical dips and secondary cleavages are also developed with dips at acute angles to the main direction. Some mineralisation has occurred in these rocks but because of their nature it might be expected that no definite vein system would be developed. A certain amount of pyrite can be seen disseminated through the schists and some small irregular quartz veins and bunches also are present. The hematitic schists occur as narrow fringes surrounding the porphyry intrusions and it would appear that the dykes were responsible for the formation of this hematitic material.

In the bed of Claude Creek below the series of falls and rapids are further outcrops of these rocks and here ^{the} intrusions of porphyry are far more extensive.

West Coast Range Conglomerates

Succeeding unconformably the preceding series is a group of rocks some thousands of feet in thickness, of which the most characteristic member is the conglomerate. These rocks which form the main mass of the neighbouring mountains of Claude and Roland occur extensively in the Western part of Tasmania and because of their great resistance to erosion often constitute the major portion of mountain ranges. The conglomerate is a characteristic siliceous rock pink to purple in colour, containing large pebbles of quartz, quartzite and, more

rarely, schist in much greater proportion than the ground mass. Its colour is due to iron staining and often distinct beds of hematitic material are developed. It is extremely hard and competent and consequently its beds show little folding. Bedding itself is difficult to determine and can only be recognised in the occasional bands of shales and sandstones.

These conglomerate beds are portion of a large shore-line deposit that must have accumulated over a great period of time round the ancient Pre-Cambrian and Cambrian land mass. However, there is no fossil evidence visible that would assign this accumulation to any definite period. An unconformable junction with the underlying porphyroids can be seen in a road cutting between the Round Hill Mine and Cethana.

Because of the extremely competent nature of the Conglomerates, no openings were formed during the uprising of the Devonian magma and consequently there was no path for the mineralising solutions which characterise the neighbouring Sandstone Series.

Tubicolar Sandstone Series:

The youngest stratified rocks outcropping in this neighbourhood are a series of quartzites, sandstones, slates, lavas and tuffs and limestone assigned to the Tubicolar Sandstone Series. On cursory examination it would appear that these rocks underlie the West Coast Range Conglomerates as today they occur at lower elevations in this district. However, in other parts of the State there is conclusive evidence that they are younger than the Conglomerates and it is the great overthrust fault here that has thrown the latter rocks many thousands of feet above their original position.

Although this has been called a sandstone series, the characteristic rock is a quartzite which does, however, weather back to a white sandstone. It is a hard siliceous rock usually blue or grey in colour but sometimes white and often stained to various red and brown

colourations by iron oxide. Included in the quartzites are narrow beds of slates, seldom exceeding a few feet in thickness. These are generally of a light brown colour, but where they are interbedded with limestones they are black in colour. Cleavage is well developed in these slates and shows a regional direction of strike, much the same as the bedding, i.e. at about 300° , and with a vertical dip.

Interbedded also with the quartzites are narrow bands of lavas and tuffs. The lavas grade into the quartzites and represent thin sheets poured out under the sea during the accumulation of the sediments. They are studded with tiny golden hollow pellets which break out of the matrix very easily leaving vesicles and represent bubbles formed during the sudden cooling of the lava. One such band, only 6 inches in width, can be seen in an anticlinal structure in a road cutting just above the upper falls. Small cubes of pyrite occur intermittently in these lava beds.

Fairly high up in the series is a distinct bed of white conglomerate which can be traced over several thousand feet in length. It is particularly prominent along the edge of a quartz-porphry dyke intruding these sediments in the vicinity of Cockatoo Road. The intrusion of this dyke has baked and hardened the conglomerate along its margin so that it stands up in a small cliff face cutting across the general hill slope. This conglomerate can be distinguished in the field from its older, more extensive counterpart, the West Coast Range Conglomerate, in that it is lighter in colour, often quite white, has smaller more regular pebbles; and the proportion of matrix to pebbles is higher.

