

ART. XII.—*Some Features in the Geography of North-Western Tasmania.*

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[With Plates XX., XXI.]

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The recent earth movements in Tasmania are of special interest to Victorian geologists, as they were probably connected with the formation of Bass Strait, a problem of primary importance in the geology of the Victorian coastlands.

In a recent visit to north-western Tasmania my first impression was of surprise, at seeing such clear evidence of an uplift (or to use Suess's more precise term, a negative movement), of that country to the height of several hundred feet. The railway from Emu Bay to Zeehan, on leaving the coast, started at once to climb a long slope, which proves to be the northern face of an undulating plateau. On reaching the plateau at Hampshire Plains, 20 miles from Burnie (altitude 1500 feet)<sup>1</sup> there is a fine view, southward and westward, to some bold peaks that rise abruptly above the general level of the country, like rocky islands above the sea. The traverse across the north-western corner of Tasmania to Macquarie Harbour enabled me to see many of the features of this plateau, and to recognise it as a member of that class of land forms which Professor W. M. Davis calls an uplifted pene-plain. The surface of this pene-plain is in places, as near Farrell and the foot of the West Coast Range, 1300 feet or more above the sea; but it becomes lower to the north, west and south. This pene-plain area extended, as far as I could see, from the Emu Bay Railway towards the northern and north-western coast. Inland it ends abruptly against the West

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<sup>1</sup> For the altitude and for facilities in examining this country, I am indebted to Mr. J. Stirling, the Manager of the Emu Bay Railway.

Coast Range, at a distance of from 20 to 25 miles from the sea. It extends in a broad band parallel to the western coast, at least from the Arthur River on the north, to some distance south of Macquarie Harbour, where it apparently sinks to but little above sea level.

The general contour of the country between Emu Bay and Strahan shows that the pene-plain in this part of Tasmania was due to river action, and that the main slope is downward to the west; but subsequent river action has destroyed so much of the surface of the plain that its existence can only be recognised in a broad distant view.

The best views showing the geographical structure of the country are gained looking westward from the peaks of the West Coast Range, as from the western end of the ridges of either Mount Sedgwick or Lyell (Figs. 2 and 3). The view from the summit of the Haulage of the Mount Lyell Mining and Railway Company is less extensive; but it shows the features of the pene-plain of the Henty and Queen rivers exceptionally well. At the foot of the steep ridge of schists is the deep valley of the Queen River; beyond it, the country looks rugged and irregular, consisting of a series of deep gullies and river valleys separated by narrow spurs and ridges. Here and there is an expanse of open plateau, such as Madam Howard's Plains, relics of the widespread plain that existed before the country was dissected into the present maze of ridge and gorge. The crests of the ridges generally reach to the level of the old pene-plain surface; and further to the west, as the details become obscured in the distance, the valleys are hidden and the blue hills and ridges combine to give the impression of a level plain, sloping slightly toward the sea. In the far distance the edge of the pene-plain forms a skyline almost as straight, and horizontal, and featureless as that of the sea beyond. To the north and south, the level of the land is less regular, for the country slopes upward to the hills that mark the site of the banks of the old river, which made this part of the pene-plain; and further northward the truncated cone of Mount Zeehan, the long serrated crest of the Heemskirk Range, and the tumbled masses of the West Coast Range, rise high above the general level of the country.

The upper, or eastern part of this pene-plain, is comparatively narrow. It is bounded on the south by some woody hills, which run northward from the King River, and on the north by Crown Hill and the mountain known as the Professor. These hills must, at one time, have formed the banks of the river which eroded this part of the pene-plain. This river rose on the Central Plateau, near the Eldon Range, and flowed first through the upper part of the valley of the King River, and then along the Sedgwick Valley and through the gap between Mounts Sedgwick and Lyell, over the site of the Queen River valley. As the river flowed westward its valley became wider. It was joined by tributaries from the south, which drained country now included in the lower basin of the King River; it was also joined by the Henty and other rivers from the north. As most of this area is now drained by the Henty, I suggest for it the name of the Henty pene-plain. Near the sea this pene-plain joins with those of other rivers, and they together form the continuous pene-plain which backs the western coast of Tasmania.

