ON THE EARLIEST KNOWN TRACES OF MAN IN THE THAMES DRIFT, AT READING.

By Joseph Stevens, M.R.C.P.

ALTHOUGH, in a few instances, human bones have been met with in valley drifts, it may be broadly stated that all our knowledge of man in the pleistocene gravels, at all events in England, is derived from relics of his handiwork, in the shape of implements of stone; and when remains of man have been found in drifts, as in the case of portions of the human skeleton dug out near Paris, and in the valley of the Seine, the discoveries were so rare as to have furnished in themselves very inconclusive evidence. What we know of man in Palæolithic times, in his out-of-doors life, is practically due to the indestructible nature of flint. This, however, is of no great importance, since the implements themselves, made from the flint and buried in the gravels at the time they were laid down, are conclusive that they were fashioned by an intelligent agent: an opinion which is now conceded by all who have paid any attention to the subject. That the men of the Drift Period used wood, bone, and horn, these materials being easy of access, and not difficult of recognition, there can be no doubt, as needles and pins made from bone are found in caves of the Palæolithic Age, their preservation in these recesses being due to their having fallen under protective influences. Nor should we wonder that few traces of man's bony skeleton, or that, so far as I am aware, no traces of his implements of bone or wood have come to light in the drift gravels, when the destructive nature of the operations to which they have been exposed are considered. Subject to the lashing of waves, and the grinding of flint gravel, which have in some cases almost obliterated the flint implements, such small objects would quickly perish; while some perhaps would be washed out to sea, or they would settle down in the gravels and rot. Other reasons have been assigned for the absence of human bones in the drift, such as their small size relative to those of the large animals met with in gravel beds rendering them more easy of destruction. The sparseness of man, who then subsisted in small fishing and hunting communities, compared to the numbers of the animal forms surrounding him. Sir John Lubbock has calculated that among the North American Indians the proportion is about one to 750; and as man is in all probability at least four times as long lived as most of these animals, the proportion might be

increased to one to 3,000. If this were so, and all the bones were preserved, it would follow that about 3,000 bones of the different animals of the chase would be left, for one of human origin. Then we have the liability of such small portions of human bones as may be present in the gravels to escape the observation of the men who are employed to remove the drift materials; and it might be observed that many of the bones and teeth, even of the larger animals, are in an exceedingly water-worn condition, so much so, indeed, as to frequently render the animal impossible of recognition. To these views may be added the probability that, degraded as must have been the condition of the man of that rugged period, respect for the dead, which has shown itself in some shape among the most savage tribes, might have operated in some form of disposing of the dead altogether removed from the river-courses.

The Drift Beds.

The quaternary drift-gravels, some of which contain implements wrought by man, lie along the Thames Valley on formations of different ages, from the London clay down to the chalk. They sometimes extend up the sides of the valley, as along Redlands, or they occupy steps or terraces, these terraces running more or less level along the walls of the valley; and are often worn down into small hollows, or are cut through by side valleys, whereby the underlying beds have been laid bare. At such points, as at the north-west of the Grovelands drift, the gravel ends off somewhat abruptly, although it must at one time have extended over the adjoining slopes. The extent of the denudation at Grovelands is shown at about 200 yards north of the present gravel cutting, at which point the chalk has been reached. The Woolwich and Reading beds have been entirely worn away, only about five feet or six feet of ferruginous drift-gravel, and mixed rubble and drift now overlying the chalk; and there are some pot-holes in the Chalk into which the drift-gravels have been let down.

The same is observable on the Caversham side of the Thames Valley, on the chalk elevation opposite to Grovelands. The altitude, which at Grovelands is 81 feet above the Thames level, here reaches 119 feet above the Thames. The drift gravels at some small sections lying alongside of the high-road to Wallingford being about four feet to six feet in depth. As the slope runs in the direction of Caversham Village the drifts are denuded down to the level of the chalk surface at Caversham Chalk-pit, where there are some remarkable chalk pipings filled with drift-gravel. I have found the gravels at Caversham, as at Grovelands, to contain palæolithic flint implements, Figs. 3 and 4, Plate 2, representing two well-marked specimens. The hatchet (Fig. 3) was found in the gravels removed in digging the foundations of Mr. May's house; Fig. 4 showing an implement picked up on the site of old gravel-pit workings on Mr. Reading's farm; and some well-wrought flakes occurred in the small open gravel section in the same field. The drift here must have suffered considerable

