NOTES ON THE GEOLOGY OF WINEGLASS BAY.

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During a recent visit to Wineglass Bay I was enabled to make a cursory examination of the neighbourhood, and, as the locality has not been described in any detail, a few notes may be useful as a guide to future workers.

Wineglass or Thouin Bay is situated on the eastern side of the isthmus joining Freycinet Peninsula to Schouten Main, which, together with Schouten Island, form the eastern boundary of Oyster or Fleurieu Bay. The whole consists of a magnificent series of granite peaks, extending for 12 miles in a north and south direction, the highest, Mount Freycinet, rising to the height of 2,014ft. above the sea. This granite occurs in a meridional line, extending from Flinders Island to the Hippolyte Rocks, off Tasman Peninsula, and is contemporaneous with the granite massifs of the West Coast. It is to be found penetrating all rocks earlier than the Permo-Carboniferous, but has not been seen intrusive in strata of a later age. It is usually distinguished from the earlier granites and syenites by its uncrushed character, though in places it has been subjected to a certain amount of dynamic stress.

The granite at Wineglass Bay varies considerably. The normal rock is a coarse-grained granite, pink with flesh-coloured orthoclase. The chief constituents are orthoclase, quartz and biotite. The latter appears in green chloritised crystals, and is quite subordinate in quantity. In large boulders at the northern end of the beach appears a medium-grained biotite-granite, the composition of which is quartz, biotite and felspar. Much of the latter will probably be found to be plagioclastic. This is the more typical East Coast granite. Running through this are veins of granite porphyry, in which the ground mass looks quartzose, with scattered crystals of quartz, biotite and muscovite throughout. In other veins there is a concentration of the biotite. A wide vein of this biotite-granite was reported as running up the hill from the water's edge on the northern side of the bay, but I did not come across it. A broad vein about 20ft. wide is found on the south side of the bay. This is also a granite porphyry of magnificent appearance. It consists of pink orthoclase and quartz in a quartzose ground mass. The ferro-magnesian

constituents are very few. Running through the boulders on the sides of Mt. Hazard are to be found narrow veins of microgranite, a very fine-grained variety composed of felspar, biotite and quartz. On the northern side of the bay also occurred a highly porphyritic granite with large crystals of felspar (orthoclase?), also quartz, biotite and muscovite.

Numerous quartz veins traversed the rock in a more or less north and south direction, and varied considerably in size. They varied also in colour from rose to white, and there were numerous nests of rock crystals. There was no evidence of the greisenised zone, carrying tin, found at the northern end of Schouten Main.

At intervals along the south side of the bay are parallel dykes of dark rock, running approximately north and south. This rock has previously been referred to by Dr. Milligan, who thought that it was greenstone, and certainly it somewhat resembles diabase or dolerite to the naked eye. But microscopically it is resolvable into a combination of plagioclase, felspar, and hornblende, and is therefore a diorite. Some biotite is also present. The felspars in lath-shaped sections exhibit both albite and Carlsbad twinning, and from the extinction angles belong to the oligoclase-andesine series. The biotite where not chloritised is brown in colour. The hornblende is irregular in form and green. It is mostly chloritised to some extent, during which process iron oxide has separated out abundantly. Diorite is a rock which is met with in more than one form of occurrence. It may exist in dyke form, or as a separate rock mass, or finally as a facies of granite. The structure of the present rock is consonant with its occurrence either as a facies or a dyke. Evidently it has genetic connection with the granite rock of Freycinet Peninsula. In one vein close to the water's edge large crystals of felspar were to be seen embedded in the diorite, which there appeared more grey in colour. I was not able to examine it closer owing to its position and the lack of time, but it appeared as if some absorption of the constituents of the granite had taken place, leading one almost to suppose that the dyke theory was more probable, but there is not sufficient data to dogmatise about the matter. They certainly appear to be xenocrysts rather than phenocrysts.

Most of the hills appear as great boss-like masses with rounded surfaces, curiously streaked by the descending waters charged with mineral matter. These hills descend right into the sea, with little or no foreshore. Along the

east coast great cliffs have been formed, seamed with cracks and joints, and showing traces in parts of columnar structure on the outer and upper faces. The structures seen in many of the cliffs indicate that there has been intense dynamic stress taking place in part during consolidation, but mostly subsequently. The sinking of the land to the East, approximately along this line of granite, may have tended to weaken the structure. The deformation of the granite on Maria Island appears to have been of a more intensive nature, though not nearly so severe as in the earlier granites.

Very few traces of the older or subsequent strata are to be found. The rate of denudation and sea erosion is and has been very great. Silurian slates appear at Blue Stone Bay. Cretaceous diabase is found at Buckley's, on the south side of Hazard Bay, and on Schouten Island, the two latter deposits being fringed with Mesozoic sandstones. In speaking of Oyster Bay, Mr. Twelvetrees reports:—"The form of Oyster Bay illustrates the eroding force of the waves on a large scale. We must believe that the surviving fringe of diabase on the E. side of the bay at Hepburn's Point, on the S.W. of the Peninsula, and on Schouten Island, was once continuous with the sea-front of the same rock on the Swansea side of the bay. The fragmentary deposits of Mesozoic sandstone (freestone) associated with the diabase indicate that it, too, extended across the bay to Kelvedon. It follows, accordingly, that the present Oyster Bay has been scooped out of the coal measures, sandstones and diabase, the eroding process being, perhaps, assisted in its initial stages by the weakness of the strata along the contact line of the diabase with granite on the eastern shore of the bay. The excavating process has extended to a depth of 12 fathoms, on the average. The present depth of the bay does not represent the sum total of erosion since the coal period, for it has probably been reduced by deposition in Tertiary times of sediments, which have since been denuded as the land has risen again. The Tertiary deposits in the lower part of the valleys of the Swan and the Apsley illustrate the depression and subsequent elevation of the land during that period, observed frequently elsewhere in Tasmania."

The sand forming the beach at Wineglass Bay is very white, being composed almost entirely of quartz and small rounded particles of felspar. In Hazard Bay, however, it is more yellow in colour, and contains much felspar and many shell fragments. The isthmus itself is composed of a broad flat, fringed with high sandhills, and somewhat

hollowed in the centre, forming a large shallow lagoon. The general appearance would lead one to suppose that it is the result of subsidence rather than the result of the accumulation of drifting sand, though the rapid disintegration would account for abundance of material. An interesting field of study would be the formation of the tied-islands and isthmuses of S.E. Tasmania. The amount of evidence here is very little, and no definite conclusions could be formed without further examination. There is no doubt that the peninsula was separated from Schouten Main just as at present Schouten Island is separated from the peninsula, and also that the different character of the rocks on the north and south side of the bay would lead to the conclusion that they represent two quite distinct intratelluric intrusions, which were, however, approximately contemporaneous, but further investigation must be left to a subsequent visit. In conclusion, I must express my indebtedness to Mr. Twelvetrees, who gave me valuable assistance in checking the constituents of the rocks found, and especially in determining the composition of the diorite.