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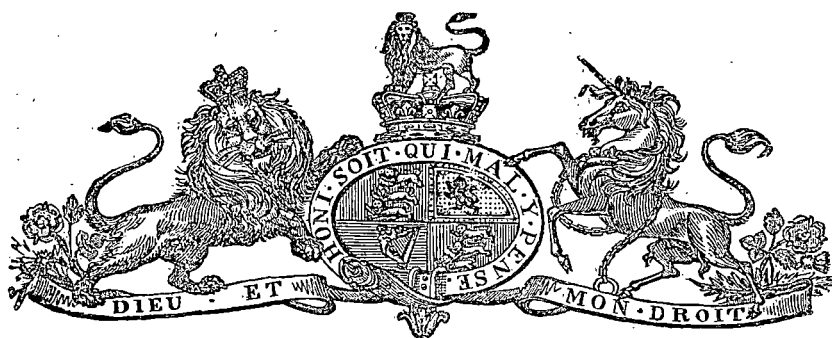
1862.

TASMANIA.

MACQUARIE HARBOUR.

REPORT OF THE GOVERNMENT GEOLOGIST.

Laid upon the Table by the Colonial Treasurer and ordered by the House to be printed, 29 July, 1862.



SIR,

In enclosing the accompanying Map of Macquarie Harbour, and the country round it, I must explain that it does not purpose to represent in detail their geological structure, but only to express broadly the area which is occupied by the various formations; and that the remarks which follow are of a general character, and not intended to enter into minutiae, which could only be supplied by a much longer and more detailed survey than I have been able to effect.

My conception of the general structure of that country is derived from an examination of the north shore of Macquarie Harbour, and the course of the Gordon River for thirty miles from its mouth; a short distance of the courses of the Kings and the Franklin Rivers, and the line of country between the Eldon Ranges and the West Coast.

Throughout this area, the upper Palæozoic and Trappean formations, so largely developed in the settled portions of the Colony, are entirely absent; there being nothing intervening between rocks, which I shall show to be of Silurian age, and others of late Tertiary.

There are several marked divisions of the Silurian rocks, but their exact sequence has not yet been determined; since a series of anticlinal axes, coursing to the west of north and east of south, cause a repetition of the same members of the formation in parallel zones, and the existence of accompanying subordinate contortions, conjointly with the absence of sections, render their relation extremely obscure. The most prominent sub-formation consists of fossiliferous limestones, the entire thickness of which, is probably not less than one thousand feet. It is, in some cases, slightly argillaceous and thickly bedded; but ordinarily compact and massive. It is jointed in a variety of directions, and the fissures thus produced have frequently been re-filled by calcareous spar of stalactitic origin.

Irregular fissures or veins containing calcareous spar and quartz also ramify through it. These vary in thickness from a few inches or less to several feet, and proved, in some instances, to contain galena or sulphuret of lead. The spots where this was the case are indicated on the map.

In the specimens obtained about four miles up the Franklin River traces of copper were also detected.

The following are the observations which I made at the last meeting of the Royal Society, with regard to the fossils contained in this limestone:—"In these rocks fossils are abundant; they are only conspicuous, however, in that portion of the beds exposed to the action of the running water. It is exceedingly difficult to ascertain their presence on a fractured surface, although they may be abundantly concealed in the specimens, and the ordinary atmospheric agencies appear to simply disintegrate the rock, without causing the specimen to be exposed in relief, as is the case with many of those upon the table. Hence it follows that the ground for collecting fossils is limited to the surface of the rocks between the level of the water and about 30 feet above it,—the greatest height to which floods attain, as might be anticipated. The different beds or zones in the formation are not equally fossiliferous, nor do they contain identical species, one part being conspicuous for the abundance of corals, another of univalve shells, &c., while a third is characterised by containing abundant fragments of large chambered orthocerata, &c., &c. I shall briefly enumerate a few of the most striking, characteristic, and best preserved forms:—

