

According to the theory entertained as to what was the origin of these different auriferous deposits, and partly to recapitulate what has already been stated at pages 35 and 36, after the deposit of the higher beds of the Old and Middle Mesozoic formations, the area of what is now Otago became dry land, and for a long time denuding agents were active in the reduction of the great anticline between the south-west slopes of the Hokonui Hills to the south-west, and the Kakanui Mountains, on the north-east borders, of the goldfields. Gradually the higher formations were removed, and ultimately a large area of schistose rock was exposed and extensively denuded before the commencement of the deposition of even the lowest beds of the Cretaceo-tertiary formation. What is now the seaboard of Otago, and for a considerable distance inland of the present coastline, must then have been loaded and burdened with enormous quantities of shingle- and gravel-deposits derived from the gold-bearing rocks. During the slow submergence of the land which followed, the sea reduced the greater part of this to the condition of a quartz gravel, effecting this by a process of grinding and removal of the softer parts, and thus originated the quartz drifts, grits, and sands lying east of a line drawn from Naseby to Blue Spur and from Blue Spur to Switzer's. North-west and north of this line the sea does not appear to have covered any part of central Otago, but a vast extent of fresh water seems to have occupied the area between Moa Flat and the foot of Lake Wanaka in a north-and-south line, and between Mount Cardrona and the Remarkables and the eastern borders of the Maniototo Plain in an east-and-west direction. Whether it be within the borders of the Maniototo, in the Pool-Burn, or Ida-Burn Valleys, at the source of the Manuherikia, at Coal Creek, in the Upper Nevis, at Bannockburn, at Gibbston, or within the Cardrona Valley, or on the highest elevation of Mount Criffel, the beds betray everywhere the same sequence, exhibit the same character, and indicate not a number of comparatively small lakes, but a vast inland sea capable of simulating the greater ocean in the mode of treatment and deposit of the residue brought into it. Within both the marine and fresh-water areas of deposit, beds of hard cement stone were formed.

During Miocene times, alterations took place whereby the great inland lake was partly drained, the deposits in it denuded, and the new breccias and quartz drifts, as also the sandstone gravels known as "Maori bottom," were deposited. At the close of the Miocene period, the inland lake occupying the greater part of central Otago was largely filled up with material brought into it, latterly from the north and north-east. It is not necessary to suppose that this great lake was completely drained of its waters, since during Middle Pliocene times great changes in the configuration of the land began to take place. Along lines of faulting, constituting great earth-fractures, unequal movements took place, whereby in one place the beds affected were elevated, while at other places they were depressed. These movements have affected all strata of the age of, and older than, the "Maori bottom," and, as a consequence, the breccia conglomerates and quartz drifts, whether fluvial, lacustrine, or marine, are in a majority of instances found standing at high angles, and not unfrequently in an inverted position. Their present outcrops, therefore, show beds under such circumstances that it is impossible to conclude here was the limit of the lake or sea, or that the existing hill-slopes and mountain-heights ever formed such shore-line.

Faults.

Faults have undoubtedly exercised a very great influence upon the physical outlines of Otago since the beginning or middle part of the Pliocene period. Twelve great faults are known to intersect different parts of the North and South Islands, and several of these pass through the area of the Otago goldfields. In a previous report a map is given showing how far these have been traced, and their supposed extension through parts of the country over which they have not actually been traced.* Of these, Nos. 2, 3, 8, 10, 11, and 12 intersect different parts of the Otago District. Nos. 13 and 14 were at the time considered of minor importance, but 13, it would appear, is a gigantic fault, ranking with the others as regards its lineal extension and vertical displacement, and of great interest as being, perhaps, the one in Otago most recently initiated, and, it may be, still active. A number of additional faults have been discovered during the progress of the examinations lately made, but it has not been ascertained how far some of these are great earth-fractures extending to other parts of the South Island outside the Otago District. Fault No. 10, described in the report above cited as the "Moke Creek Fault," extends from the south-west across the middle arm or cross-reach of Lake Wakatipu to Bob's Cove on the northern shore of the lake. To the south of the lake the line of fault has not been explored. To the north-east from Bob's Cove the line of fault runs along the south-east flank of the Richardson Mountains as far as the upper part of Skipper's Creek and the east spurs of Mount Aurum. Further information obtained during the past season necessitates a slight variation of the line of direction as drawn on the map upon which this fault was first shown, and the modified line is coincident with some remarkable features in the Upper Matukituki Valley, which may, in part, be due to the presence of the fault-line. To the south the correct line also coincides with some remarkable features which its presence may serve to explain.

Near the middle of the east-and-west reach of Lake Wakatipu this line intersects the south-west extension of No. 2 (the Great Clarence) Fault, and jointly the effects of the two have been the principal cause of the great depth of this part of the lake, which is 1,350ft. deep, or its bottom is 300ft. below sea-level. To this fault is due the preservation of Tertiary, Cretaceo-tertiary, and unaltered rocks of the Palæozoic series at Bob's Cove, and of the Cretaceo-tertiary rocks that are found along the line as far as it has been traced.

Fault No. 2 (the Great Clarence Fault).—This runs through the South Island from one end of it to the other. It enters the Otago District to the east of Lake Hawea, and is continued along part of the Cardrona Valley to Arthur's Point on the Shotover, and Bob's Cove on Lake Wakatipu. That part of its course which runs along the Cardrona Valley may, and probably does, correspond with the fault showing along Criffel Face; and in drawing the sections which cross from Mount

* Geological Reports, 1890-91, p. 1.