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# Some Gravel Deposits at Walton near Clevedon

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# 1. INTRODUCTION.

Although the gravel deposits, which are the subject of this paper, have been discussed before, they have not been the primary consideration in any previous communication. For this reason, and also because further information about the deposits is not likely to be forthcoming in the near future, it is thought advisable to collect and place on record the facts which are now available. Further information is not likely to be obtained because quarrying work at the best exposure, namely in Holly Lane Quarry between East Clevedon and Walton, has now ceased.

In 1907, Prof. S. H. Reynolds' recorded the results of his excavations in a small cave which had been filled with the gravel and cave-earth, and in 1922 Dr. E. Greenly<sup>2</sup> described the gravels, and some of their fossil contents in a paper on the æolian sands which are exposed in the same quarry. Further reference was made to the deposits in a paper by one of us3 in these Proceedings.

#### 2. THE DEPOSITS.

Gravels of the type under consideration are to be found banked along the Southern and South-western sides of the line of hills which skirt the left bank of the Severn between Portishead and Clevedon. Deposits of a somewhat similar kind are also to be found on the South-western end of Brean Down, near Weston, and also on the Southern slopes of the Quantock Hills. All these deposits are similar in that they consist of alternate layers of subangular unstratified gravels and sands. Dr. Greenly has shown that the sands which occur at Clevedon are æolian. It is practically certain that the sands on the South-west of Brean Down are also æolian.

Plate VIII, A shows the general apearance of the section at Holly Lane Quarry, near Walton. The maximum depth of the section where it abuts against the limestone cliff is about 50 feet, but in the course of quarrying as much as 80 feet of deposit have been exposed. This was done when prospecting for the maximum depth to which the gravel extended. It was found that the gravel became much coarser towards the bottom. About 30 feet below the present level

<sup>1 &</sup>quot;A Bone Cave at Walton, near Clevedon," Bristol Naturalists Soc. Proc. 4th Series, Vol. 1, p. 183.
2 "An Aeolian Pleistocene Deposit at Clevedon." Geol. Mag. Vol. LIX, pp.

<sup>365</sup> and 414.

<sup>3 &</sup>quot;The Stratigraphical Position of the Transitional Culture in the South and South-west of England." Proc. of the Spelæo. Soc., Vol. I, No. 3, p. 126



PLATE VIII, B.

PLATE VIII, A.

it rested upon a limestone platform the extent of which could not be determined from the limited excavation that was necessary for prospecting purposes. The depths of the several layers of the deposit vary considerably in different places, but the present exposure near the cliff shows in order from top to bottom :—

1.	Recent humus and stoney loam	6-ins. to 1-ft. 6-ins.
2.	Upper limestone breccia with lenticular	
	seams of sand	5-ft. to 12-ft.
3.	Aeolian sand and loam	1-ft. to 10-ft.
4.	Lower limestone breccia with occasional	

angular blocks of limestone and bands

of coarser gravels ... ... ... over 15-ft.

On the whole the gravels are thickest close to the cliff face at the Northern end of the quarry, whilst the sands increase in thickness towards the South. Although two distinct layers of gravel are apparent in most sections, they probably represent quite minor and possibly local fluctuations in the climatic and topograhic conditions which determined the nature of the whole deposit. This is supported by the fact that Dr. Wallis of Bristol Museum was unable to detect any differences between samples of the sandy matrixes taken from the two breccias. Furthermore the minerals he kindly determined for us in the matrix of the gravels are identical with those enumerated by Dr. Greenly as occurring in the intervening æolian sand. Many of the quartz grains are facetted and have a "dreikanter " appearance, whilst some of the limestones of the breccias are curiously tetrahedral in shape with rounded and polished edges.

Except for the constituent materials, the general nature of the deposits recalls the Coombe Rocks of the South coast, and it is suggested that both deposits were formed under similar conditions during the later phases of the last cold epoch. In fact Clement Reid's4 description of the mode of formation of Coombe Rocks along the South coast applies equally well to the formation of the limestone breccias at Clevedon.