Orthoceratites.....	SP. 2
Lituites.....	1
Halysites.....	1
Favosites.....	2
Raphistoma.....	1
Orthis.....	1
Rhynconella.....	1
Euomphalus.....	2
Murchisonia.....	3

The collective evidence of these fossils is unmistakable,—they are all Silurian; and some of them, especially the *Raphistoma* and one species of *Murchisonia*, are Lower Silurian types. The lithological character, and associations of the strata, east and west (that is, across the strike) of this formation, is the only evidence of their age, (no fossils having yet been discovered in any other of the group of formations comprised in the Western Country, except the Silurian Mudstones, &c., of the Eldon River.) There can, however, be little doubt that they are none of them later than Silurian, while some are evidently referable to the very earliest epochs.”

These limestones appear to be identical with those at the Great Bend, and, according to some specimens brought from Point Hibbs by Mr. Bennett, with limestones existing there also. They occupy the course of the Gordon for about seven miles, and are then succeeded by sandstones and grits rising from below them, arching over an anticlinal axis, and then dipping again, so as to cause the re-commencement of the limestone, at the junction of the Gordon and Franklin Rivers, the courses of both of which it occupies for about six or seven miles. The next division of importance is a coarse conglomerate, consisting of quartz pebbles, cemented by a siliceous matrix, which appears to be succeeded by siliceous grits, and a variety of sandstones, micaceous mudstones, purple grits, &c., streaked with quartz veins, and apparently passing down into clay slate, quartzite, and micaceous schists. The conglomerate forms the most conspicuous summits of the ranges, west of the King's River; and my impression is, that the white-topped rocky mountains running right down to the harbour, as well as the Mount Direction range, and the range visible half way between Pyramid Island and the Frenchman's Cap will prove also to consist of it. As far as one can judge, this formation extends across in descending order, from the ford at the King's River towards the Coast, the lower bed cropping in the course of the last seven miles of the King's River.

Mudstones, resembling closely in lithological character those of the Eldon Valley, crop out near the mouth of the Gordon; while Head Quarter's Island affords sections of rock which I considered, upon lithological ground, to be the equivalent of those at Fingal. Steel grey, and yellow clay slates, resembling those of the Mersey District, occur both in the King and the Gordon River, while a gradual passage into the metamorphic rock is presented by the granular quartzites and micaceous schists, existing on the western side of the Harbour, between Wellington Head and the Coast.

If we regard the limestones as the highest member of the series (as I think we may), it follows that the whole tract of country, with the exception of that I shall mention hereafter, is occupied by Silurian or metamorphic formations; and that, in fact, the line of country between the Great Bend of the Gordon and the West Coast, presents every member of the series, from, perhaps Upper Silurian, down to the metamorphic mica schists and quartzite,—which are represented as forming, in great part, the range of the Frenchman's Cap. It is reasonable to anticipate that all of this may be auriferous, although to what extent it is impossible to say. It is probable that some divisions of the formation may prove richer than others; and that hence the more valuable tracts will be found to lie in zones, running in accordance with the prevalent strike in the direction from 20° to 30° W. of N., and E. of S.

I may point out that, in consequence of the structure of the Western Country, any mineral discovery made in one part of it would almost equally affect the whole in this manner,—that, as the outcrop of any particular set of beds which might prove to contain metal must extend in accordance with the strike more or less to the north, and would probably be repeated in passing from east to west by the series of parallel anticlinals which affects the country, a series of metalliferous bands or zones of country would thus be found to exist running along its entire length.

I feel no hesitation in stating my opinion of the importance of continuing, as uninterruptedly as the seasons will permit, the Geological Survey of this portion of the Colony. Without a continuous survey of that character, vague supposition must always supercede authentic information, and the development of what might possibly prove to be the most valuable portion of the Island, be left to the chance discoveries of casual investigation in place of the more certain experience of well-directed research.

It is possible that the hopeful anticipations with regard to it may not be realised; but surely it is at least well to know what is the structure, character, and value of a district constituting a very large portion of the Colony, which is at present almost as much a *terra incognita* as if it were situated at the south pole.

