V.—GEOLOGY.

Art. LV.—*Description of a remarkable Dyke on the hills near Heathcote.*

By A. D. Dobson.

[*Read before the Philosophical Institute of Canterbury, 1st April,* 1880.]

On the west side of the Heathcote valley a remarkably sharp peak forms the crest of the hill, the almost vertical sides of which are in marked contrast with the rounded slopes immediately below it.

This peak is formed by the outcrop of a volcanic dyke, which, flowing over the edges of the original chasm, forms a cap about 550 feet long, 200 wide, and from 70 to 80 feet high.

On the north side of the peak the dyke is first visible about 90 feet below the lower edge of the cap, at which point it is just traceable as a narrow band, chiefly noticeable by a hard selvage on the west side passing through a coarse-grained Porphyritic dolerite, of which No. 1 is a specimen.

Proceeding upward the dyke rapidly widens, and, 20 feet above the point where it first appears, it is 10 feet wide, and well defined. Specimens No. 2 and 3 are from the dyke at this point; No. 2 being from the selvage on the west side, and No. 3 from the centre. A little higher up the stone becomes more compact, as shown by specimen No. 8.

The dyke here passes through about 20 feet of basaltic tufa, shown by specimens 4, 5, and 6. To the westward this bed becomes intercalated by bands of a harder stone, specimen No. 7; changing further westward into or replaced by No. 7a. Above this up to the cap, a height of about 55 feet, the dyke can be traced, but indistinctly, owing to the superincumbent mass of loose rock.

The rocks passed through are hard porphyritic basalt, about 30 feet (shown by specimens Nos. 9 and 10), and a soft dolerite lava, about 25 feet (specimen No. 11). This is the rock on which the cap rests. The junction of the dyke and cap at the north end is obscured by the mass of loose rock lying on the northern slope, but at the southern end it forms the crest of the spur, is about 20 feet thick, and can be readily traced to the top of the crater-well. At this end it is mostly of a much harder material than at the north end, being very similar in character to the rock forming the cap, but in places it passes into a soft freestone.

Like the dykes in the vicinity, it is divided into polyhedric form—at right-angles to the cooling surfaces, and is also jointed parallel to the direction of flow.

The rock forming the cap comprises many different qualities, varying from a workable stone, like No. 13, to a hard slaty rock, as shown by specimens Nos. 14 and 15. It was evidently of much greater extent, the existing portion being the central mass, which has survived the general denudation the outer portions having been undermined from time to time by the wasting away of the softer underlying rocks.

At the junction of the cap with No. 11 both rocks appear to be slightly altered, and at some places, especially on the west side, a hard slaty selvage occurs.

The most striking feature in the case is the great change which takes place from the soft freestone (specimen No. 8), which occurs to the northward of the cap, to the hard dark rock in the cap itself.

No. 8 is like the brown stone at present being worked in Thompson's quarry on the opposite side of the valley; whereas the stone of the cap is very similar to that occurring in the dykes which crop out along the Sumner road, between Heathcote ferry and Sumner.

Dr. von Haast, in Chapter XII. of his "Geology of Canterbury and Westland," mentions the fact that the chemical constituents of dyke stones taken from different localities, vary very considerably, although their appearance is in every respect the same; but in this case the stone varies in appearance to such an extent that it is difficult to believe it to be part of the same dyke without personally tracing out the continuity; and doubtless the chemical composition varies as much as the general aspect.

It would be very interesting to analyse a set of specimens, taken in ascending order, from different parts of the dyke and cap; and also to examine, with the microscope, thin slices from the same places. These two series of observations would throw much light upon the chemical change and action of the rock, both when under and when free from pressure.

In this case it would appear that the rock is hardest when it was subjected to the least pressure.

The enormous pressure the dyke rock must have been subjected to when being forced up the chasm, is readily seen by estimating the weight of a column of stone an inch square. For sake of comparison, it may be assumed that a column 1 inch square and 10 feet high weighs 120 lbs; thus supposing the dyke-stone to be in a fluid state, the pressure 10 feet below the surface would be 120 lbs. per square inch; at 100 feet below the surface, 1,200 lbs.; and at 1000 feet, 12,000 lbs. Now even assuming that, when in a state of ebulition, the action of the entangled gases would relieve a cer-

tain amount of the pressure, still it is quite certain that all the lower portions of the dykes must have been formed under great pressure; but yet,—so far as I have been able to judge, with the exception of the dyke under consideration,—the stone has the same appearance whether taken from the upper or lower part of the dyke.

The commercial value of this dyke, with its cap, is very considerable. From the number of parallel joints stones with two beds can be obtained of almost any size, and the softer portions can be used for all purposes for which cut stone is required.

Description of Rocks.

1. Porphyritic dolerite lava stream with crystals of labradorite.
2. Trachyte from dyke at west edge.
3. Trachyte from dyke at centre decomposed.
4. 5. 6. Basaltic tufas red and grey.
7. & 7a. Compact basalt showing somewhat globular structure
8. Trachyte dyke partly decomposed.
9. Porphyritic basalt.
10. Ditto
11. Dolerite lava with crystals of labradorite.
12. Trachyte.
13. Trachyte with crystals of sanidine.
14. From the top of the cap.
15. „ „ „

Art LVI.—*On the* Foraminifera *of the Tertiary Beds at Petane, near Napier.*

By A. Hamilton.

[*Read before the Wellington Philosophical Society, 24th July*, 1880.]

During the past year I have been collecting the fossils which occur so plentifully in the tertiary beds to the north of the inner portion of Napier harbour to determine their true age and position. When the fossils have been examined and tabulated, I hope to lay the results before you, but as Mr. G. R. Vine, junior, of Sheffield, has kindly forwarded to me some very interesting and valuable information concerning the Foraminifera occurring in these beds, I hasten to communicate the result of his examination of a