

bright colours with the crossed nicols; these about equal the quartz in quantity, sometimes the one, sometimes the other predominating; very probably they are fragments of a decomposed felspar, but some may be bits of an argillite: (3) fragments of well-preserved felspar: (4) some fragments of a rather fibrous brown dichroic mineral, probably biotite: (5) two or three fragments of a filmy green mineral, probably an altered form of (4): (6) a white mica. The microscopic aspect of the rock would suggest that it was a quartzite; but the microscope shows no marked deposition of secondary quartz, or any indication of *metamorphism*, so that it must be named an indurated, rather felspathic grit. It is not likely to be an Archæan rock, but has probably derived its materials from rocks of that age, being itself very possibly Palæozoic. There is no very definite indication of either a laminated or a cleaved structure.

---

ART. XL.—*On a Striated Rock-surface from Boatman's, near Reefton.*

By G. J. BINNS, F.G.S.

[Read before the Otago Institute, 11th September, 1888.]

PLATE XXV.

THERE is no source of geological action more frequently appealed to for elucidation of problems in dynamical geology than ice; and the various traces of its former presence, in the form of striated boulders and rock-surfaces, *roches moutonnées* and *blocs perchés*, are familiar to all, if not from actual experience, at least from the text-books.

It is very necessary, in ascribing great geological results to this agency, to be certain that the evidence upon which we base our calculations—frequently erecting a vast superstructure of hypothesis upon a very small foundation of evidence—is indisputably true.

As an example of what might, were its origin not known, have led to misconception and possible error, I beg to bring before this Institute an example of a striated rock-surface, in the grooving of which ice-action had no part. (See Plate XXV.) The fragment of rock forming the subject of this paper was removed by me, on the 4th of May, 1888, from the surface of a large mass of *débris* resulting from a landslip which occurred at Boatman's, near Reefton, during the preceding March. It consists of a piece of indurated arenaceous clay, containing some mica and indistinct carbonaceous impressions, and its

geological position is in the Cretaceo-tertiary series of the New Zealand Geological Survey. The surface of the specimen, which is one of innumerable equally well-marked samples which might have been chosen, is scored in more than one direction by grooves or striæ, which vary much in depth, the maximum being about  $\frac{1}{16}$  in.; and were it not that some of these are curved they would present no features distinct from true glacial striæ.

The slip occurred on a surface of the coal-measures dipping at  $25^\circ$ , and was caused by the accumulation of surface-water in a deposit of soil and vegetable growth, the cohesion of which had been destroyed by fires. After proceeding for some distance the direction of the moving mass was changed to about  $40^\circ$  from the straight line by an outstanding mass of quartzose grit, and at this point the whole body plunged over a vertical cliff about 20ft. in height, forming a veritable cascade of mud, and stones, and tree-roots. In the lower portion the angle of slope was reduced to  $10^\circ$ , and at this point a cottage was carried away and destroyed, unfortunately not without loss of life, for an infant member of the family was left behind in the confusion, and the mother perished in a heroic but unsuccessful effort to save her child.

The surface bared in the upper portion of the slip is fire-clay, rendered very slippery by the presence of water, while the part which came away consists, below the soil, of about 8ft. of fireclay and quartz grit, the hard fragments of the latter causing the striation of the remaining rock, which at the time of my visit was covered with numbers of well-defined grooves.

---

ART. XLI.—*On the Neighbourhood of Te Aoroa, Northern Wairoa.*

By JOHN HARDING, of Mount Vernon.

[Read before the Hawke's Bay Philosophical Institute, 13th Aug., 1888.]

TE AOROA is situated on the west bank of the Northern Wairoa, between Aratapu and Dargaville. This, together with a long stretch of country to its north and south, is classed as "drift" on our geological map. This would apply to the high lands, but about one-fourth is rich alluvial flat and swamp, the hills soft sandstone, varying in colour from snow-white to black. The coast-hills differ much from those farther inland, the latter having a large quantity of bog-iron mixed with the surface-soil, in many parts rendering it impervious to water, and so almost useless for agriculture or grazing. All this hill-