

The newer quartz drifts are intimately associated with these, and in the Manuherikia and Cardrona Valleys the beds appear to be for the most part river-bed deposits: perhaps at Drybread and the Little Kye Burn they are, in the higher beds, deltaic or lacustrine. Succeeding these, the next beds are the heavy sandstone conglomerates, which in Otago are usually called "Maori bottom." In the Cardrona Valley these beds are at least 500ft. thick. In the Manuherikia Valley and in the Maniototo Basin their actual thickness is not so easily determined, but it is less than within the Cardrona watershed. At Switzer's the thickness of the beds is considerable, though far short of the maximum above stated. Before the deposit of the "Maori bottom" beds, all central Otago had been denuded of the rocks capable of yielding the sandstone gravels of which the "Maori bottom" is composed, and it seems almost a necessary conclusion that at this time the area of the goldfields of Otago be regarded as having been depressed below the general level of the surrounding regions, over which sandstone and slaty rocks were present. One very large or several smaller lakes there probably were, and into this or these were carried the sandstone gravels from the exterior regions. The eastern area now comprising the Maniototo Basin could easily have been supplied from the Kakanui and Mount Ida Ranges, and the Manuherikia Valley from the unaltered rocks of the Mount St. Bathans and Hawkdun Ranges; but there is a difference in the case of the "Maori bottom" in the Cardrona Valley. The gravels there present can have come from nowhere but the Hunter Valley, above Lake Hawea, although at the present time the rearranged glacier-moraines and gravel-plains below the lakes to the Luggate Burn show few signs of the presence of sandstone.

The older quartz drifts and breccia conglomerates and the beds belonging to the same series that overlie them appear to have been denuded to a considerable extent before the deposition of the lower beds of the next succeeding series. The newer breccia conglomerates and quartz drifts, like the older, rest generally on schist rocks, and appear to be the product of river-action, as seen on Criffel Face, at Tinker's, and Devonshire Diggings. At Drybread the higher beds appear to be more of a lacustrine character. To some extent, therefore, the extensive lacustrine area, which was characteristic of the period of the older drifts, had been broken up, and parts of it brought under the influence of the denudation then in progress; but there is no evidence that the country was being rapidly modified by the elevation and depression of the land on opposite sides of great fault-lines traversing the whole length of the provincial district. It was not till after the deposit of the sandstone gravels known as "Maori bottom" that this took place. In the Waitaki Valley, Maniototo Basin, and generally in eastern Otago it is not quite clear that the great disturbance took place after the deposit of the "Maori bottom" gravels; but in the Manuherikia and Clutha Valleys the evidences that it was subsequent are decisive. Subsequent to the deposit of these, the several fault-lines which have been described began to be formed, and up till the present time vertical and thrust movements have been and are in progress. The result was that the Maniototo Basin was separated from the coastward tract by the appearance of the Horse Range and Kakanui Mountains; was also cut off from the Poolburn and Ida Burn Basin by the Rough Ridge and the Wetherburn Range. Ida Valley and the Poolburn Valley, likewise an old lake-basin, shut off, as described, from connection with the Maniototo Basin, was likewise separated from the lake-basin of the Manuherikia Valley by the Raggedy Ridge, Blackstone Hill Range, and the Hawkdun Home Hills. These, and the Hawkdun Mountains to the north-east, limited to the south-east the Manuherikia lake-basin, which the Mount St. Bathans Range and the Dunstan Mountains limit on its north-west side. The Mount Pisa and Carrick Ranges limit in the same way the lower portion of the Clutha lake-basin, the waters of which filled the lower part of the Lindis Valley, and, in the neighbourhood of the present lakes, Lake Hawea and Lake Wanaka extended some distance up the Cardrona Valley. The Nevis Valley probably has not been a lake since the deposit of the "Maori bottom." While these different lake-basins were being formed in the central and northern parts of Otago, more to the west the same thing was going on in the Lake Wakatipu district; and while depression of the country to the east of the line of the Moke Creek and Great Clarence faults was going on, resulting in a yet further deepening of the lake, the schist formation of the Richardson Mountains, due to lateral pressure from the eastward, was gradually overriding the Tertiary and Cretaceous-tertiary rocks along the eastern foot of that range.

Between these newer lake-basins portions of the deposit in the older were raised high on to the mountains, as is shown by what remains on Criffel and Mount Buster even at the present time. Several fault-lines intersecting each other in the vicinity of the lower ends of Lakes Wanaka and Hawea, the depression where these crossed being greater than elsewhere, the present lakes now lie in that portion; but the united Lakes Wanaka and Hawea extended along the Clutha Valley to Cromwell and Bannockburn, and were of large area compared with the combined extent of the present lakes. The level at which the waters stood in these newer Pliocene lake-basins was, in the case of Lake Wakatipu, nearly 1,000ft. above the present level of the lake; in the case of the united Hawea and Wanaka, 1,600ft. above the present level of Lake Wanaka. In the case of the Manuherikia and Maniototo Basins—these being now totally drained, or almost filled in—such comparison may not be made; but on the eastern side of the Maniototo the highest superficial gravel exceeds somewhat 2,000ft., while the level of the Taieri Lake is 1,100ft. above the sea. There is no proof that since the deposit of the "Maori bottom" the waters of the lake in the Maniototo Basin reached the level of Hamilton's or Naseby, and the superficial alluvial drifts at high levels between the Upper Hogburn and Eweburn may wholly be due to the action of those streams before they had cut down to their present level. In time glacier-ice invaded the upper valleys, and filled the depressions now occupied by Lakes Wakatipu, Wanaka, and Hawea. Glacier-moraines reach to Franktown and the foot of the Remarkables, and choke the former outlet of Lake Wakatipu, and lie against the lower slopes of Ben Lomond opposite Queenstown; but the highest terraces on the side of the Ben Lomond Range and on the Crown Terrace, on the left bank of the Arrow, opposite Arrowtown, are old lake-beaches. Therefore the lake had been lowered considerably from its highest level before the advance into it of the glaciers of the Dart and Rees Valleys.