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Edward Easton, Esq., 49 Upper Bedford Place, Russell Square;
George Maw, Esq., F.L.S., F.S.A., Benthall Hall, near Broseley;
Joseph Elliot Square, Esq., 4 Stanley Crescent, Kensington Park, W.;
and Edward B. Tawney, Esq., Assoc. Royal School of Mines, were
elected Fellows.

The following communications were read:—

1. FURTHER DISCOVERIES of FLINT IMPLEMENTS and FOSSIL MAMMALS
in the VALLEY of the OUSE. By JAMES WYATT, Esq., F.G.S.

SINCE my communication to this Society of discoveries of Flint Implements associated with fossil remains of extinct Mammalia in the Post-tertiary gravels near Bedford, I have been so fortunate as to have the opportunity of examining in this valley several good sections; and there is one especially of which it is desirable to have a record, as it furnishes several important data in reference to the question of the Drift.

The opening of this section appeared to me to present a good opportunity of ascertaining whether the gravels at this lower level of the Ouse Valley exhibited any phenomena different from those of the upper level at Biddenham. With this view constant observations were made throughout the excavation; and some points of evidence were obtained, which tend to support the opinions of Mr. Prestwich in regard to the different periods and climatal conditions

under which those deposits were made*. Without doubt I have found this lower portion of the Drift exhibit some features not met with in the higher levels, namely, a marked difference in the grouping of the fauna and in the types of Flint Implements. Although, as might have been expected, there are several species of Mammals in common, yet the section under notice contains some species not known in the localities considered to belong to the upper-level deposits; and the same remark holds good with reference to the land and freshwater Shells.

The new line of railway from Bedford to Cambridge has been made across a large tract of this Drift-gravel to the east of Bedford, but very few fossil bones have been obtained from it, as the levels of the line did not necessitate any deep cutting. In connexion, however, with these works an excavation has been made in a hill contiguous to the line, which has furnished the interesting section now under consideration. Two miles eastward of the town of Bedford, and near the junction of the parishes of Cardington and Goldington, where the general level of the land is not more than four or five feet above the water of the River Ouse, there is a large mound known as "Summerhouse Hill." The Ordnance Map does not give this name, but shows the hill and the brick-kiln on one side of it. The whole of the surrounding flat land is a deep alluvial deposit, and a great portion is under water during part of the winter, through the river-floods. Beneath is an extensive deposit of gravel, which overlies the clay and limestone of the Middle Oolite, and this hill is composed of the same clay.

The hill is a conspicuous object, although only 36 feet above the level of the river, as it is the only natural elevation in this part of the valley. It is exactly four miles from the celebrated pit of Biddenham "*as the crow flies*," but nine miles if the measurement be taken by the present meandering river, the feeble successor of the ancient torrent which scoured the valley. In the absence of an actual survey for the true levels of this district, some idea may be formed of the difference of the levels between the pit at Biddenham and the cutting at Summerhouse Hill when it is stated that the river has, in this distance, four mill-dams; so that the natural fall may be calculated to be at least 30 feet between the two sites.

The railway contractors found that there was on the north-eastern flank of this hill a valuable deposit of gravel. This discovery was soon turned to account, and several acres have been excavated to furnish ballast for the line and roadways to the viaducts. I watched the work with great interest, as the gravel-deposit here presents the peculiarity of a great buttress to the hill on that north-east side only. This deposit has a depth of 15 feet at the foot of the hill, gradually decreasing in thickness until near the top, where it ceases altogether; and on the south-western slope *no* gravel is found, but there the hill is excavated for brick-making, the clay coming close to the surface. It would appear as if this mound had caused a shoal, and that

* See his "Theoretical Considerations," in the 'Proceedings of the Royal Society,' March 27, 1862.

the current of the ancient Post-pliocene river had eddied round it, depositing a large bed of gravel, silt, and mud on one flank, and subsequently shifting its course.