denudation, as drift gravels are intermingled largely with the surface soil; and Palæolithic implements are met with on the surface with Neolithic ones. The fact of Palæolithic implements being diffused over the surface by denudation appears to show that the drift has been largely denuded, as implements are found to lie mostly at the base of drift beds. It has already been stated that the Caversham drift occupies an elevation of 119 feet above the Thames level at a point immediately behind Mr. May's residence, and that Grovelands is 81 feet above the Thames level. As the water during the excavation of the Thames Valley must, at the time the gravels were laid down, have occupied the former level, it follows that the Thames River must have flowed at something like 38 feet above the present drift plateau along Grovelands and Westlands (the level is a few feet higher at Westlands). And that this difference affords some measure of the denudation the Grovelands gravels have undergone.

Along the chalk elevation from Caversham to Mapledurham, and extending onwards towards Whitchurch, pleistocene beds are present. They occupy no large extent of surface, and are of various depths, and of very irregular outline, the gravels having been cut into and removed along the hollows or combs, which slope downwards into the Thames Valley. The drifts do not extend into the hollows; but in places along the slopes where lodgments could be effected chalk-drifts occur. These are made up chiefly of water-washed chalk with some flints. And at intervals along the valley large bay-like scoops appear, showing where deflected currents have carried away the materials from the rising chalk buttress. The pleistocene drifts, in occasional open sections along this line, appear to be less ferruginous than those on the opposite side of the Thames, and contain more small pebbles, and large chalk-flints. No implements appear to be present, showing seemingly that the drift people must have lived in small scattered communities along the Thames Valley, for the purpose most likely of obtaining subsistence by fishing.

On the south side of the Thames, at Coley Hill, the mottled clay is overlaid by some superficial gravel of about five feet or six feet in depth, in places deeper. It is ferruginous, and contains the usual chalk-flints and quartzites. These deposits have been cut through by the existing valleys. The gravel here has worked itself into small basin-like pits in the surface of the clay, the pits being observable where the clay has been cleared away. On these surface gravels I found a rudely-wrought Palæolithic flint hatchet, and a pointed tool similar to Fig. 10, Plate 2.

The drift-gravel at Grovelands, which has yielded Palæolithic implements of different forms since 1879, extends eastwards along the edge of the valley, in front of a bench of post-glacial drift which runs backwards at Westlands from the valley for about 200 yards, where it thins out. There is a cutting at its southern margin for obtaining road material; but I have not been able to detect any implements at this section. The gravel here is more densely impacted, and the subangular flints are smaller than at the edge of the valley, and there

are fewer chalk flints. It is deeply ferruginous, and black iron bands extend through the gravel at about the centre of the cutting. The drift along the margin of the valley varies in thickness, it being in places denuded in shallow hollows. Along St. Mary's Hill it is sometimes dug into for laying foundations, but I have never been able to detect any implements in the removed material. At the Grovelands pit the gravel at its greatest depth is about 14 feet. It consists of an iron-stained loam, with small flint gravel and subangular flints, in places pebbly, and towards the base occur occasional patches of river sand. In addition, the drift contains some boulders of quartzite from the high-level drift, water-worn fragments of chert, quartz-rock, Tertiary pebbles, green-coated flints from the base of the Reading beds, and in one instance a nodule of obsidian. The gravels lie immediately on sands of the Reading and Woolwich series, the upper beds of the Tertiary clays being entirely denuded away. The depth to the chalk is 15 feet, the stratifications having the following arrangement:—Soil with flint-rubble, one foot; mixed rubble and drift gravel, one foot; ochreous gravel 14 feet, basal beds of the Reading and Woolwich series, consisting of buff and yellowish-green sands, a thin layer of blue clay, some green-coated pebbles, and a few chalk-flints lying immediately on the chalk, 15 feet;—the whole, 31 feet.