The Tertiary deposits to which I have referred are principally developed on the north shore of the harbour, and for some miles up the Gordon River, forming cliffs at many points of seventy or eighty feet in height, consisting of coarse sand rock, and shales, largely impressed with leaves of existing plants and containing occasional thin seams of lignite, which have been the origin of reports of the existence of coal there.

Raised beaches of loose quartz pebbles surmount them, and form elevated plateaus of marsh land on the southern as well as upon the northern side of the harbour.

As you are well aware of the difficulty that I experienced in exploring this country, and of the loss of time which unfavorable weather and other circumstances caused, and as, moreover, it is, I believe, your desire that I should re-enter it during the coming summer, it will be unnecessary for me to give other reasons for not entering into a more detailed description of the lithological character of the various rocks, the more especially as detailed lithological descriptions would in this instance be, to a great extent, valueless, from being imperfect and unconnected; the value of such descriptions depending essentially upon their applying to a series of rocks of which the sequence had been fully determined.

In fact, I consider myself as having taken only a preliminary glance at the country, and present this merely as the forestalment of a report which will be the result of a more detailed and comprehensive examination.

I append a list of assays of quartz from various parts of the western country; the results of which are, I think, when considered in connexion with the discovery of drift gold, sufficiently encouraging, as I shall endeavour to show.

Date.	Locality.	Weight of Quartz.	Proportion of Gold per Ton.	REMARKS.
<i>Assayed by Mr. HODGSON.</i>				
1856.		lbs. ozs.	ozs.	
Sept. 27.	Frenchman's Cap	0 16	1·610	} Collected by J. E. Calder, Surveyor-General.
	Base of Mount Arrowsmith	0 12	4·180	
	Between Frenchman's Cap and Mount Arrowsmith	0 39	4·180	
	Vein from S. W. slope of Mount Arrowsmith	0 15	8·012	
Nov. 12.	Quartzite, Port Davey	2 0	134·40	} Mixed with metallic iron.
	Micaceous Schist, Port Davey	1 6	300·98	
1859.				} These were brought down by Mr. Tully from the Western Highlands of Tasmania, during his expedition in search of Gold in the neighbourhood of Frenchman's Cap, January to March, 1859, sent to me from Hobart Town, and forwarded by me to Mr. Hodgson, in Melbourne; the results, with the Gold produced, I forwarded, with a Report, to the Gold Committee, 18th June, 1859. (For Mr. Tully's Report and my remarks thereon see <i>Hobart Town Gazette</i> , No. 4098.
June 18.	Eastern slope of Mount Arrowsmith	37 1	291·300	
	Shaft under Frenchman's Cap	7 0	353·920	
	Grotto Reef	4 10	665·280	
	Calder's Reef	44 6	64·500	
	High Reef	23 6	20·180	
	Point Hibbs	22 2	71·680	
	Pebbles of Quartz from Macquarie Harbour	4 0	2·566	
1860.	Reef No. 1, in the neighbourhood of Lake Dixon	-	dwts. grs. 5 3	} Specimens collected by Mr. Gould in neighbourhood of Lake Dixon.
June.	Reef No. 2, ditto	-	6 10	
<i>Assayed by Mr. BIRKMYRE.</i>				
1858.		lbs. ozs.	grains.	
April 17.	No. 1 Top stratum (burnt Quartz)	4 0	22 4	} Specimens collected by the Hon. J. Whyte, M.L.C., from the neighbourhood of Mount Arrowsmith.
	" Ditto (unburnt)	4 0	2 0	
	" 2 Lower stratum (burnt)	4 0	72 0	
	" 3 —	4 0	2 0	
	" 3 —	4 0	56 0	
8th May.	- Quartz containing some rust of Iron	2 0	22 0	

In remarking upon the results of the above analysis, it is my desire to point out and remove a misapprehension, which I have found to be very generally entertained, with regard to the character and value of these and similar determinations.

