

Brunner Coal series, at the place where the Davy Mountains reach the sea;* and the short examination I made of the Grey-mouth District quite bears out his views, although I did not go so far as Mount Davy.

ART. XXXIV.—*On some Ancient Rhyolites from the Mataura District.*

By Professor F. W. HUTTON, F.G.S.

[Read before the Philosophical Institute of Canterbury, 6th October, 1887.]

THESE rocks were collected by M. Gordon Rich, Esq., near Waipapa Point, east of the mouth of the Mataura. They occur as more or less rounded boulders, and with them are found portions of silicified tree-fern stems, and of beautifully preserved coniferous wood, all of which probably came down the Mataura River. The vegetable remains come no doubt from the Hokonui System, and probably the rhyolitic rocks accompanying them are of the same age, or not much older. At any rate they are of considerable interest as showing that somewhere in the neighbourhood rocks of a highly siliceous character were erupted at a period not later than the Lower Jurassic; and when they are found in position, it is possible that they may furnish proof of the age of the granites which in many places pierce our Maitai rocks, which are probably of Carboniferous age.

Spherulitic felstone.—This is a compact light-grey felstone, with abundance of spherulites about a quarter of an inch in diameter. The spherulites have an opaque white centre, surrounded by a broad dark brownish-grey ring, and show no outer transparent zone. Occasionally, both the centre and the dark ring may be seen with a lens to be composed of radiating fibres, but this is not generally the case. The specific gravity of the rock is 2.54.

Under the microscope, with ordinary light, the rock is seen to be a ground-mass without any crystals. With an inch objective this ground-mass shows as a colourless glass, hazy with innumerable minute specs, which with a fifth objective often show a greenish colour. With this power, also, the transparent glass generally shows an indistinct granular appearance, but occasionally there are irregular milky patches without any appear-

* "Report of a Topographical and Geological Exploration of the Western District of Nelson," by Julius Haast: Nelson, 1861, p. 109.

ance of granulation. The ground-mass is crossed by straight streaks and spots of a dark-greenish colour, which under the fifth objective are resolved into dark-green specks, lying in a yellowish-green base. I could detect no signs of dichroism in this yellow-green mineral. When the nicols are crossed, the ground-mass breaks up into a very fine mosaic of dark grey and yellowish white, the milky portions behaving like the granular portions. This mosaic consists of clusters of similarly oriented granules which extinguish simultaneously. When the axes of the nicols are placed at an angle of 45° most of the mosaic disappears, but as the stage is revolved some portions take a blue colour. When these portions are viewed with crossed nicols their colour is brownish-yellow.

From this it will be seen that the Mataura rock is very like the felstone from North Wales described by Mr. Clifton Ward in the "Quar. Jour. Geol. Soc." vol. xxxi., p. 400, and those from Shropshire described by Mr. Allport in the same journal, vol. xxxiii., p. 454.

In sections that are nearly equatorial the spherulites always show, both in ordinary light and in crossed nicols, a radiating structure from the centre through the dark ring. In more tangential sections this structure of course becomes obscure. The radiating fibres stop abruptly at the junction of the ring with the granular ground-mass, and there is no appearance of an intermediate hyaline zone. But where two spherulites meet, rather large grains of quartz have sometimes been developed, and these quartz grains are also occasionally seen in the spherulites themselves, either in the centre or in the ring. The long green streaks, mentioned as occurring in the ground-mass, run into or even quite through the spherulites without disturbance.

Another specimen of the same kind of rock has numerous small spherulites without any ring scattered through the base. These spherulites show a fixed interference cross, and the rock passes in places into a laminated felstone.

2. *Perlitic felstone*.—This is a green rock, weathering paler, with veins and nodules of chalcedony, and a hand specimen might easily pass for chert. Its specific gravity is 2.50. Under the microscope, in ordinary light, the ground-mass is a colourless glass with numbers of dark chrome-green specks. These specks are gathered thickly together in curved bands, which imitate exactly the perlitic structure of many vitreous rhyolites. Between crossed nicols the ground-mass is anisotropic, but it shows no mosaic. The chalcedony calls for no special remarks.

3. *Laminated felstone*.—There are several varieties of these. In some the laminæ are pink and white, in others grey and white. In thickness the laminæ vary from very minute up to 0.05 inch. Sometimes they are approximately parallel; in

other places they are twisted, contorted, and broken off in all manners of ways; in fact they resemble in this the laminated rhyolites so common about Lake Taupo. The specific gravity is about 2.53. I have only prepared thin sections of one specimen, as they are extremely hard, and more are not necessary for my present purpose, which is merely to draw attention to the existence of these rocks. This specimen is one of those with pink laminæ, and it shows under the microscope the ordinary felstone structure, with a mosaic between crossed nicols, which vanishes when the nicols are oblique. The pink bands are due to minute specs of ferric oxide in a more opaque base. I should judge that the original lava contained two *magmas* differing in their amount of iron oxide, and that in the more ferriferous laminæ some of the iron has segregated into minute globules.

There can be no doubt but that all these rocks are devitrified rhyolitic lava streams.

ART. XXXV.—*On a Leucophyre from the Selwyn Gorge.*

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THIS rock was first noticed by Sir James Hector, as greenstone (diabase?) occurring in the gorge of the Wakaepa (or Selwyn) in the Malvern Hills,* and is shown on his section (*l.c.*, iv. c.) as interbedded with slate rocks, and forming an anticlinal. Sir Julius von Haast, in his "Report on the Geology of the Malvern Hills," mentions them under the name of diabasic rocks,† associated with chertse rocks and marble. Also in his "Geology of Canterbury and Westland," (p. 271) as diabase ash-beds. In "Reports of Geological Explorations for 1883," p. 29, Mr. S. H. Cox mentions these diabases, and says that he agrees with Mr. A. McKay that they are the same as the diabase ash-beds and cherts of Okuku which he had found to contain triassic fossils ‡ Mr. A. McKay in "Geological Reports, 1884," (Bulletin of Geological Survey, No. 1,) p. 7, describes them as diabasic rocks with Jasperoid rocks, either slates or resembling tufaceous sandstone, grey or reddish limestone, crystalline or compact at different horizons in the diabasic beds, with grey cherts and manganese

* "Rep. Geol. Expl." 1870-71, p. 49.

† "Rep. Geol. Expl." 1871, p. 136; and 1871-72, p. 10

‡ "Rep. Geol. Expl." 1879-80, p. 99.