The animal remains associated with these beds consist of water-worn shells of *Gryphœa (Oolitic)*, *Ostrea*, *Inoceramus*, and *Terebra*; and in the chalk-flints casts of *Micraster*, *Ananchytes ovata*, *Galerites*, *Cidaris*, *Inoceramus Cuvieri*, *Spondylus*, and casts showing the shell-borings of *Cliona Conybearei*. After repeated examinations no recent river shells appear to be present. Some coarse grey river sand from near the base of the drift, from which plates of a mammoth's molar, teeth of *Equus fossilis*, and sundry scraps of river-wasted bones were dug out, was found to consist of fragments of the plates of large shells *(Ostrea)*, coarse angular sand grains of various tints, a few small pellets of rolled chalk, some ragged splinters of chalk-flints, but the larger proportion consisted of grains of various sizes of glauconite from the green sand. Immediately underneath this sand lay a quantity of large chalk-flints, which from their immense size and unworn condition might have found their way to the spot in drift-ice.

The remains of the larger *Mammalia* from this section have been mostly associated with these loose sandy drifts lying chiefly at the base of the impacted gravel, and the friction the bones have undergone, and their saturation with water, have rendered them peculiarly friable and rotten. The long bones are in fragments, and the Elephants' molars have not been found entire. In three instances the harder dentine plates of the molars were alone removable. The flint implements also are more commonly met with in the looser gravel towards the base, and mostly in distinct patches. Many of the better shaped hatchets are water-worn; but the flakes, rude cores, and nondescript articles, probably refuse, have their angles unworn, implying that they were wrought near where they lie imbedded. The animal remains consist of *Elephas primigenius*, *Bos primigenius*, *Cervus*, two species

of *Equus*, and the anterior half of a molar of Elephant in which the dentine plates appear to differ from those of *primigenius*.

The gravel-beds at Redlands, near the Grammar School, have been treated on by Mr. E. B. Poulton, in a paper "*On Mammalian Remains and Tree-Trunks in Quaternary Sands, at Reading*," published in the Quarterly Journal of the Geological Society for May, 1880. And I merely allude to the gravel-drift capping those deposits, inasmuch as it has occasionally yielded Palæolithic flint implements. The drift is of much the same character as the drifts higher up; and contains quartzites from the high-level gravel. It further contains occasional flint casts of fossils from the chalk, and rarely shells from the Tertiaries. I obtained a flake, and a badly-wrought implement from the surface of the loose material in 1880; but had deemed these hardly sufficient to justify the opinion of Palæolithic implements being present. During the present year I obtained from the pit-men an undoubted trimmed-flake (Fig. 5, Plate 2); and it was stated that another well-wrought specimen had been met with, and disposed of. There is no doubt that the drift is implement bearing; but from their scarcity, and the almost total absence of flakes, it is likely that the implements occasionally found have come from higher levels. The imbedded Mammalian remains, found in the different stratifications underlying the gravels, are stated by Mr. Poulton as belonging to *Elephas primigenius*, *Bos primigenius*, *Equus fossilis*, and *Rhinoceros tichorhinus* (doubtful). And in the sand-bed were discovered silicified tree-trunks of the genus *Pinus*, the vegetable structures of which had become much altered by saturation, and by drifting.

Near the mouth of the Kennet there is a lower cutting in the fluviatile drift-gravels, which is denominated the "Kennet's Mouth Pit." The section is about 20 feet in depth, and its level above the Thames is 30 feet. The drift appears to be a continuation downwards of the Redlands gravel; but the conditions under which it must have been laid down have caused a considerable difference in the character of the materials. The drift is less compact and ochreous, and contains more river sand. There are more pebbles, and what has been called "White-water-gravel." The constituents of the drift are water-worn as from ordinary river action, the shells and animal remains being rubbed down by friction. Here, as higher up, teeth of *Equus fossilis* and Mammoth are found, several water-wasted fragments of the latter being in the possession of Mr. Harrison Jones. It is not conclusive that flint implements are present in this drift, some few specimens hitherto met with not being sufficiently well-marked to place the question beyond dispute.