Outcropping in various places in the bed of Claude Creek in the vicinity of Brazen Nose are beds of bluish limestone. The last two hundred feet of the Water Tunnel is also driven in this rock. A.M. Reid and earlier authors considered the limestone to be of later

age than the Tubicolar Series and to have formed in hollows in the floor of these rocks. However, close investigation of the Claude Creek outcrop shows that the limestone is interbedded with the quartzites and slates and in places even grades into black slates. The limestone in the Water Tunnel is not in faulted relation to the quartzite and the stream of water that was supposed to flow from this fault occurs in reality in two different joints in the limestone itself. The following is an analysis of a typical limestone from Claude Creek :-

<u>Constituents</u>	<u>Percent</u>
SiO ₂	10.12
Al ₂ O ₃	1.45
Fe ₂ O ₃	2.29
MnO	0.03
P ₂ O ₅	0.03
CaO	43.50
MgO	3.81
Ignition Loss	38.04
	<u>99.27</u>

Scattered throughout the quartzite members of this series are groups of irregular tubes, usually a few inches in length and resembling colonies of worms. They show no cell structure or indeed any features that may ascribe them to definite organic origin and have, in the past, usually been described as the filled vertical burrows of marine worms allied to the genus, *Scolithus*. However, it is by no means certain that they owe their origin to any thing living and may even have been formed mechanically. In one location, the author found a tube which seemed to show some branching at one end. This has been forwarded to the Commonwealth Palaeontologist for further examination. ¹ * These casts are scattered very thickly over wide areas and although they are more noticeable in the weathered sandstone they have been observed in the massive unaltered quartzite.

Save for these indeterminate remains, no trace has been found of any fossils either in the quartzite or limestone by which a definite age could be ascribed to this particular series.

* 1 (See Appendix)

This group of rocks occurs in a close series of folds over a wide area. Bedding is usually easily distinguished as apart from the different facies present, the quartzite beds themselves are often thinly bedded; sometimes individual beds are no more than a couple of feet in thickness. However, jointing is well pronounced and this occasionally masks the bedding. For instance, in Brazen Nose Creek, a section of an anticline is exposed. Vertical jointing here is so pronounced that were it not for the extent of the section, it might be assumed that the beds were vertical.

The thickness of the strata cannot be accurately gauged in such a small area but it appears that it must be at least of the order of 1,500 feet. Sudden oscillations of the strand line must have occurred during the deposition of those sediments as the transition from quartzite to slate and quartzite to conglomerate is very abrupt.

Igneous

Intruding all the different Sedimentary Series are a number of quartz porphyry and sometimes quartz felspar porphyry dykes. A number of small dykes, some only a few inches in width may be seen intruding the "porphyroid" series in road cuttings, south of Cethana. In the area mapped, the only distinct dyke is one that intrudes Tubicolar Sandstones and West Coast Range Conglomerates in the vicinity of Brazen Nose. This has a width of 120 feet and outcrops for a short distance along Cockatoo Road, which it crosses at an acute angle. The conglomerates to the south have suffered contact metamorphism on the margins and have become hardened and hence more resistant to erosion than the porphyry itself, so that they stand up in a small cliff face.

The porphyry itself consists of distinct idiomorphic phenocrysts of quartz set in a cryptocrystalline groundmass. Subordinate felspar laths were also present but these have been altered to sericite. Although the quartz phenocrysts usually have well developed idiomorphic outlines, embayments are sometimes present and they occasionally suffer inclusions of groundmass material. The quartz phenocrysts show no evidence of strain but there has been a certain amount of bending in the altered felspars.

These porphyry intrusions were an earlier phase of igneous activity than the uprising of the main granitic mass but in all probability they were derived from the same source magma as the granite and hence can be placed in the Lower Devonian.

STRUCTURE

In considering the chronological order in which the various structural features were developed, there is little in the way of direct evidence. It would be tempting to apply the grand concept of Geosynclinal Revolution that must have occurred in Tasmania during the Devonian - that is, first the collapse

of the geosyncline and the stage of folding, followed by the formation of a granitic mass from the roots of the folds sinking deep into and reacting with the basement sima; and finally faulting of the rigid mass formed of the folded sediments reinforced by masses of granitic material. However, there are several local objections to this order of events, chief of which is that the faulting appears to be pre-mineral.

A better theory seems to rely on the intrusion of a granitic magma, as such, as the determining agent in the evolution of much of this structural history. Let us suppose that an orogeny in early Devonian times had caused the great Claude Creek Fault when the mass of the West Coast Range Conglomerate had been thrown thousands of feet above the younger Tubicoliar Sandstones to the South West. The stage is now set for the intrusion of the granite magma and its effect on the structure.

