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NOTES ON GEOLOGY OF KING ISLAND

The following notes are of general nature only, and the conclusions arrived at are subject to some modification when detailed petrological work is carried out.

King Island is situated at the western entrance to Bass Strait, to the north-west of Tasmania, and about midway between Cape Grim and Cape Otway. It has an area of about 400 square miles. Its greatest length is about 40 miles and width about 16 miles. The outstanding feature in the physography of the island is the generally level surface presented to the eye whenever a panoramic view can be obtained. It is not easy to locate a vantage point owing to the level surface but this feature is very noticeable from the sea when the land surface is seen to be monotonously level. The general height of the northern and central portions of the island is 200 feet above sea-level, but along the south-east coast the elevation attained is as much as 500 feet, the average being about 400 feet. The portion of the island represents an old peneplaned surface which has been uplifted relatively to sea-level Since this uplift degradational forces have been active in wearing down the level surface, and the streams are still cutting down their beds, youthful V-shaped valleys being common. The extreme south of the island is comparatively low-lying. This area, together with the western coastal strip, is covered with sand-dunes, which rise to a height of 250 feet. The western portion of the island is that which has received most attention in the past from settlers. This is due to the fact that it has been proved to be eminently suitable for producing grass suitable for fattening cattle - the staple industry of the island. The soil which produces this grass is really a loose sand composed essentially of shell fragments. This is undoubtedly a beach sand, which owes its present distribution essentially to the prevailing westerly winds. Although this western coastal strip extends from north to south of the island its width varies from less than 1 to over 4 miles; its average width is probably about 1½ mile.

Further inland occurs in different parts of the island a very different class of country, well called by its local name of " plain country". This country is not so fertile as that previously described. It is very level, the surface being covered frequently with white quartz sand, and occasionnal fragments of angular white quartz. In places the surface is boggy, and it may be covered with a variety of peat to a depth of several feet. It usually supports only a stunted vegetation. The width varies very considerably, being practically neglibible at some points. These areas may represent plains of marine denudation developed prior to the most recent uplift of the island.

Portion of the central, eastern, and practically the whole of the south-eastern portions of the island are characterised by the presence of timber, and not infrequently of dense scrub. Timber is almost entirely absent from the areas previously described. The soil is usually of a clayey nature, and is derived directly from the decomposition of the rock-formations in situ. Rock outcrops are noticed at intervals, although it is only along the coastline that anything approaching a continuous section is obtainable.

Having touched on the broader features of the area, it remains to refer briefly to the rock-formations developed. It must be understood that in the western portion of the island only isolated rock outcrops are to be seen, excepting along the actual coast line. Generally, similar conditions prevail in the extreme north and south, while in the north-east, even along the coast, rocks are seldom encountered. On the east and south-east, coastal outcrops are common, but inland scrub usually conceals any outcrops which may be avialable. In this sector are found possibly the most interesting rocks, from the purely geological standpoint, and certainly the most puzzling.

Dealing first with the sedimentary rocks developed on the island, the oldest are comprised in the series of Pre-Cambrian rocks, the predominant members of which are slates, quartzites, and schists, which outcrop at various points around the coastline, and occasionally inland. These rocks strike nearly north and south, and dip at steep angles, usually to the west along the west coast, and to the east along the east coast. In places the rocks are intensely crushed and contorted. Members of the group include slates, quartzite, mica-schists, actinolite-schists, and possibly andalusite-schists; rocks of igneous origin are mentioned later. The evidence for classing the series as Pre-Cambrian is not conclusive, being based mainly on lithological resemblances to Tasmanian rocks whose age is known. Apparently later than this widely-distributed series are slates and quartzites, which, from their association with the complex series of igneous breccias, tuffs, etc, exposed on the south-east coast are believed to be of Cambrian or Ordovician age, and are tentatively classed as Cambro-Ordovician. Probably belonging to the same period are the reddish-chocolate and green flaggy slates outcropping in the vicinity of the City of Melbourne Bay, which have been exploited as a source of commercial slates. These strike about N. 30° E., and dip east.

A very interesting formation exposed on the south-east coast is tentatively classed as belonging to the base of the Permo-Carboniferous system, viz., beds of glacial till. The thickness of the beds is uncertain, as they are covered by sand a few yards from the shore; they strike a little east of north, and dip east at about 45°. There are no fossils to enable the age to be positively fixed.

