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Glacial Features in the D'Entrecasteaux Valley

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In 1928 (Lewis, 1928) one of the present authors reported Silurian quartzite conglomerates in the valley of the D'Entrecasteaux River—Recherche Bay area—South-Western Tasmania. In so doing he was influenced by Twelvetrees (1915). Considering the matter more recently, it appeared that this occurrence might be of glacial origin. If this proved to be correct, the original site of these rocks must be westward of the La Perouse Range. An opportunity to visit this difficult locality has now presented itself. The rocks in question are undoubtedly of glacial origin, but they are Triassic grits, and not of Silurian age. No one can now be sure whether the series is the same as that reported by Twelvetrees, but from his very brief description this may be so. In any case, some further observations were made which are worth recording. This paper must be considered merely as an amplification of the previous account (Lewis, 1928).

Some four miles westward of Leprena, in the D'Entrecasteaux valley, and some two miles westward of the seaward limit of the button-grass plain in that locality, a peculiar button-grass covered and stream dissected spur runs northward from Leillateah to the present course of the river. This was previously described as consisting of quartzite conglomerate boulders (Lewis, 1928, p. 193). It is, in fact, an old moraine. On the surface lie boulders of considerable size. These consist of coarse quartzite conglomerates and grits, but of Triassic age, and evidently derived from the flanks of La Perouse, where a thin band of similar rocks exists (Lewis, 1924, p. 23). This spur is a distinctive feature, clearly discernible for miles around. The large white boulders are merely the largest erratics left on the surface after the finer and softer material has been washed away. The evidence that this is really an old moraine is—

(1) The assorted nature of the rocks, which are a jumble of stones of all sizes, from sand to the size of a large tent, and of conglomerates, grits, sandstones, shales of Triassic age, fossiliferous mudstones of Permo-Carboniferous age, and dolerite.

(2) The stratification planes of the grits, which are clearly visible, now appear pointing to every point of the compass and at every angle.

(3) The grits when *in situ* only occupy a vertical range of 50-100 feet, while here they are strewn over a vertical height of nearly 1000 feet.

(4) The ridge extends into the main valley in such a way that it cannot be an erosion feature, and is dissected by streams that traverse its long axis in a way which shows that they cannot have been responsible for it.

(5) The degree of dissection compared with that of the neighbouring hillsides shows that it is of different topographic origin from the main valley.

(6) The rubbly nature can be seen over a vertical range of nearly 1000 feet. We see here a very considerable ancient moraine lying across a previously eroded glacial valley, and itself eroded by a newer glacier which has superimposed its moraine upon the older one in rather a peculiar manner.

The whole D'Entrecasteaux valley appears to have been filled with ice at some time. It could not have been eroded as we see it at present by the existing river; its spurs have been shorn by a glacier, and there is evidence that ice reached sea-level at Leprena, where quartz pebbles and basalt boulders indicate an eroded moraine. Subsequently, a glacier deposited the moraine already described as a barrier across the valley. This may originally have stood 800-1000 feet above the valley floor. This moraine was then eroded to about 400 feet above sea-level on the northern side of the valley, and ice again extended to at least the eastern extremity of the button-grass plain, some two miles below the old moraine, and deposited a newer moraine in the valley occupied by it. Subsequently again, ice invaded the highlands of La Perouse, two miles further westward, and gave us the mountain tarns already fully described (Lewis, 1924). The lastmentioned glaciers did not reach the Leprena Plain. The glacier which flowed down the valley eroded in the older moraine reached at least to 300 feet above sea-level, but did not fill the valley as previously eroded. In its own valley it left a considerable area of terminal moraine, now visible as the button-grass plain of the D'Entrecasteaux valley, and distinguished by frequent small boulders of dolerite, particularly where clumps of trees are now growing.

