

are sufficient to bring about all the physical changes necessary, and the conditions I have offered in explanation are capable of producing all those phenomena which are characteristic of the period preceding, during, and following what is generally known as the Glacial period.

ART. LVII.—*On the Occurrence of Moa-footprints in the Bed of the Manawatu River, near Palmerston North.*

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Plate XLVII.

DURING a brief stay at Palmerston North, in February last, my attention was directed by Mr. H. J. Gilberd, one of our members, to some footprints of a bird he had lately discovered in the bed of the Manawatu River, not far from his place of residence. Being well acquainted with the character of the area in which similar footprints are found at the mouth of the Turanganui River, and having several of the footprints in my possession, I was curious to see whether the footprints and the deposits bore any resemblance to one another in the two localities. The place where the footprints under notice were found is situated towards the right bank of the Manawatu River, and about 6ft. above water-mark at the time of my visit. The place, however, must be covered with water, or nearly so, during the winter season. The top of the river-bank would be about 18ft. above the deposit containing the footprints. A recent flood in the river had washed away a portion of the river-bank, and a number of large-sized logs had become exposed, all of them lying parallel to the present flow of the river, and suggesting a different direction or flow at the time of their deposition. The deposit in which the trees are found is an alluvium running into a bluish sandy clay, which, however, does not appear to be of any large extent, as a shingle conglomerate is seen to underlie the alluvium in several places both above and below where the blue sandy clays rest on the conglomerates. The area where the footprints were was possibly a swamp or depression, which was filled by flood-waters heavily charged with clay and pumice-sands, and which became exposed as soon as the river assumed its normal flow. The deep impressions show

that the material was not fully hardened when it was traversed by several birds moving in the same general direction. It would seem that the impressions were subsequently filled by blown pumiceous sand, and it was in consequence of the washing-away of the overlying material and the movement of water over the surface containing the impressions that the softer sands were removed. The footprints are somewhat numerous, but only about eight of them were clear and distinct at the time of my visit. At my request, Mr. Gilbert measured the larger impressions, and it will be noticed that they are much larger than any of those found in the Poverty Bay deposits. From the end of the middle claw, which was very clearly shown, to the heel the length of the largest impressions were 15in., and within half an inch it was the same distance between the two outer claws. Another footprint measured 8 $\frac{3}{4}$ in. from the end of the middle claw, whilst the distance between the two outer claws was 10in. In this impression the two outer toes were much deeper than the middle one, and it may be that the latter was not fully extended, owing to the material being somewhat harder. There were a number of smaller tracks about the same length as those found at Poverty Bay, but they were not so wide, and the claws were seen in most cases. Judging from the larger impressions only, the length of step was 26in. The peculiar character of the deposit made it hopeless to attempt to get out any of the impressions, and I had to content myself with making a rough sketch of several of the footprints (Plate XLVII). I do not know whether the floods in the Manawatu since the date of my visit have washed away the deposit containing the footprints, but I expect this has been the case.

The age of the beds in which the footprints are found, both at Poverty Bay and in the Manawatu River, is later Pleistocene, corresponding to the later plain-deposits of the Here-taunga and Poverty Bay plains.