There appears to be a considerable break in the geological column, succeeding the Permo-Carboniferous, as no sedimentary rocks appear to have been formed until Tertiary times, when at least parts of the island were again submerged, as shown by the presence of Tertiary limestone. Two occurrences were noted, one in the south of the island and another on the east coast, towards the north endof the Sea Elephant Bay, both similar in general appearance, and composed essentially of marine shells and shell fragments. These patches are probably remnants of a former extensive development of similar rocks removed by subsequent denudation.

Several distinct formations of Pleistocene and Recent age have been developed. Reference has been made to the sand-dune country of the west coast. These dunes

have been formed by wind action, and are composed largely of fragments of shells. The action of surface waters containing carbon dioxide in solution has resulted in the solution of some of this comminuted shell material, and its redeposition under favourable circumstances as travertine. The formation of sand-blows at the present time, resulting in the movement of the sand of some of these dunes shows that a good deal of this secondary carbonate of lime has been deposited in simple and branching pipe-like forms which are speudomorphs after tree-roots. The sand is cemented in places by secondary carbonate of lime, and shows stratification.

Another example of recent cementation is evidenced on the cliffs in places, where recent rock talus is being cemented, largely by carbonate of lime derived from the beach sands referred to above, to form a compact rock.

Of recent formation, but at present unconsolidated, is the raised beach of Sea Elephant Bay, north of Fraser River, on which a little work has been done to try and recover some of the contained tin and gold values. Belonging to the same period are various deposits of unconsolidated shingle around the coast, at an elevation of about 15 feet above present sea-level. These formations clearly indicate that there has been a recent uplift of the island of about 15 feet.

Considering igneous rocks and their modifications, the variety developed on the island is noteworthy, and many of the rocks in their present form undoubtedly represent intensely altered forms of rocks which cannot be readily recognised at the present time.

The oldest igneous rocks noticed on the island are the amphibolite schists occurring in the Pre-Cambrian series developed at Cape Wickham in the extreme north of the island. They doubtless represent original basic rocks, perhaps diabases which have been reconstituted as a result of the intense dynamic metamorphism which the rocks have undergone.

A rock which may, perhaps, be referred to the Cambro-Ordovician era is a crushed and altered granite, which outcrops at various points along the west coast. Although it sometimes occurs in association with the newer granite (Devonian), and intruded by it, it is questionable whether the two are genetically connected.

Occurring on the south-east coast of the island, north and south of Bold Head, is an intensely altered series of basic and acid igneous rocks and igneous breccias and tuffs. Members of the group are not only crushed and contorted, but are largely epidotised, and in most cases are not easily recognisable. They are tentatively classed as Cambro-Ordovician, because it seems likely that the series may be correlated with the porphyroid series of rocks widely developed on the West Coast of Tasmania, and which are known to be earlier than Silurian. Members of this group include porphyroids, spilites, spilite tuffs, porphyrites, altered diabases, and igneous breccias. These rocks are associated with slates and quartzites.

Several outcrops of gabbro and pyroxenite were noticed in different parts of the island, and although there is no definite evidence of their age, the rock is possibly of Devonian age, and may be genetically connected with the granite referred to below, but slightly older than the rock. The gabbro is amphibolitised and

saussuritised in places. Occasional masses of concretionary limonite on the surface where no solid rock outcrops indicate the presence of some such rock as that noted.

Very fresh granite, easily distinguishable from that previously referred to as of Cambro-Ordovician age, outcrops at various points. It is frequently porphyritic, and shows no signs of crushing. In places it appears to be intrusive into the older granite. There appear to be seven or eight distrinct massifs - three on the east coast, and the others on the west coast of the island. The scheelite deposit at Grassy River is genetically connected with one outcrop of this granite. Although as a rule it does not appear to be stanniferous, it is probable that the rock is to be correlated with that abundant in Tasmania, which is of, approximately, Devonian age. Dykes of granite porphyry and aplite traverse the grznite at intervals, and these are undoubtedly late products of consolidation of the granite magma itself. Dykes of pegmatite, sometimes with coarse felspar, muscovite mica, and tourmaline are not uncommon in the Pre-Cambrian rocks, and are believed to be final consolidation products of this Devonian granitic magma. Dykes of lamprophyric rocks, which occasionally traverse the newer granite, are believed to be genetically connected with the granite itself, and to be differentiation products of the same magma, intruded after the crust of the granite had consolidated. It is probable that various dykes of hornblendic rocks whose nature has not yet been determined in detail are derived from the same magma.