To the South West of this area the magma intruded the Sandstone Series and pushed them in a North Easterly direction against the hard resistant buttress of the conglomerate. Hence a series of folds having their axes in a north westerly direction was formed. A certain amount of fracturing would accompany this folding and as the weakest regions would be along the axial planes of the anticlines, it would be here that the best developed openings would occur. Before the magma cooled, gases and liquids containing solutions of various economic minerals would permeate the surrounding rocks and force their way along these openings and to a lesser degree along bedding planes.

Having this general picture in mind, the details of structure can now be studied.

Faulting

There are many outcrops in this neighbourhood which provide clear evidence of the Great Claude Creek Thrust Fault. In at least half a dozen localities can

be seen the fault shatter zone of brecciated conglomerate and quartzite. This zone is about fifty feet in width and grades to the north east into normal conglomerate and to the south west into normal quartzite. This shatter zone and hence the fault itself is striking about 300° and dipping to the North East at 55° . In at least two places slickensides in this direction can be seen. By plotting this strike pattern of the fault in conjunction with the contour pattern it can be seen that the outcrops of the fault conform to these figures and that the direction is fairly constant except in the extreme West where it has a tendency to swing to the North.

Perhaps the best example of this brecciated shatter zone may be seen on the bare south western slopes of Round Hill above the Round Hill Mine. A good section of the zone may be seen in the gorge of Claude Creek just below the main waterfall, but this is not easily accessible.

The amount of the throw of the fault cannot be measured but it must amount to some thousands of feet. Minor faults have been developed along the edges of the main fault and, as may be expected, are usually normal to it.

Folding

The Tubicolar Sandstone Series has been deformed into a series of close parallel folds, the axes of whose anticlines are usually from two to three hundred feet apart and sometimes even less. This close folding of brittle quartzites implies that the folding occurred at great depth, making the quartzite beds highly competent. The narrow width of the incompetent enclosed slate beds has evidently precluded minor flexural movement and no drag folds are apparent. Instead these incompetent beds have yielded by slip resulting in closely spaced cleavage surfaces.

The cleavage developed in the slate beds and its traces on the bedding planes are of great assistance

in determining the direction and nature of the folding. Generally the cleavage strike is about 300° and parallel to the bedding strike, while the dip is vertical. As the axial planes of fold are parallel to the cleavage, the axes of the folds themselves must be vertical and at 300° and there can be no appreciable plunge. Several actual sections of anticlines are visible in road cuttings and creek beds. While these generally have vertical axes and thus conform to the cleavage pattern, one or two do show inclined axial planes. This may be due to a slight variation in the ideal pattern, but it is possible that it has been caused by a local hill slip. One such fold with an axis dipping to the North East at 73° occurs in a creek bed, a tributary of Claude Creek, which flows down between Round Mountain and Brazen Nose and here the precipitous nature of the country is such that a hill slip could easily have occurred.

The development of parallel folds in competent strata results in the slip of beds relative to each other along the bedding planes. The visual evidence of this consists of slickensides formed in these bedding planes. A good example of these phenomena may be seen in the bed of Claude Creek just below the mouth of the Water Tunnel. Here thin beds of dark blue quartzite are striking at 283° and dipping to the north east of 55° . In the bedding planes are very thin sheets of quartz which show well developed striations in the direction of dip.

In considering the relationship of this folding to causal stresses, its very nature suggests that it has been caused by direct compression acting in a horizontal direction from the south west. The orientation of the strain ellipsoid shows the direction of minimum strain to the north east and that of maximum strain vertical, resulting in a series of folds whose axes are parallel and at right angles to the direction of least strain. The deforming force from the south west was the uprising granitic magma, portion

of which today outcrops some three quarters of a mile to the south west of the area.

ORE DEPOSITS

It must be pointed out that owing to the inaccessibility of the main workings no first hand knowledge is available about the main lode formation which was successfully worked in this mine. A certain number of small veins of galena, pyrite etc. can be seen on the surface and in small surface workings but these are in no way comparable with the ore shoots that have been mined.

The principal metallic constituent of the ore is lead, but an appreciable amount of copper and some zinc and bismuth may be present. The silver content of the galena is very variable but generally may be taken as 1 oz. of silver per unit of lead. However, in some ore shoots the silver content is exceptionally rich and some specimens have contained as much as 900 oz. of silver per ton. The gold content is also inconstant but averages from 2 to 3 dwt. per ton in ore containing 50% lead. In the vicinity of the open cut in the Western Workings a small pile of stacked ore was found to contain large specimens of Jamesonite - a lead antimony sulphide - but this mineral was not seen in situ.