This is the first recorded instance of a Pleistocene moraine definitely superimposed on an earlier moraine of the same period. The appearance of this feature, however, is very different from what was expected. We see here a Pleistocene moraine which must at one time have formed a wall some 800-1000 feet high and about a

mile broad across a valley which had previously been impressed with typically glacial characteristics. After the disappearance of the ice which deposited this moraine, it was breached at one side, and eroded below the present level of the valley floor. During a succeeding glacial phase of the Pleistocene period a new glacier passed through this breach, widening it considerably, and, eventually, deposited its terminal moraine for four miles or more over its valley. This material is of unknown depth, but it must be shallow in comparison to the huge older moraine. It extends along the present valley both below and above the older moraine, and is definitely superimposed on the old transverse deposit where it crosses it.

The sequence of events during the Pleistocene ice age appears to have been as follows. The period was initiated before the final uplift of the La Perouse Range when the area was a dissected peneplain, with Leillateah and Sugar Loaf Range representing the general level of the higher elevations. The summits of La Perouse, Pindar's Peak, Mts. Wyllie, &c., and Precipitous Bluff group probably stood at much the same general level (2500 feet). During the first discernible glacial phase (Malanna) an ice-cap covered the plateau, and extended in very considerable glaciers to sea-level down the D'Entrecasteaux, Catamaran, and Lune valleys. The terminal areas of the glaciers are now flooded. Ice must have been over 1000 feet in depth, and must have entirely filled the valleys. During the recession of the glacier in the D'Entrecasteaux valley the transverse grit moraine was deposited. The uplift of the La Perouse group of mountains to their present height (4000 feet) occurred during the succeeding (Malanna-Yolande) interglacial phase. At this time the streams flowing over the new escarpment wore the present gorges and deepened troughs in the older glacial valleys. The Yolande glaciers succeeded, and were responsible for the cirques described by Lewis (1924). The Margaret phase was responsible for the mountain tarns and superimposed cirques also described in the lastmentioned paper.

Two other possibilities exist, but the evidence is too doubtful to permit of either being advanced as certainties until confirmed by observations elsewhere. The transverse grit moraine has definitely been deposited in a previously eroded glacial valley. This erosion may have been due to the same glacier as deposited the moraine, that event having occurred towards the end of its recession phase. On the other hand, we may have here evidence of two separate glacial phases. The second possibility is that the glacier which was responsible for the superimposed moraine descended, not from the cirques at present so clearly defined on the sides of La Perouse, but from a point half-way down the three valleys of the present D'Entrecasteaux River. Here there is now a marked topographical break, a sharp waterworn gorge indicating a drop of about 1000 feet with the

glaciated valley below and the cirques and glaciated valleys above. This feature may indicate two glacial phases between that responsible for the transverse grit moraine and the Margaret features on the mountain tops. Lewis (1924, Plate VI. fig. 1) shows a view from the top of the Yolande cirque, with the glacial valley extending towards Leillateah in the centre of the picture. At that point the valley turns half left and drops rapidly. 1000 feet below are found the traces of the glacier which was responsible for the superimposed moraine. (In the same paper Plate VI, fig. 2, shows a Margaret cirque superimposed on the Yolande cirque shown in fig. 1, the edge of which is visible on the left of fig. 2.) The break in the glacial valleys as here described may be due to post-glacial (or post-Yolande) river erosion at the point which the streams fall over the main fault scarp of the range, or it may represent the scarp of a post-Yolande uplift breaking the continuity of the Yolande glacial valley, or it may represent the results of two distinct ice phases.

It appears, therefore, that this area shows a topography which would well conform to a landscape moulded by four distinct Pleistocene glaciations. But at present we do not regard the evidence so far available as conclusive proof of the existence in this part of Tasmania of four Pleistocene glacial periods, and confirmation must still be sought elsewhere. The evidence in the D'Entrecasteaux valley is quite consistent with the occurrence of only three glacial phases. For the present we assign to the transverse grit moraine the tentative appellation of " The D'Entrecasteaux Phase," leaving it to future investigation to determine whether it should be correlated with the Malanna glacial phase or whether it represents the missing fourth glaciation.

REFERENCES.

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