I am of course aware that, to the very many who appreciate them correctly, this suggestion will be unnecessary. It will not, however, be the less useful upon that account to those with whom it is otherwise; and in them, at least, may serve to produce a more accurate understanding of the principles upon which quartz mining is to be undertaken, of the uncertainties attendant on it, and of the value either encouraging or disheartening of statements regarding the prospect of any proposed or newly established company.

It appears hardly possible that, in these days of gold-mining, educated people should labor under the delusion (as from experience, I find some do) that the assay, however correctly made of any small sample of quartz should furnish information as to the general richness of the reef from which that specimen had been obtained, or still further, of the auriferous character of the district in which the reef exists.

Thus to condemn, off hand, a reef because small samples indiscriminately obtained yield small results, is simply absurd although not uncommon, much more so is it therefore to condemn a district. It would be more satisfactory certainly to have found a larger per-centage. It may not contain throughout an average sufficient to render it payable; but, upon the other hand, it may: and what is more, the evidence, so far as it goes, and to those who understand how to interpret it, is favorable to that supposition instead of adverse. Favorable to this extent; that, provided no error can have crept into the analysis, the reef is proved to be auriferous, which is the first and most important step to be determined. Now the researches of geologists, and the experience of miners, has proved that quartz reefs are merely mineral lodes, with nothing exceptional in their character, save this, that the matrix or gangue is present in large proportion to the useful mineral, and that the former is almost entirely quartz, the latter gold. They appear to be subject to the same laws and to be indebted to the same origin.

Thus, ordinary mineral veins, such as copper and lead lodes, are merely fissures in rocks which have been subsequently filled up with mineral matter so as to form lamelliform masses of irregular surface of ever varying width and extent in depth, with dislocations often accompanying the main lines of fracture, and having a tendency to split and ramify in various directions.

These fractures, in any one district, are either all approximately parallel in direction, or can be classified into sets in which the general direction is parallel according as the forces which have produced them were synchronous, or in action at successive periods; and a local correspondence exists between the direction or age (for the one indicating the other, the terms in this case are almost convertible) of the lode and its mineral contents. Thus, for instance, in the Mining District of Cornwall, eight distinct sets of fissures have been noted, originated at different epochs, with, in several of them, corresponding variation in general direction and contents; thus, while in one portion of the district the right running veins—that is those coming from E.N.E. to W.S.W.—contain zinc, copper, tin; the north and south veins mostly furnish peroxide of iron and argentiferous galena.

A general parallelism of directions; viz., to E. and W. may also be observed between the lead lodes of Flintshire, between the mineral veins of Schemnitz, &c. In fact, similar instances might be adduced from the study of most of the principal European mining districts.

While the general nature of the contents of these lodes appears to be determined, to a considerable extent, by their direction, their poverty or richness is equally influenced by a variety of conditions, which would at first sight appear to be less important. Variations in the kind of rock (country) traversed, in the angle at which the lode dips, in the extent to which it opens out, or is wrung up, the falling in of leaders, or tributary veins, either from the one hand or from the other, or from both. The proximity of dykes, the existence of faults, all influence more or less the richness of the lode.

It is the miner's art to study the subtle indication of such changes; and some, as for instance the tributaries of Cornwall, depend almost for the means of bare existence upon the local skill they have acquired in recognizing their approach, and appreciating their value. Characteristics such as those I have described, are more or less apparent in the quartz veins of this and neighbouring Colonies.

Unity of direction, more especially, is common in many Districts; and is strikingly illustrated in Sheets 9, 13, 14 of the Maps of the Geological Survey of Victoria, devoted to the Castlemaine Gold Field, where some hundreds of quartz reefs are laid down, all coursing slightly to the west of north and east of south, without a single instance of any great deviation from that direction.

Cross Sections of almost any of the reefs in which extensive operations have been conducted, would show a variation in respect of dimensions, similar and equal to that presented by the more ordinary metalliferous deposits, while the capriciousness with which, in the latter, the ore is distributed among the gangue or matrix is paralleled in quartz reefs by an uncertainty of occurrence of Gold, which frequently defies all calculation, although apparently the result of certain leading principles, of a similar nature to those referred to above. It is obvious, therefore, that the by no means uncommon impression of the homogeneity of auriferous quartz is entirely incorrect, and that the assay of any individual specimen from a reef affords no information as to the value of the reef generally, since another specimen taken from within a few inches of the first might, and probably would, have yielded an entirely different result.