In considering the deposition of epigenetic ore deposits such questions as the source of the metals; the medium in which they were transported from that source; the openings along which this medium travelled; and finally the concentration and deposition of the metallic contents in some particular place; must be considered.

It is not difficult to find the source of these metallic deposits because a few miles away a large mass of granite may be seen outcropping. Moreover a characteristic zonal arrangement of metals can be traced from this outcrop in a lateral direction. In the granite itself can be seen small seams of molybdenite; tin, tungsten and bismuth occur at its edges and further

away, in the area under discussion, lead, copper, zinc, gold and silver were deposited. As this zoning is lateral, so it must also be vertical and, in any mining at depth, a gradual change in the composition of the ore would be expected.

The medium in which epigenetic ore deposits are transported from their source to their place of deposition has latterly been the subject of some argument as to whether the ore fluid is an alkaline liquid or an acid gas. However, for the purpose of this report it is not important to ask how the ore was transported but rather where it was deposited. When considering the general structure of the quartzite series, it was pointed out that this quartzite was of such competence that while it was able to be folded into a close series of anticlines yet certain fracturing would result. It was these fractures that provided that main channel ways for the ore fluids and as the fractures developed best along the axes of the anticlines, it was here that the main mineralisation tended to develop. The nature of the fracturing was such that not a large single break but a series of small ones was formed. Consequently the lode formation is made up of a series of small veins disseminated in the country rock and the lode itself has no well defined walls. Bedding planes in the quartzite were sufficiently well developed to allow some of the solution to spill out from the main channel-ways along these planes. Having dealt with these preliminaries of ore deposition, the most important questions may now be asked. Was the metallic content of the ore solutions deposited in sufficient concentration to form ore shoots and, if so, where may these be expected? A normal precipitation gradient would be sufficient to cause the imposition of the ore minerals from the hypogene solutions, and evidence of this is abundant in the neighbourhood. For instance at Tin Spur the tin oxide has been deposited because of the conditions of temperature and pressure.

However, if only a normal precipitation gradient were operating, were the solutions sufficiently concentrated in lead and silver salts to precipitate these metals so that ore shoots would be formed? It is doubtful if they were but, fortunately, here there is another factor which has played a large part in the depositing of the minerals from their solutions. This is the control exercised by an impounding structure - The Claude Creek overthrust fault. As the ore fluids rose vertically or spread laterally from the magma, they eventually reached the region of the fault gouge. This acted as an impervious layer or more correctly as a semipermeable membrane through which the water in the solutions may have passed but which definitely proved a barrier to the metallic content of the ore fluids. Thus the galena and other metallic sulphides and some gangue were deposited close to this fault zone. Moreover the fractures in the quartzites nearest to the fault, that is, nearest to the harder conglomerates, would be at a maximum and hence provide space for the crystallisation of the galena. Although the fault gouge was the main barrier, the conglomerates themselves would tend to act as an impounding medium to the ore fluids.

Hence in the search for ore shoots in this district a simple rule may be formulated. Search always on the nearest anticline to the fault, the position of which is shown on the accompanying plans. As the search becomes deeper so it must follow the dip of the fault to the North East.

MINING PROPERTIES

Round Hill Mine

In Bulletin No. 29 published in 1919, A.M. Reid dealt fully with all the workings which were in existence in 1918. It is not proposed to recapitulate this detail, especially as the minor adits show little of importance and the main workings are now inaccessible. The Annual Reports of the Secretary for Mines up to 1925 contain

some information of the mine developments subsequent to 1918 and a summary will be given of these.

Briefly then up to 1918, the mine workings were divided into three sections. The Western, containing two small adits and two small open cuts from which a little ore had been produced in 1908 and 1909; The Central, consisting of the long unproductive Water Tunnel and two small surface workings 200 feet above it; and the Main or Eastern Workings.