The eastern part of the Henty pene-plain, between the lower King River and the Professor, has the features of the lower valley of a large river. This aspect of the country is especially well seen from Mount Lyell. The slopes on either side have the contours characteristic of the sides of an old river valley, and not of cliffs formed by marine denudation. If the pene-plain had been formed by the sea, some remains of old cliffs and beaches might be expected to occur round it, and some traces of marine deposits on its floor. I am not aware that any such have been found or recorded, while I am told by Mr. Huntley Clarke, Engineer of Supplies at Mount Lyell, that some of the hills are capped by river gravels.

Montgomery has described the occurrence of rounded, water-worn gravel upon this pene-plain, and has described the area as a plain of marine erosion.<sup>1</sup> He says, "At the Nine Mile Plain on the road from Strahan, a good deal of well-rounded waterworn gravel is seen lying on the bed-rock beneath the surface soil, at an elevation of from 700 to 800 feet above sea level, and pretty well on the top of a watershed."

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<sup>1</sup> A. Montgomery: "Notes on the Queen River and Mount Lyell Mining District," Parl. Pap., Tasmania, 9th July, 1894.

The Queen River itself appears too small to have formed so great a valley ; but it is clear that the river system in this part of Tasmania, at no distant date, was arranged very differently from its present plan.

Between Mount Lyell and Mount Sedgwick in the north there is a deep valley. It is known as the Sedgwick Valley, and is two miles in breadth. Though the walls on both sides are steep, they have been cut back into deep gullies, between which are long rocky spurs, so that the Sedgwick Valley shows signs of much greater age than the canyon of the King River. This Sedgwick Valley is a direct continuation of the north-eastern branch of the King River, which drains the southern slope of the Eldon Range. The valley to the Henty pene-plain opens by a low pass known as the Sedgwick Gap. This Gap, now 1160 feet above sea level, is but slightly raised above the King River, at its bend to the east of the Gap. In all probability the King River once continued its westward course along the Sedgwick Valley, through the Gap, and across the site of the Henty pene-plain to the south of Crown Hill and the Professor. This river would have been of considerable size and quite sufficient to have formed the pene-plain. Then, either the glacier which formerly filled the valleys of the King River and some of its tributaries, or a slight uplift along the Great Fault of Mount Lyell—which runs along the western face of Mounts Sedgwick, Lyell and Owen—interrupted the course of the King River. The river was dammed back till it found a fresh outlet to the south of Mount Owen, through the gap between Mounts Huxley and Jukes. There it has cut for itself the deep canyon, through which it flows to Macquarie Harbour.

One important point in connection with the age of the pene-plain and the deflection of the King River is its bearing on the age of the recent glacial deposits of Tasmania. It has often been maintained that extensive glaciations are the result of increased elevation ; and this explanation is attractively simple because, if a country be uplifted, its temperature must be reduced ; and, therefore, if the precipitation remain the same, its snowfall will be increased. The explanation, however, does not appear to be consistent with the facts in some cases, where there is a considerable amount of evidence as to the relations of maximum glacia-

tion and earth movements.<sup>1</sup> Nor is there any evidence, as far as I am aware, that Tasmania has been uplifted, in Cainozoic times, much above its present level.<sup>2</sup> It is indeed possible, as maintained by Montgomery, that the glacial deposits of Tasmania were formed when the country stood some hundreds of feet below its present level. The western glaciers followed the existing valleys, occupying those between Mount Sedgwick and Mount Tyndall, between Mount Sedgwick and Mount Lyell, and down the King River to the east of Mounts Lyell and Owen. The course of these valleys had been determined by earth movements in pre-glacial times; and the general evidence renders it highly improbable that they were scooped out by glacial action, although the glaciers may have deepened and modified them. Hence the diversion of the King River from its old course through the Sedgwick Valley, to its present circuitous route to the south of Mount Jukes, was probably caused during the latter part of the glacial period. The damming up of the Sedgwick Valley by ice and moraines was quite sufficient to cause the drainage from the glaciers in the Upper King Valley to overflow at the lowest gap on the southern margin of the King basin; and the lowest available outlet was between Mount Huxley and Mount Jukes.

