

The upper part of the Karangarua exhibits most beautifully the effect of glaciation. From Karangarua Pass the broad U-shaped valley is well displayed from the cirque at its head to the great bend at the Cataracts, west of which stands out clear against the sky—straight down the valley—the snowy crest of Mount McGloin. Bordering the upper valley to the east and west are mural precipices rising to bare rocky ridges, over which small streams fall hundreds of feet from their source in snow-patches or ice-blocks into the bush-clad valley beneath. At the junction with the main river these streams in places descend vertically over rock cliffs in falls of a hundred feet or more.

Below the great bend, as far as the mouth of the Copland, numerous small streams descend abruptly into the Karangarua from hanging valleys on the ridge of aiguille-shaped peaks extending north from Mount McGloin, giving falls of exquisite beauty. Below the junction of the Karangarua and Copland the united river flows almost at grade, and in places anastomoses in many channels through broad alluvial flats.

The lower slopes of Conical Hill, between the mouths of Regina Creek and the Twain, show rounded rock-surfaces beautifully smoothed and striated by ice.

The McKerrow Glacier rises in many small ice-falls, descending from lofty peaks on the main divide—Maunga Ma, Mount Eric, and The Dwarf. It is some four miles long and about half a mile in width, though this latter dimension varies. The glacier has in general a gradual and uniform descent from the great cirque near its head, though there are minor irregularities. The ice is much crevassed and morained below Karangarua Pass, but above that point only a very few moraines are visible, and the ice is almost unbroken. Numerous small ice-blocks appear on the steep cliffs which border on either side, but there is only one cliff glacier of any size—Maori Glacier. The latter is a fine piece of much-séraced ice. Near the frontal face of the McKerrow steep precipices of phyllite appear on the westward, while ancient lateral moraines are conspicuous on either side. A low rocky ridge separates the upper part of the McKerrow from the basin of Fitzgerald Glacier.

In former times the greater part of the upper ice of the McKerrow Glacier probably flowed over Karangarua Pass and down the Karangarua Valley, while relatively only a small portion flowed by the present channel—a fact which is shown by the narrowing of the glacier below Karangarua Pass. Even at the present day but a slight elevation in the ice-level would turn part of the glacier over the two passes.

The Landsborough River gushes forth from beneath the fine ice cliff forming the frontal face of the McKerrow Glacier, and from its inception is a large and powerful stream, practically unfordable for many miles. Like the Copland, Twain, and Upper Karangarua, the Upper Landsborough forms a remarkably straight, broad U-shaped valley. It is noteworthy that its course is almost at right angles to that of the three parallel streams already described—the Copland, Twain, and Upper Karangarua. Running parallel to the splendid chain of the Southern Alps, which rise majestically on its eastern side, the Landsborough forms apparently in the main a strike valley, though it is possible also that its course is along a great rift-line.

The numerous terraces stacked with old lateral and terminal moraines, both of the ancient Landsborough Glacier (a continuation of a portion of the McKerrow) and of the many tributary glaciers, form the most conspicuous physiographic feature of the Upper Landsborough Valley. The terraces represent the incision by the Landsborough and its tributaries into the *débris* left by the retreating ice in the old glacial floor. Above these terraces rise steep grass inclines to the rock precipices descending from levels of perpetual snow. Many glaciers, some of notable size, descend from either side of the valley.

In the upper part of the Landsborough the most prominent of the tributary glaciers on the eastern side of the Alps are Le Blanc and Spence glaciers; while the Fettes Glacier is the most conspicuous tributary on the western side. The Spence Glacier, as already mentioned, was not carefully investigated by the writer, but the Le Blanc was followed from the Landsborough to Stradbroke Pass, heading into Canterbury. The Le Blanc Glacier does not directly enter the Landsborough, but is joined to the latter by a small but very rapid and almost unfordable stream, about half a mile in length. The glacier, which carries considerable moraine near its frontal face, is a typical valley glacier. It is formed by the union of several steeply descending ice-falls flowing from the *névé* in the neighbourhood of Stradbroke Pass, from the rugged slopes of Mount Spence, and from other lofty peaks of the main divide further south. The lateral moraines bordering Le Blanc Glacier, both ancient and comparatively recent, are very prominent. Smoothed and striated rock-surfaces are visible on the hills to the north of the glacier.

Fettes Glacier, descending from the fine conical peak of Mount Fettes—the most prominent elevation on the ridge to the north-west of the Landsborough—forms an imposing sight. It is a steeply falling glacier of much-crevassed and séraced ice, and enters the Landsborough in a great cliff of solid, well-banded ice, some hundreds of feet in height, from beneath which the water gushes forth with geyser-like fury. On either side at its frontal face the Fettes Glacier is bordered by recent and relatively ancient moraines, the latter being covered with a luxuriant forest-growth.

The scenery of the area covered by the Karangarua and Landsborough reconnaissance is everywhere grand and impressive. It is particularly fine in the wild valley of the Karangarua. There from an open grassy flat one may contemplate the luxuriant forest, with its many shades of green, gay in summer with the brilliant scarlet flowers of the rata; the stately rock precipices, with their numerous waterfalls; the occasional patches of tussock brightened by alpine flora; and the matchless array of snow-covered peaks and hanging glaciers visible in the background.