The main workings, in 1918, consisted of two levels 70 feet apart, both adits, but connected with each other^{and}/the surface by a series of rises. The lower or Main Tunnel was driven for 545 feet on a lode formation containing a series of ore shoots which pitched to the north west and had been stoped up from this level. At 545 feet the adit branched, one drive following to the south east a formation carrying much quartz but little galena, and the other an indicator vein to the east. At 144 feet in this latter drive a cross cut was put in to the north east and at 30 feet cut a strong lode. At the end of the year this lode had been driven 51 feet north west and 57 feet south east from the cross-cut and showed an average width of 12 feet of ore, concentrates from which gave a bulk assay of 3 dwt. gold, 85 oz. silver and 42% lead per ton. Meanwhile the No. 2 or Upper Adit, which at the time of Reid's visit was in 500 feet, had been further advanced and found to contain a fair quantity of ore in a crushed formation as far as the conglomerate wall which was encountered in rises. 1919 saw the first development of the new formation. It was driven on a further 286 feet south east and 21 feet north west over an average width of 16 feet of ore, and five stopes were opened up. Development continued over the next few years and by 1921^{the}/adit was in 1,420 feet including 700 feet on the new development. In this year a commencement was made to test this lode at a lower level, and at about 700 feet from the entrance

an internal shaft was commenced. The next year, 1922, saw a level 80 feet below the main adit opened out and the lode was driven on 137 feet to the south east vertically below the main adit.

From 1922 to 1927 when the mine closed, most development was undertaken from this shaft level. From the shaft, drives had been extended 600 feet to the south east and 700 feet to the north west. More stoping was done south east of the shaft where the lode averaged 4 feet in width.

It is natural at this stage to wonder why the mine closed down at all. A variety of reasons, some logical, some fantastic, have been given by local residents but from the above information it will be seen that at the lowest level the lode averaged only four feet compared with twelve to sixteen feet at adit level and this, combined with the low metal prices, of the time, may have caused the management to suspend mining operations. Nevertheless it is logical to suppose that untapped ore-reserves do exist in this mine. As the fault dips to the north east more determined cross-cutting should have been implemented at the shaft level in this direction. Unfortunately, all workings up to adit level are at present filled with water and before any development can be attempted these would have to be pumped out.

No complete figures of production from the Round Hill Mine are available but from 1908 to 1927 approximate yields are 4,700 tons of lead; 1,500 oz. gold; and 370,000 oz. silver at the estimated value of £180,000. The average grade of the ore sold was approximately 54% lead; 3 dwt. gold and 46 oz. silver per ton.

Round Hill Extended Mine:

This, the poor relation of the Round Hill Mine, has been fully described in Bulletin No. 29

and no useful purpose would be served by repeating that information. No further work has been undertaken since Reid's visit. The structure of the quartzites is similar to those at Round Hill and the various persons interested in this area have evidently been influenced by this in their development. Certainly the various adits crosscut several anticlines and in these have intersected some forms of mineralization, but they have missed the whole point of the key to ore deposition in this area; that is, that the ore is most likely to be found in the anticline nearest the fault. Consequently they have driven their adits on the wrong side of the creek and in them have picked up just sufficient signs of mineralization to encourage them to further efforts. There has been no production from this show, nor is there likely to be any in its present position.

Operations of Present Company:

On 27/1/48, a syndicate of local residents, the West Mt. Claude Prospecting Syndicate N.L., was registered to undertake further development in the vicinity of the Round Hill Mine. At the time of my visit, a little work had been done on the property, mainly by members of the Syndicate themselves. The old Magazine Adit, on the opposite side of Claude Creek from the Main Adit, had been extended a few feet and a formation 12" in width driven on either way. A sample taken across this formation was assayed with the following result :-

Lead	16.6%
Copper	0.2%
Zinc	Nil
Bismuth	Nil
Gold	3 grs. per ton
Silver	3.2 oz. " "

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About fifteen hundred feet north west of the Main Adit and on the side of the road a small cut has been made on a formation consisting of several narrow seams of crystalline galena and pyrite. These do not represent a true lode formation but occur in the bedding planes of the quartzite. Mr. R. Muir, Inspector of Mines, took a sample across 6 feet of this formation which assayed:-

Lead	5.4%
Zinc	2.7%
Silver	4.6 oz. per ton
Gold	4.5 dwt. " "

Hand picked ore from these veins was assayed for Mr. E.J. Martin, Manager of the Syndicate, and showed 65.3% Lead and 54.9 oz. silver per ton.

At the time of the completion of my survey the Syndicate had already commenced to erect a small concentrating plant.

The Syndicate has applied for a lease of 40 acres, 111M/47, but this has not yet been surveyed.

South east of this application is another lease, No. 111M/46, 20 acres, in the name of J.P. Godwin. As far as I could ascertain, no work had been done on this by Godwin up to the time of my visit.