The glacial deposits around Mount Lyell are more recent than the formation of the Henty pene-plain, for that plain was made by a pre-glacial river, and some glacial deposits occur in valleys cut through it, as at Queenstown; but the difference in time was probably small. The pene-plain was certainly formed when western Tasmania stood a few hundred feet lower than it does now; and Montgomery may be correct in his view that the glaciation of Tasmania occurred in this period of depression.<sup>3</sup> Mr. R. M. Johnston does not favour the idea of any considerable earth movements in Tasmania in recent geological times. He says,<sup>4</sup> "In Tasmania there is little evidence of physical disturb-

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1 See for example, "Contributions to the Glacial Geology of Spitzbergen," *Quart. Journ. Geol. Soc.*, vol. liv., 1898, p. 224.

2 The drowned valleys of the Tamar and the Derwent do not necessarily indicate a subsidence of the whole of Tasmania.

3 Montgomery, A.: "Glacial Action in Tasmania." *Proc. Roy. Soc. Tas.* 1893 (1894), p. 165.

4 Johnston, R. M.: "Geology of Tasmania," p. 326.

ances of an extraordinary character during the [Post Tertiary] period, if we except the minor local oscillations of land indicated by the raised beaches on the islands of Bass Strait, and on other places along the northern coastline of Tasmania. . . . It may generally be affirmed that the leading features—the mountain chains and ridges, the main valleys and their river courses, the great plains and plateaux—were all established prior to the deposit of the members of the Post Tertiary age.” The Henty pene-plain, however, has been so deeply dissected that it is probably somewhat older than the glacial deposits, which in some cases are comparatively fresh.

The formation of the Henty pene-plain must have been a long task, and must have been completed when Tasmania was less elevated than it is now. It may have been contemporary with the formation of the extensive dissected pene-plains, which are among the most important features in the geography of Victoria.

The date at which the pene-plain was uplifted is, though pre-glacial, geologically recent. The most convincing evidence is given by the narrowness of the river gorges that cut through it. The railway between Emu Bay and Strahan runs for some distance down the Pieman Valley, a deep and narrow gorge, the bed of which is being rapidly deepened by corrosion. The Henty River near Strahan flows across a low-lying alluvial plain, crossed by lines of high, weathered, sand dunes; but further to the east this river cuts through the pene-plain in a very deep gorge.

The best case, however, is that of the King River, which rises in the central plateau of Tasmania. East of Mount Lyell it flows through a broad, flat-floored valley, known as the “Long Marsh.” Here its valley is obviously of great age, but further down its course the river flows through a sinuous, narrow canyon.

Mr. W. T. Batchelor, the engineer of the Mount Lyell Mine, kindly told me that in one place the depth is 1700 feet, where the canyon is at the summit only between 2000 and 2500 feet across. The narrowness of this river gorge, and the vertical character of its cliffs, show that it is a very young valley.

Further evidence indicating a comparatively recent uplift of this part of Tasmania is supplied by the southern face of Mount Sorell. This mountain is situated on the northern side of Macquarie Harbour. It consists of a block of the West Coast Range

conglomerates resting upon Lower Palaeozoic or Archean beds. A straight, well-marked beach line runs across the southern face of the mountain. Its level is quite straight, though it is now tilted slightly from the horizontal, dipping at about 5 degrees to the west. The terrace, so far as could be seen from the steamer, cuts across the bedding of the strata, so that it cannot be due to the outcrop of a band of hard rock. It is clearly a beach line formed when the country stood several hundred feet lower than at present.

#### DESCRIPTION OF PLATES.

1. Sketch map of north-western Tasmania, showing parts of the areas occupied by the Central Plateau, and by the North-Western, Henty and Western Pene-Plains; and the probable former course of the Henty and King Rivers. The Central Plateau is accepted from the map in Johnston's *Geology of Tasmania*. The boundaries of the pene-plains are approximate, and the limits uncertain.
2. Sketch of the view across the Henty Pene-Plain from the hill face above the Royal Tharsis Mine, Mount Lyell.
3. Outline sketch across the Henty Pene-plain from the western spur of Mount Lyell.

Figures 2 and 3 have been drawn by Mr. D. J. Mahoney, from sketches by the author.

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