XXI.—*On Reindeer and other Mammalian Remains from the Pentland Hills.* By JOHN HENDERSON.

(Read 18th March 1886.)

THE Green Craig, where the fissure occurs in which these remains were found, lies on the north-west flank of the Pentland Hills, near the north-east end of the range, and about 1000 yards south of Dreghorn Castle. The craig stands at an elevation of a 1000 feet above the level of the sea, and is formed by an irregular range of rocks between two and three hundred yards in extent, facing north and north-west. The ground from the base of the craig slopes downwards at an angle of about 30° to the depth of nearly 200 feet. The angle of the slope is just what the weathered fragments of rock falling from the craig will rest on the hillside without rolling to the bottom, consequently the craig is not easily accessible from the front. To remedy this difficulty, Mr Macfie got a number of footpaths cut in a zigzag direction up the face of the slope and round the base of the craigs, placing seats here and there in convenient places, where the visitor can rest and view the splendid scenery which this hill commands. The face of the craig is not continuous, but is rather a number of craigs, separated here and there by grassy slopes running from bottom to top; and it was in making a path up one of these, whereby access could be got to the top of the craig, that the fissure was exposed wherein Mr Macfie discovered these remains. The north-east end of the Pentland range is almost wholly composed of rocks of igneous or volcanic origin, known under the name of felstones. They lie in long sheets running north-east and south-west, with a dip to the south-east, and overlapping each other in an ascending order from north-west to south-east. The rock of the Green Craig is a portion of one of these great sheets of felstone. It is described in the "Memoir of the Geological Survey" as a dark, compact, porphyritic felstone. This felstone at an early stage of its existence had been fractured in a number of places at right angles to the line of bedding, and into these fractures lime and other minerals had percolated, forming veins; and it is to the occurrence of one of these veins in the Green Craig that the fissure is due in which these bones were found. The fissure, as exposed when I saw it last, was about 2 feet wide, and about 10 feet in from the sloping surface of the craig. It has been cut, by the action of water, out of a vein composed principally of a clayey-like felstone and lime. The fissure was filled mostly

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with weathered and angular fragments of the felstone of the craig, and the bones occupied a space of about 3 feet in depth near the bottom. A portion of the bones, along with weathered fragments of rock, were cemented together with lime, forming a breccia, while others lay loose among the broken and weathered felstone that filled the fissure. With regard to the age of the deposit, unfortunately we have no data to work upon by which we can fix it even approximately. According to recent investigations, the reindeer lived in Britain in pre-glacial times. That they occupied the South of England in great numbers during the glacial epoch, is shown by Professor Dawkins in his work on "Early Man in Britain." The reindeer seems to have lingered on in Britain and the middle of Europe during the pre-historic period, and, according to some authors, far into historic times ; and it is said to have been hunted in Caithness as late as the twelfth century. Now, we have a period extending from pre-glacial down to at least pre-historic times in which to fix the age of these remains found in the Pentland Hills. The probability of the remains being of pre-glacial age is, in my opinion, not very great, because, in the first place there is no appearance of boulder clay, nor are there any rounded or scratched stones in the fissure as far as I could make out. No doubt it might be argued that the fissure being filled up with weathered rock before glaciation commenced, the boulder clay would be kept out ; but when we consider the great pressure and rubbing that would be exerted on the surface of the country during the passage of the ice of the glacial period over it, we can scarcely believe that the material in the fissure would not have borne some evidence of it. Then again it is not likely that such a narrow fissure could have existed throughout the whole of the glacial period, when we consider the enormous amount of erosion these hills must have been subjected to during that period.

The hills themselves have been carved out of those sheets of felstone I have before alluded to, and there is no doubt a large amount of that work was done during the glacial period. The likeliest time for these fissures to be formed in the Green Craig, would, in my opinion, be when the ice-sheet had receded from the district, and severe climatic conditions still existed. When little or no vegetation covered the rocks, they would at that time be exposed to the full action of the weather ; but even under those conditions the scooping out of the fissure would be slow, because there are no ruts or runlets leading into them from the higher hill-sides. They are more of the nature of that well-known fissure in Salisbury Craigs, known as the "Cat-nick," only on a much smaller scale. The process of scooping out the fissure had evidently stopped, and the process of filling

up by the weathered material falling from the sides had not long commenced when the carnivorous animal that dragged in the remains made this fissure its retreat, for the lowest bones found were near the bottom of the fissure. That the animal or animals occupied this fissure for a considerable time, is evident from the fact that the bones were spread over a depth of between 3 and 4 feet, and mixed with the weathered rock. How long it has taken to fill up the fissure completely with the weathered rock, and how long it has lain undisturbed beneath its covering of turf, it is impossible to tell ; but there can be no doubt that a great time has elapsed, and great climatic changes have taken place since the reindeer roamed in comparative abundance on the flanks of the Pentland Hills, as these remains prove it must have done at one time. I have no hesitation in saying that this find from the Pentland Hills is by far the most conclusive evidence of the existence of the reindeer in Scotland in pre-historic times that has ever yet been shown. Nearly all the evidence in connection with the former finds of reindeer remains in Scotland is given in a Paper by Dr Alexander Smith, published in the "Proceedings of the Society of Antiquaries of Scotland," vol. viii. In that Paper all the evidence brought forward to prove the existence of the reindeer in Scotland in pre-glacial and pre-historic times, depends upon the identification of certain fragments of antlers. Now when we consider the amount of variation the antlers of all the deer species are subject to, it will readily be seen how unsatisfactory such evidence is. But in this find from the Pentlands there can be no doubt. The most important parts of the skull and metatarsal bones are there, and these contain the principal characters that distinguish the reindeer from the rest of the Cervidæ. The importance of this find made by Mr Macfie will thus readily be seen ; and great credit is due to Mr Simpson for the effectual way in which he has determined the character of the remains. He has managed to name not only the more complete bones, but mostly all the fragments found in the fissure—a work of no small labour and ability, considering the number and condition of the remains ; and it is to be hoped that this find of Mr Macfie's will lead to further research and further discoveries of a like nature in the nooks and crevices of the Pentland Hills.