The excavation by the railway contractors gave a transverse section of the deposit; and beds of gravel, of the depth stated, were shown between the alluvial soil and the Oolitic clay at the base. The gravel was similar to that at Biddenham, subangular, and composed of flint, limestone, New Red Sandstone, trap, and various old rocks—just such a collection as is found in the neighbouring hills of Boulder-clay; but some of the pebbles are much rolled. The section presented none of those contortions of the strata which are so frequently displayed at Biddenham; but the layers of gravel, sand, and mud were unusually conformable, the constant deposit of the current apparently extending over a long period of time; while the large quantity of marginal and land-shells at different depths, the marks of vegetable fibres in the mud, and the black streaks as from decomposed wood indicate a long continuance of this as a bank or shoal line. There were three very distinct layers of mud; those at the depths of 9 feet and 12 feet from the surface contained an immense number of land and freshwater Shells. A collection of these I have submitted to Mr. Gwyn Jeffreys, who has kindly furnished the following list:—"In the first layer (at the depth of 6 feet) were *Valvata piscinalis*, *V. acuminata*, *Pupa marginata*, *Ancylus fluviatilis*, *Pisidium amnicum*, *P. fontinale*, var. *pulchella*, var. *Henslowiana*, *Limnæa peregra*, *L. truncatula*, *Helix hispida*, *H. pulchella*, *Planorbis spirorbis*, *Bithynia tentacu-*

lata. This assemblage of Shells shows the result of a large river-scouring, with a mountainous or hilly stream flowing into it, as well as the vicinity of the sea. In the second layer (at the depth of 9 feet) were *Planorbis spirorbis*, *Ancylus fluviatilis*, *Sphærium corneum*, *Pupa marginata*, *Limnæa truncatula*, *L. peregra*, *Bithynia tentaculata*, *Pisidium fontinale*, *Zua lubrica*, *Unio Batavus*. The *Unio* is the same species as now living in the Oise. In the third layer (at the depth of 12 feet) were *Valvata piscinalis*, *Helix pulchella*, *Pupa marginata*, *Bithynia tentaculata*, *Sphærium corneum*, *Pisidium amnicum*, *P. fontinale*, *Ancylus fluviatilis*, *Limnæa peregra*, *Succinea elegans*, *Planorbis albus*, *P. spirorbis*. The shells have the same appearance as those from the Abbeville district; and it is very probable they were coëval, and deposited under similar conditions."

During the excavation great quantities of bones were found, but from the nature of the work very few were preserved at the onset, as a large gang of navvies had to fill ballast-waggons in a given time for an engine to draw away to Bedford; the consequence was that many fine fossils assisted to make approaches to the new bridges. As the demand for ballast slackened, the chances of observation increased, and eventually many valuable specimens were obtained. There were great numbers of antlers of Deer, some shed, and others having portions of the skull attached: there were also teeth and bones of the same species, and many bones, teeth, and cores of horns of a large species of *Bos*. A doubt has been previously expressed whether the gravels in this valley have yet given good evidence of the presence of *Hippopotamus major*; but this excavation removes all doubt on that point, as I obtained portions of two tusks with an astragalus and portions of other bones; and within 500 yards of this spot, in the cutting for a watercourse by the side of the railway a fine tusk was found, which, however, the men broke in pieces. Professor Owen kindly permitted me to forward to him a portion of the fossils for his examination, and amongst them he has found *Elephas antiquus*, Falc., some very fine remains of *Hippopotamus major*, *Bos giganteus*, Owen, *Cervus elaphus* (large variety), *Cervus tarandus*, and *Ursus*. It may be added that very few of the bones exhibited any signs of having been rolled far, but the great proportion retained their natural form perfectly.

But there is another fact which gives importance to this section, and causes Summerhouse Hill to be added to the interesting localities which have yielded the rude tools of the primitive flint-chippers. The only unsatisfactory point is that no Flint Implement has been discovered *in situ*; but the circumstances under which I found one specimen leave no doubt as to its original place of deposit, and its condition carries the most complete evidence of its antiquity. At a later period of the excavations the sand was sifted out, and only the larger gravel taken away for ballasting purposes. In one of the heaps of this sifted gravel I found a small Flint Implement of oval form, and this heap must have come from the lowest bed of gravel, and was amongst the last material that was removed from the section. Many of the stones were deeply stained with oxide of

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iron, which I had observed all along a layer about 2 feet from the bottom of the bed; other stones had a whitish patina from immediate contact with the clay, and it was the latter coating which had accumulated on the implement so as to give it a porcellaneous appearance. This flint tool is $2\frac{3}{4}$ inches long, and similar in outline to one found in the Champ de Mars at Abbeville, and figured by Mr. Evans in the sheet of typical forms accompanying his paper on Flint Implements, published in the 'Archæologia,' 1862. It is also similar to one found at St. Gilles, near Abbeville, and figured in the paper by Mr. Prestwich, in vol. cl. of the 'Transactions of the Royal Society.' Amongst the gravel I found three flint flakes, on which there are sufficient facets to show that they were artificial. Soon after this discovery, Mr. Evans, who had come to pay me a visit, went to this spot, and on the newly constructed road through this section found amongst the gravel, which had been taken from the lowest stratum, a flint implement of oval form, which is rounder at the cutting end than usual, and altogether of a different type from that of those tools which have been found at Biddenham and St. Acheul.

