

members of the Cretaceo-tertiary series. See Fig. 8: A, Livingstone; B, limestone table-land on the southern side of the Maraewhenua; X, old rock; 5, older quartz drift; 6, middle part of the Cretaceo-tertiary series—the lower bed of this division, resting on the quartz drifts, is gold-bearing; 6a, volcanic rocks, as basaltic lava-floes, associated with middle division of the Cretaceo-tertiary formation; 7, upper part of the Cretaceo-tertiary formation.

No other section on the eastern side of the Kakanui Mountains adds to the information contained in the above, which makes perfectly clear the relation of the quartz drifts to the fossiliferous greensands that overlie the coal, and of the greensands to the volcanic rocks which further south are thought to be of Miocene age, and of all the underlying strata to the limestones. This section, along the southern side of the Maraewhenua, from Duntroon to Livingstone, was first examined by me during 1877, and in my report on that district the following remarks are made: "In the upper part of Awamoko Creek the coal-beds are not yet known to be present; but a considerable extent of country near the Maraewhenua gold-workings is covered with coal-grits and the overlying greensands, which, striking across the Maraewhenua River, reach as far as the Otekaike River, west of the limestone table-lands. The grits in this latter district are of great interest, as they form the matrix from which most of the gold on this field has been obtained, all the claims which were examined being opened in the grit, and in not a few of them the grit is directly overlain by fossiliferous greensands and sandy calcareous beds full of marine shells. From what could be learned, paying gold-workings have not been found in this district in any other deposit than this quartz grit, which, dipping away to the east, is overlain by a thick bed of columnar basalt, followed by the representatives of the greensands, and again by the Maraewhenua limestones."* At Black Point, on the Waitaki River, four miles below the Maraewhenua junction, the lower beds of the Cretaceo-tertiary series are of great interest, from the fact that they are here composed of coarse conglomerates of sandstone and other rocks, overlain by the usual quartz grits. The coal horizon overlying these is represented by a carbonaceous shale, followed by white clays, similar to those met with in the Maniototo Basin, and these pass into a mixture of yellow and green sands, with hard concretions full of fossil shells overlain by greensands, the latter being followed by the Maraewhenua limestone.

Numerous sections, all of them showing the same relation of the quartz drifts to the middle and higher parts of the Cretaceo-tertiary series, are to be met with in the country north-west and west of Oamaru, but to cite further examples would be needless. South of Shag Valley, to Waikouaiti and Blueskin, the same evidences appear, the quartz drifts overlain by the coal-beds and greensands passing under limestones of the age of the Ototara limestone or Oamaru building-stone.

In the neighbourhood of Dunedin the sands and quartz drifts of Green Island, with their accompanying coal-seams, pass under greensand strata, and these are overlain by the Caversham (calcareous) sandstones. At Mullocky Gully, and on both sides of the upper part of Silverstream, the quartz drifts with coal-seams are strongly developed. Between Saddle Hill and the lower gorge of the Taieri this is also the case, and in Waiholo Gorge and at Millburn the sequence is again closed by limestones. Over the Kaitangata Coalfield fossiliferous greensands appear to be the highest beds. In the Pomahaka Valley, beds containing marine fossils, apparently of Miocene age, close the sequence beginning with the auriferous quartz drifts, while in the vicinity of Switzer's the grits and coal-beds are overlain by beds containing concretionary masses full of sea-shells such as are found on the Kaitangata Coalfield. At Bob's Cove, Lake Wakatipu, Moke Creek, Stony Creek, and Skipper's, the quartz drifts are everywhere followed by fossiliferous beds containing marine shells.

As the breccia conglomerates of Adam's Flat and the west branch of the Tokomairiro River, below Glenore, lie at the base of the coal-bearing series, in the low ground further to the east and south the quartz drifts overlie these, their relative position to each other being thus made clear. Thus, also, may be determined the true position of the beds west of Glenore Railway-station, on Manukau Hill, and at other places where the beds are isolated from the other members of the sequence. At Waitahuna and near Lawrence the relation of the older quartz drifts to the breccia conglomerates is not so clear, the two never appearing in actual contact, although occurring in the close vicinity of each other. The two sets of beds, as seen in the section across Waitahuna Gully, are illustrated by Fig. 9: A, Waitahuna Gully; B, heights to the east of Waitahuna Gully; 1, schist rocks of the Otago goldfields; 4, breccia conglomerates; 5, older quartz drifts.

The apparent discordance between the breccia conglomerates and the quartz drifts may be explained under the supposition of the absence or removal of the lower beds and the overlapping of the quartz drifts, these latter having since been removed from the areas where the breccia conglomerates are now found. The apparent weakness of this theory is the absence of the quartz drifts as the higher beds included along the line of fault; but, as there can be no doubt that the quartz drifts, whether conformable or unconformable, are the younger of the two sets of beds, it is equally probable that they once overlaid the breccia conglomerates.

Between Coghill's Hill and Waitahuna Flat, opposite the Railway-station and Township of Havelock, the difference in the levels is 800ft., in a horizontal distance of less than half a mile; yet the same beds are present at both localities, and show no signs of disturbance other than the different altitudes at which they occur. Fig. 10 shows the beds in the line of section above indicated: A, Coghill's Hill; B, Waitahuna Flat; 1, schist rocks; 5, the older quartz drifts. In the low grounds of the river-valley a band of lignite occurs between the higher and lower beds of 5, and it has to be supposed that the auriferous beds on the top of Coghill's Hill correspond to a horizon underlying the lignite-seam.

The quartz drifts in the vicinity of Lawrence, at Evans's Flat, Monro's Farm, Beaumont Hill and thence extending towards the Lower Tuapeka, not having been proved to contain gold in paying quantities, and showing nothing remarkable in their composition, or in the position they occupy, require no special comment or illustration in this place.

* Geological Reports, 1876-77, pp. 64, 65.