The presence of æolian sands indicates that the wet and cold periods presupposed by Clement Reid alternated with drier intervals during which we believe the prevailing wind was from the South and South-cast. Dr. Greenly suggests that the prevailing winds were from the North and North-west, and thus he accounts for the similarity of the mineral constituents of the South Wales and Clevedon sands. He does not apparently consider the possibility that both sands may have been derived from a common source. This

4 "Origin of Dry Chalk Valleys and of Coombe Rock," Q.J.G.S., Vol. XLIII, p. 364

seems to be the more likely hypothesis because, firstly, both sands are banked up on the Southern and South-western sides of the hills, and secondly, there are similar sands on the South-western end of Brean Down, which contain practically the same minerals. It is also very significant that two minerals occur at Clevedon, namely Brookite and Muscovite, which are present at Dartmoor but absent from South Wales; whilst Actinolite and Muscovite' occur at Brean Down, and are also present at Dartmoor and absent from South Wales. It therefore seems more probable and is certainly the simpler hypothesis to assume that all these sands were derived directly from the granites in the neighbourhood of Dartmoor and that they were all transported by the same South-westerly wind. This aspect of the matter is discussed more fully in another fort coming paper.6

It has been stated above that the lowest stratum of the deposits at Holly Lane Quarry rest on a limestone platform. This platform is roughly horizontal and appears to have been cut in the limestone rock with the resulting formation of the cliff against which the gravel deposits are banked. The cliff is markedly smoothed and rounded, and in places is curiously curved so that the top almost overhangs the foot. This can be seen from the photograph in Plate VIII, B. The cave which Prof. Reynolds excavated is situated at the base of this cliff, which lies approximately on the 50 foot contour. The cliff would have been washed by the sea during the period when the 50 foot raised beaches were being formed, and the East Clevedon gap would have been a narrow arm of the sea joining the inland waters on the South-eastern side of the coastal hills with the Bristol Channel on the North-west. Thus it seems possible that the peculiar features of the cliff may have been caused by marine action before the terrestial gravels and sands were deposited. This is supported by the occurrence of similar overhanging cliffs and small shelters at the same level on the opposite side of East Clevedon gap, but the evidence there is not well marked because of much weathering and vegetation. In an earlier paper7 it was concluded that the 50 foot raised beaches were formed during the last cold epoch and probably about Mousterian times. From this it would follow that the overlying terrestial deposits are post Mousterian. This would be in accordance with the kind of climatic and topographic conditions necessary for the formation of the breccias; namely, a cold and wet but ameliorating climate accompanied by a gradual elevation of the land.

<sup>5</sup> Kindly identified by Dr. Hodge at Manchester University. (see also 6.) 6 "Some Pleistocene Gravels near Clevedon, Somerset," Proc. Geol. Assocn
 7 "The Pleistocene Deposits of the Portsmouth District and their Relation to Man," Proc. Geol. Assocn., Vol. XXXIV, p. 253



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PLATE IX.

# 3 FOSSIL REMAINS FROM THE GRAVELS.

With the exception of some of the microtine fauna, no species has been found which is not mentioned by Prof. Reynolds as having occurred in the cave which he excavated. As in the cave, so in the gravel outside, the small horse bones occurred in the largest numbers : but unlike the remains from the cave, the gravels yielded more wolf bones than bear bones. The foot bones of a horse, and the lower jaw of a wolf are shown in Plate IX, Nos. 1 and 2 respectively. The greater quantity of wolf bones might be expected if the animals died where they were found; a suggestion which is borne out by the fact that the skull, limb bones, pelvis, skull and some ribs of a horse were all discovered within a few feet of each other, and in such order as to lead to the conclusion that they all belonged to the same animal. Furthermore, two wolves' skulls together with the lower jaw shown in Plate IX, No. 2, were found resting beside the horse's skull. This latter was unfortunately very crushed and friable, and it was quite impossible to extract it in pieces so that it could be reconstructed. However, the juxtaposition of these remains at the foot of the cliff tempts one to imagine the probable tragedy which led to their occurrence.