RECOMMENDATIONS:

In the search for new vein systems on an area which has already produced ore we must be guided by two paramount precepts, inference and analogy. That is the veins must be looked for in structures which conform to a carefully built up theory of the ore deposition of that particular district but these structures should be similar to those in which ore has already been found. Here then it has been argued that ore deposition is most likely to have taken place in the axes of the anticlines nearest to the Claude Creek Fault. This is in accord with the positioning of the ore produced by the Round Hill Company where the

anticlinal axis is but a few feet from the fault and the lack of ore of the Round Hill Extended Company where two anticlines intervene between the workings and the fault.

The position of the fault at the surface is shown on the accompanying plans, and a boring campaign should be mapped out in accordance with this, remembering that the fault dips to the north east at about 55° .

Two areas recommend themselves because of the known occurrence of some galena within them. The first is in the vicinity of the small cut made by the Company on the side of the road between Round Hill and Cethana. As mentioned above, the narrow galena veins exposed here suggest spilling of the ore into bedding planes rather than an ore-channel in the fracture zone of the quartzites. It is likely, therefore, that the true lode formation will be found closer to the fault. The position of the first bore should be within two hundred feet of the fault and it should be put in at a shallow angle - preferably about 30° - as the fault itself is dipping away at 55° . From the information gained on the first hole a wider programme could be planned.

The second area suggested is on the north east bank of Claude Creek opposite the old Round Hill Extended Workings. It has been pointed out that this Company positioned their workings on the wrong side of the creek but at the same time there is some indication of mineralization in their adits. The positioning and inclination of possible bores here should be the same as in Area 1.

These areas are both about 1,500 feet from the limits of the Round Hill Workings and if a long campaign is planned, boring could thus close on the workings from either end. If it were possible to drain the workings

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themselves, exploratory work should be carried out ^{to} the north east of the Shaft Level, and also below this level. Because of the pronounced mineral zoning it might be expected that in any deep workings the character of the ore might change from one of lead to one of bismuth, tin or wolfram.

In conclusion it should be stated that the structure of the country rocks, together with the source reservoir of mineral solutions, that is, the granite, makes it a very promising location for future operations.

signed: (Terence D. Hughes)
GEOLOGIST

Department of Mines,
HOBART

9th November, 1948.

Notes by Dr. Opik of the Bureau of Mineral Resources
on specimen of Fossil from the Tubicolar Series
(See Page 11 of Text).

"The samples (No. 9983) from the Tubicolar Sandstone, Tasmania, contain a fossil belonging to the genus Diplocraterion Torell 1870, first described from the lower Cambrian of Sweden. Diplocraterion is a "dwelling pocket" of an unknown animal. Diagnosis: U-shaped tubes with a narrow fissure between the both branches and the bottom of the U. The fissure was an open space connected with the tube.

Diplocraterion buildings are known nearly in the whole of the Paleozoic and in the Triassic of Europe.

The fissure of the Tasmanian Diplocraterion is bent in a vertical axis like in some specimens from the lower Cambrian of the Baltic area and this peculiarity occurs also in the Diplocraterion Zimmermani (Kolesch) in the triassic "Bundsandstein" formation of Germany.

Thereafter, the Tasmanian Diplocraterion is valueless for determination of the age of the Tubicolar Sandstone, and can be used for identification of this sandstone in Tasmania only. The very age of Tasmanian Diplocraterion can be determined by the position of the rock in the sequence or by better fossils. Selecting between the formations from Lower Cambrian, and up to the Triassic, it seems reasonable to agree with P.B. Nye and F.Blake, 1938, and D.E. Thomas 1948, for a Silurian age of this Diplocraterion, - until new and better fossils will have been recorded.

The Tasmanian Diplocraterion occupies a vertical position in the rock and can be used as reliable evidence for the recognition of bedding planes. The bottom of the "U" is always directed down.

Diplocraterion is a marine fossil and belongs to a shallow epicontinental facies".

Ref:

- Torell, Otto. "Petrifacta Suecana Formatiouis Cambriae", Lunds Univ. Arskrift, Tom VI, 1870.
- R. Richter (Many papers in "Senckeubergiana," 1920-1927).
- Westergard, A.H. "Diplocraterion, Monocraterion and Scolithus" Sveriges Geologiska Undersokning, Arsbok 25, No.5 1931.
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