This being understood, it also follows that (even admitting the perfect accuracy of the assays) no deductions upon the comparative value of the quartz from the various localities cited above can be made; since, as in order to determine practically the value of either of the reefs, it would be necessary to obtain a variety of samples from many different points in it, and pursue the method ordinarily adopted for procuring average samples of ores generally. I should, perhaps, express my meaning more clearly, by stating that, while the positive evidence afforded by a rich assay is encouraging, the negative results of a poorer one are not discouraging,—this remark being understood to apply only to results of the assays of small and individual samples, since the chances are perfectly equal, that

the first might have been in contact with a poorer, and the latter with a richer, quartz; so that, had there been a slight alteration in the positions from which the respective samples were chosen, results exactly the reverse of the others might have been obtained.

It follows that the well-authenticated occurrence of even a small proportion of gold in any specimens of quartz from the Western Country is of great importance; for, as in all reefs the ratio of the richer to the poorer quartz is small, the chances are proportionately less that any small sample selected, as those above must have been, under circumstances of difficulty, and pretty much at hap-hazard, should contain the maximum or even average yield of gold. It follows equally that too great confidence must not be reposed in the favourable result of the richer samples, which are, in fact, only samples of particular portions, and not of the entirety of the lode.

Had the assays enumerated above been few in number and made at one time, it would have been open to question whether some error might not have affected the results,—an error which one can easily imagine might occasionally occur in an establishment devoted entirely to the metallurgy of gold, and in which there is the possibility of some chance intermixture of that metal taking place.

But the number of specimens procured at different times from a variety of localities, all yielding gold, ought, independently of the admitted ability of Mr. Hodgson and concurrent testimony of Mr. Birkmyre, to render such an hypothesis untenable, and forces us to look elsewhere for the explanation of the fact that, although all these samples have proved to be auriferous, and in some instances greatly so, no alluvial gold has been discovered by any of the prospecting parties east of the Frenchman's Cap. I may further remark that the discovery of drift gold in the rivers flowing westward gives these assays much more significance than they held before, and it is therefore obviously important to verify or disprove them.

A suggestion has been made by the Rev. W. B. Clarke, that possibly gold may exist in quartz in such a fine state of division as to be not readily detected by the ordinary washing process. It is, however, merely a suggestion; and, without strong confirmation, I should feel disinclined to consider that, if gold existed at all in quartz it would not be collected under favourable circumstances into more considerable and more conspicuous masses,—preferring to suspect that the ill-success of searching parties is attributable to the difficulties of exploration, which in the Western Country I know to be enormous. This opinion being entertained conditionally of course, on the supposition of the correctness of the assays.

I think, therefore, we may fairly assume the desirability of further investigating the Western Country; but how, and by whom, it can be done most effectually, is a broad question for legislative consideration, on which I can only offer a few suggestions, such in fact as might be made by any other person who had possessed the same advantages of visiting it.

The very considerable extent to which the Gordon River is navigable, renders that one of the most important routes of access; a small craft being able to ascend, without danger, to within a mile and a half of the junction of the Franklin River, while a boat can easily be taken considerably beyond that point. As, moreover, a good road exists *via* Hamilton to the Great Bend of the Gordon, and the line of country existing between that point and the highest point of navigation upon that river appears for the most part to be, although broken, free from scrub, it would seem desirable to connect them by means of a track, available at least for pack horses, which would present the advantage of traversing the strike of all the formation, while by it provisions might be readily carried into any part of the country which upon further investigation should appear to be the probably original site of the drift-gold collected lower down.

The examination of the valley of the Franklin River could be most conveniently effected by working upwards from its junction with the Gordon, which is within a few miles of a spot where a provision depôt could be permanently established.