Besides horse, wolf and bear, there were a few remains of fox, which in the case of the specimens described by Prof. Reynolds were thought to be arctic fox. The remains which we found were hardly sufficient to confirm this, but the bones are remarkably small.

The horse bones are particularly interesting because they can, like the microtine fauna, be correlated directly with the bones from deposits in other districts. The foot bones are especially useful in this respect. The prehistoric horses of Pleistocene times have been classed as one species-Equus cabalus (Linn); but many authorities, notably Salensky in Russia, Ewart in Scotland, and Commot in France, have realised the desirability of introducing two sub-species to distinguish the slender-limbed curved-face horse from the thicklimbed straight-faced horse. It is not intended in the present paper to give details of the differences between these types, nor to consider the various localities in which they have been discovered. This, it is hoped, will be the subject of a subsequent communication. For the present purpose it will suffice to compare one characteristic anatomical index of the foot-bones from Clevedon with the same index of similar bones found at Crayford, Erith, Aveline's Hole and Glastonbury. The index measured and recorded in the following table is the percentage ratio of the lateral width of the bone at the middle of the shaft to the overall length. Therefore the smaller the ratio the more slender is the bone.

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Aveline's Glaston-Hole Bone Clevedon Erith Crayford bury 6.20 5.37 5.22 5.54 . . . 6.03 5.10 5.49 4.12 4.71 . . . . . . . . . 5.99 4.83 5.45 4.61 . . . . . . . . . 5.82 5.44 4.55 . . . • • • . . . 5.54 5.36 4.28 **FIRST PHALANX** • • • 5.50 5.33 • • • ... ... 5.4 5.20 . . . 5.31 5.17 . . . . . . ..... 5.29 5.10 . . . . . . . . . . . . 4.96 • • • . . . . . . . . . 4.89 . . . . . . . . . 4.86 . . . . . . • • • 4.66 . . . . . . • • • . . . 4.52 . . . ... . . . 17.5 17.5 18.5 15.4 . . . . . . . . . 14.7 17.2 17.4 . . . . . . . . . ... META-CARPAL 17.0 17.3 . . . . . . . . . 17.3 . . . . . . 17.1 . . . . . . . . . 17.0. . . . . . ... . . . 16.7\* . . . ••• 16.2\* . . . . . . 14.9 14.2 15.5 -12.1. . . . . . 14.7 15.0 10.3 . . . . . . . . . . . . 14.1 14.8 . . . . . . . . . 13.8 14.7 . ... . . . . . . 13.6 14.6 . . . . . . ... META-TARSAL 14.6 . . . . . . . . . . . . 14.5 . . . . . . . . . 14.4 . . . . . . . . . 14.2 . . . . . . 14.1 . . . . . . . . . . . . 13.7 . . . . . . . . . 13.3 . . . . . . . . . · · • 13.1 . . . . . . . . . . . , 12.7\* . . . . . . . . . . . . 12.2\* . . . . . . . . . . . .

### TABLE.

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These figures are of interest in that they show how the slenderlimbed horse which does not occur at Clevedon gradually displaced the thick-limbed type until at Glastonbury, and also at other metalage sites, the thick-limbed horse had completely disappeared. Naturally it is not safe to make any generalizations from so few data, but the variations of the index recorded above are typical of the variations of other characteristics, and they all tend to indicate that the Clevedon deposits are contemporary with or possibly slightly older than the Erith and Crayford deposits. It is unfortunate that it is not possible in many cases to say whether the remains from Crayford are from the newer or from the older beds, but the figures marked with an asterisk are definitely from the more recent deposits. The remains from Aveline's Hole are, with the exception of two phalanges, too fragmentary to vield reliable measurements, but from the general appearance of the bones and from the measurements of the two phalanges it would appear that both types of horse were present.