Dykes of diabase were noticed at several localities and these so closely resemble both macroscopically and microscopically the Tasmanian diabase, that they are assumed to be of similar age, viz, Mesozoic, in the absence of any other criterion of age.

The newest igneous rock found on King Island is a vesicular olivine basalt, which was not seen in situ, but occurs in the form of abundant boulders on the shore at a point about 2 miles north of Currie Harbour. A similar rock is reported from the east coast, but the locality could not be visited. This rock is believed to be of Tertiary age, and to be contemporaneous with similar rocks in Tasmania.

Little need be said in this report concerning mining on the island. The property which has attracted considerable attention lately is the scheelite mine at Grassy River, on the south-east coast. A detailed report on this mine is being submitted very shortly. Scheelite occurs, with a small amount of molybdenite and traces of tin and bismuth in a large garnet-diopside-calcite formation in contact slate and sandstone country within a few chains of the granite contact. The richest scheelite occurs in quartz veins traversing the formation, but the samples show that it isdistributed throught the garnet rock. The molybdenite is not of economic importance. Very little work has been done up to the present on the formation, but enough to indicate that the deposit is likely to prove a valuable one. Further prospecting is urgently needed, and should be carried out without delay, and before machinery is erected. The deposit is very

favourably situated for economical working. At the present time, when scheelite is urgently needed, developmental work should be vigorously pushed on.

About 4½ miles north-east of the scheelite mine, at an inlet known as City of Melbourne Bay, an attempt was made a few years ago to work the red and green slates belonging to the Cambro-Ordovician series described above. Unfortunately, the attempt was unsuccessful. The slates are not fissile, and cannot be obtained in large slabs where exploited.

About 3½ miles due north of these old workings the old No. 1 Mine is situated, about 1 mile from the coast. Here an adit was driven for 160 feet on the course of a promising quartz vein carrying allittle galena and some pyrite, and traces of arsenopyrite and sphalerite. The average width of reef is from 18 to 24 inches. Crosscuts totalling 45 feet were also driven. Assay results of samples are not to hand at the time of writing.

About 3 miles north-west of this old mine, at the mouth of the Fraser River, are the old British Flag Tin Mine workings. These are at the southern end of the Sea Elephant beach. The deposit consists essentially of ilmentite, and carries both tin and gold, the cassiterite being very finely divided, the gold fine and flakey. Monazite is also present. As a result of the small amount of work done, it is said that about 3 tons of tin oxide were sent away for treatment. The attempt to work the deposit failed, but the deposit is certainly worth further attention. The appliances used for concentrating appear to have been crude, and skilled labour unobtainable on the island for this class of work. Values are said to have been proved for about a mile in length, and over a width of about 150 feet, butit is doubtful if the flat was ever properly prospected. The deposit forms part of a raised beach, and is about 15 feet above present sea-level. About the centre of the island, and within about 2 miles of the Pegarah-road are some abandoned workings comprisings what is locally known as McKie's Gold Mine. Little is to be seen at the present time. A shaft is said to have been sunk to about 50 feet on a gold-bearing quartz reef. The shaft is now inacessible being full of water, and partly collapsed. A small amount of surface trenching has been carried out. This work must have been costly at the time it was carried out, owing to the inaccessibility of the mine. The quartz carried a little pyrite. Assay values of samples from the surface are not yet available. Several other quartz reefs occur in this locality, of various sizes some of them showing a little pyrtie and arsenopyrite. The locality is favourable for the occurrence of auriferous reefs, and is worth prospecting.

With reference to the island as a whole, the opinion formed was that conditions are favourable for the occurrence of ore-deposits of economic value. Prospecting willlbe unsatisfactory in many parts of the island owing

to the cover of recent material, the the south-eastern portion of the island is favourable, and prospecting is recommended as the surface is being gradually cleared of scrub.

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L. LAWRY WATERHOUSE, B.E.,

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