Similarly, the drift gold already discovered in the King's River could be most effectually traced by following it up from the harbour. In the two latter instances, a necessary preliminary would be the cutting tracks up the courses of the river for the purpose of maintaining supplies. Mature consideration will be requisite to determine whether, after facilities of communication have been thus provided, the practical exploration of the country should be left entirely to private enterprise or undertaken wholly or in part by the Government. For as, even in well determined auriferous districts, the slightest discouragement is frequently sufficient to deter and send away a large proportion of prospectors, it is questionable whether men of energy, determination, and patience will be found in sufficient numbers to fairly test the value of a country presenting extraordinary difficulties,—or rather, whether men possessing those valuable qualities would be willing to devote their time and capital without some more substantial return in view than is afforded by the speculative riches of an undeveloped Gold-field, and this the more especially as the locality, extent, and richness of the auriferous rocks have yet to be determined, and great results, though possible, cannot be immediately

anticipated, since even a superficial examination of the Western Country can hardly be effected in less than several years, upon account of the difficulties in traversing it, which are enhanced by the peculiarities of the climate.

Upon the other hand, it must be remembered that, even under the closest supervision, mere paid employeés rarely work so thoroughly and energetically as those who, depending on their own resources, and determined by their own free will, are stimulated by well-founded anticipations of success. Whether the further examination of the country traversed by the Gordon River (which I should recommend to be made during the early spring) will warrant such anticipations being held out remains to be seen. At present it would be uncandid to do so, the sum of our information being the knowledge of the existence of drift gold in small quantities in lower parts of rivers flowing from a country unexplored, but known to be in part occupied by Silurian rocks, and there being strong grounds for believing it to be entirely so. This, while sufficiently encouraging to a nation to make further investigation, is as yet insufficiently so to the individual to make me advise great sacrifices of capital or time.

I should be sorry to be misapprehended by working men, and to be the means of their leaving employment and visiting the Western Country under the impression that they are going to a ready-made gold-field; if any go at all, they must do so purely upon speculation. The gold-field has yet to be discovered; there are strong probabilities of its existence, and its locality can be approximately defined by broad limits, but its extent and richness remain yet to be determined.

The observations previously given upon the variable characters of mineral lodes, and which were made with special reference to auriferous veins, apply equally to the veins containing galena and traces of copper in the lower part of the Gordon. It is questionable whether either of those discovered could be worked remuneratively, although possible that they might improve materially on being followed in; but the indication of the metalliferous character of the formation is none the less valuable. It would in fact be unlikely that the richer portion of lodes should be so exposed at the surface as to be discoverable upon a hasty inspection.

As tending to the discovery of workable lodes, I think that the strongest inducement to settle should be held out by the Government, and the greatest advantages offered to those willing to do so.

A resident population, emulous of advancing at once their own interest and that of their district, constantly on the spot, and ready to avail themselves of leisure moments to explore the ranges and gullies within reach, would evidently be more likely to make discoveries than mere adventurers, who, entering the country for a season only, find a large proportion of their time necessarily occupied in acquiring a general knowledge of the country, in getting from part to part, and supplying themselves with provisions.

The inducements to settle are agricultural land and timber, both existing in sufficient quantities to support a moderate population.

Here and there on the banks of the Gordon, for thirty miles of its course, are small patches of alluvial land, mostly heavily timbered, but not more so than other lands in the Colony which I have seen successfully cleared and brought under cultivation. The same is the case on the Franklin River for at least half-a-dozen miles, and probably further. Produce in each instance can be shipped and conveyed down the river in flat-bottomed boats.

Pine, myrtle, and other ornamental woods, lightwood, and in some places gum, abound on the banks of these rivers and their tributaries.

Extensive open marshes afford moderate pasture, and are probably susceptible of the same improvement which is found to follow continuous burning and stocking in other parts of the Colony.

I have the honor to remain,
Sir,

Your obedient Servant,

CHARLES GOULD.

The Hon. the Colonial Secretary.