The importance of these data lies in the conclusions which follow from them, namely that the thick-limbed horse overran the South of England in late Pleistocene times when the last ice age was passing and giving place to cold windy desert conditions, accompanied by large variations in humidity. Furthermore, the type became very rare in this district as the climate ameliorated whilst the slender-limbed horse increased in numbers. It would therefore appear from the large number of bones of the thick-limbed horse found at Clevedon that the breccia in which they were found was formed at the close of the last ice age *before* the period represented by the deposits at Aveline's Hole.

The suggestion that the deposits at Erith and Crayford are contemporary with the Clevedon gravels, is supported by the evidence from the microtine and molluscan fauna, the former of which has been discussed by one of us on several previous occasions.<sup>8</sup>

The molluscan remains were kindly examined by Messrs. Kennard and Woodward, whose full report is appended to the paper referred to above.<sup>6</sup> They identify 13 species which, with the exception of one marine shell are terrestrial. When referring to the different layers of the deposit they say, "There can be no doubt that all these deposits belong to the same stage." They also state that, "After due consideration we think that these deposits are probably of the same age as the Crayford Brick Earths, and should be classed as mid-Pleistocene."

8 Proc. Bristol Naturalists' Soc., 4th Series, Vol. I, p. 190. Proc. Yorkshire Geol. Soc., New Series, Vol. XX, p. 325.

In previous communications concerning these deposits no definite evidence of the presence of man was obtained, but it was surmised by Dr. Greenly that a piece of coal which was found in the lower gravels could only have arrived there through human agency. Small pieces of coal have been found in the sandy layers, but no hearths or occupation levels have been found. However, during the last excavations in the lower gravels one sharpened and highly polished bone point was discovered at a depth of about 35 feet from the surface. The polish is most noticeable when compared with all the other bones from these deposits. It unfortunately exhibits no certain characteristics which would enable it to be assigned to any particular culture, but from the general form of the point, from the associated fauna and from the geological horizon it is probably either of late Mousterian or of Aurignacian date. If this conclusion be correct, the artifact is one of the earliest from this neighbourhood, and is contemporary with the implements from the lower deposits in Gough's Cave at Cheddar.

It now remains to record the stratigraphical distribution of the finds. Practically all the bones of the large animals were found in the lower levels of the lower gravel where the larger blocks of stone tended to protect the bones from the pressure of the overlying deposits. One horse molar was found in the upper breccia, and it differed in no respect from the teeth found as much as 30 feet below. Many rodent remains were found in the sandy seams of both the upper and lower gravels. The molluscan fauna were similarly distributed. It was noted by Messrs. Kennard and Woodward that the shells from the lower gravels were larger and more developed than those from the upper layers which suggested damper climatic conditions during the earlier phases. Both the rodent remains and the shells occurred in much greater numbers in the lowest deposit. Comparatively few shells and no rodents were found in the æolian sand, but many small fragments of shells are to be found throughout that stratum.

#### IV. CONCLUSION.

The remains described above do not include many species of mammals that frequently occur in contemporary cave deposits. Little significance should be attached to such negative evidence as the absence of rhinoceros or mammoth for example, because with superficial terrestrial deposits a complete or even a very large selection of the mammals typical of any one period is not likely to occur in one locality. It is however significant that the species enumerated

above are all characteristic of mid to late Pleistocene times, and are thought to be contemporary with the late Mousterian and Aurignacian cultures. In particular, the æolian sand is considered to be the English counterpart of the newer löess of the continent. The whole deposit is characteristic of one climatic episode namely the passing of the last ice age; and the different strata, which vary from place to place, are considered to be the results of minor climatic fluctuations or seasonal variations. It is certain that the whole deposit post dates the 50 foot raised beaches and the last period of maximum glaciation in this country, whilst it anti-dates such late Paiace<sup>11</sup>thic deposits as that at Aveline's Hole. On the whole, the evidence points to the Clevedon gravels as being contemporary with the more recent deposits of the middle terrace of the Thames in general and with the deposits at Erith and Crayford in particular.