It was tantalizing to find that just as these diggings were beginning to be productive of interesting results the excavation ceased, the quantity of land agreed upon having been worked out. Sufficient evidence, however, has been obtained to show that the gravels at this part of the Ouse Valley are as rich in fossil remains as on the western side of Bedford.

There are six places at which Flint Implements have been found near Bedford, within a radius of four miles, in the following order of succession:—Biddenham, Harrowden, Cardington, Kempston, Summerhouse Hill, and Honey Hill. The evidence which warrants the addition of Honey Hill is curious. A few weeks ago I was on my way to inspect the neighbouring pits, and passed along an occupation-road which had lately been repaired. If the same regulations were adopted for farmers' roads as Mr. MacAdam insisted on for the public turnpike trusts—where a man's mouth is taken as the gauge for the size of the stones to be laid down—a most interesting relic would have been sacrificed. Fortunately for the interests of science this regulation had not been insisted upon here, and so I saw a flint hache reposing snugly in a rut. The rude wheels of dung-carts had gone over it and pressed it down, making one additional and unnecessary conchoidal fracture on one side, and taking off the point, but not sufficiently damaging it to prevent its identification as a true Implement of the Drift. I ascertained from the occupier of the farm that he had made a small pit at Honey Hill, and taken out such gravel as he required, and then levelled it up. This site is about a mile west of Bedford, at the junction of the parishes of St. Paul, Biddenham, and Kempston. This is on nearly the same level as the Biddenham pit, and the Implement is of the type of the pointed haches of Amiens.

In reviewing the facts now under notice, and keeping in view the circumstance of the freshwater Shell, the *Unio Batavus*, found in the valley of the Oise (France), being discovered in a fossil state at Summer-

house Hill, and not in any spot higher up the valley of the Ouse, and the different assemblage of Mammalian species, I think they may be taken as of importance in the consideration of Mr. Prestwich's theory. And, in conclusion, I must beg to express my regret that the section was not open sufficiently long to be examined by those who still doubt the high antiquity of these fluvial valley-gravels.

2. *On some RECENT DISCOVERIES of FLINT IMPLEMENTS in DRIFT-DEPOSITS in HANTS and WILTS.* By JOHN EVANS, Esq., F.G.S., F.S.A.

HAVING within the last few days visited, in company with Mr. Prestwich, the scenes of two recent discoveries of Flint Implements in gravel in the south of England, I think a few notes upon the subject may be of interest to this Society.

The discoveries in question have taken place, the one on the sea-shore, about midway between Southampton and Gosport, where Implements have been found by Mr. James Brown, of Salisbury; and the other at Fisherton, near Salisbury, where they have been discovered by Dr. H. P. Blackmore, of that town.*

The first-mentioned discovery was made accidentally in May last. Mr. Brown being on a visit at a friend's house, near Hill Head, a spot about $2\frac{1}{2}$ miles south of Titchfield, was walking along the shore about the middle of the cliff westward of Hill Head, and between that place and Brunage, and picked up a worked flint, in which he at once recognized a form of Implement peculiar to the Drift. Diligent search, renewed on several subsequent occasions, enabled him to find five more, all within forty or fifty yards of the place where the first was picked up, and near the spot where a large mass of gravel had fallen from the cliff on to the shore only a short time previously. Three of these Implements are oval, equally convex on both sides, and with a cutting edge all round. Two out of these three are more sharply curved at one end than at the other, and a fourth is more lanceolate in form. The fifth is the heavy butt end of a large Implement, probably a pointed one; and the sixth a broad flake with numerous facets on the convex side.

On the occasion of our late visit, I was fortunate enough to discover another specimen, of the spear-head form with a rounded point, exactly similar to many of those found at St. Acheul. I did not, however, find it at the spot where the other implements were discovered, but about a mile to the west, nearly midway along the cliff between Brunage and the lane leading down to the shore between Chilling and Hook. It was lying among the shingle on the shore opposite the highest part of the cliff, which there attains a height of about 30 feet above the top of the beach, or probably about 35 feet above high-water mark.

* See also the 'Geologist,' vol. vi. p. 395.