It has occurred to me that perhaps the deep ferruginous character of the drifts of the higher terraces along the Thames Valley has been due chiefly to the London clay, and the mottled clay, these forming the upper series of the Reading and Woolwich beds. And that the middle terraces, consisting of sands and redeposited clays, have been formed at the expense of the middle series of the Reading Tertiaries. These consist of the base of the plastic clay, and

of sands buff or yellow. The lower gravels, of which the "Kennet's Mouth" deposits furnish an example, appear to be made up chiefly of flint-gravel and sand; the absence of clay seeming to be owing to the denuding forces having acted principally on the lower sands of the Reading beds, the clays having been left higher up. In addition to these several constituents from the Tertiaries, the various beds contain out-coming matters of many kinds, together with gravels and other materials from the high-level drift, and flints from the chalk.

In many other drifts of the Post-Pliocene series, where opportunities for investigation have been furnished, the imbedded remains have testified to the presence of large Mammalia down the Thames Valley. It is now some 20 years since the late Mr. Sheldon Wilkinson, of Great Marlow, made a valuable collection of animal remains from a pit at Hurley, between Marlow and Henley. The drift here is largely intermingled with shattered Chalk-flints, and small fragments of Chalk, in a sandy matrix, underneath which occurs buff sand, followed by sandy gravel, subangular flints, quartz pebbles, pieces of chalk, and nodules of quartz-rock. The bones were in good preservation, probably from the dryness of the matrix. They were found at a depth of about 18 feet from the surface; and consisted of the following[1]:—

Bos longifrons, an almost perfect skull and horns.
Cervus tarandus ? (Reindeer) horns of.
Elephant, teeth and tusks.
Felis spelœa (Cave-tiger), teeth.
Hippopotamus, incisor.
Horse.
Mastodon, parts of tusks.
Rhinoceros.

Some Mammalian remains have been found in the gravel pits just above the Railway Station, at Maidenhead; but there were no signs of well-wrought palæolithic implements or of flakes in the dug material lying in the pits. Nor could we discover any implements in the low-level drift alongside of the railway below Taplow. This cutting has, however, yielded some peculiarly interesting animal remains. The drift extends up the incline towards Taplow Village. At its middle division Brickearths are present; and on the uppermost platform of the valley, at perhaps 100 feet above the Thames level, a bench of post-glacial drift extends. Close to the Railway on the upper side are some exhausted gravel beds; and some portions of the drift belonging to the same terrace are still being worked. This terrace, in fact, is a continuation of the low-level gravel which spreads out along the valley from Maidenhead to Cookham. The gravel here resembles that at the Kennet's Mouth Pit, at Reading. It lies immediately on the chalk, the whole of the Tertiaries having been denuded away down to the chalk surface. The imbedded remains consist of water-worn tertiary shells, molars of Elephant, of which a considerable

[1] Memoir 7 of the Geological Survey, Whitaker.

number are in the possession of Mr. Rutland, of Taplow. He has besides from this cutting some bones of Bos, teeth of more than one species of horse, and teeth (doubtful) of Hippopotamus. It was from these gravels that the Rev. C. Kingsley and Sir John Lubbock took a skull of the Musk-Buffalo (*Bubalus moschatus*), which has been described by Prof. Owen.[1] Mr. Prestwich, in a note on this gravel, writes that in addition to the skull "Mr. Lubbock procured a few elephant and other bones, but in a very imperfect state. They were all found low down in the gravel, at the point where it becomes mixed with Chalk-rubble, or on the top of the chalk itself."[2] The bones are in a much better state of preservation than those found at Grovelands; for although brittle and often broken they are not greatly worn. And this, as Mr. Prestwich has stated, leads to the opinion that the gravel does not furnish evidence of long-continued river or shore-action.[3]

On the Berks side of the Thames from Maidenhead to Cookham a terrace of post-glacial gravel extends. It overlies the chalk, and is cut through by the denudation of the small side valleys, so that the drift, which was once continuous, now only occupies the sides, but does not reach the bottoms of the small hollows. Below and parallel to the railway from Maidenhead to Cookham lies a second terrace. It contains sandy brickearth; and at Maidenhead there is a yard for brickmaking from the clay of this division. Lower down, extending along the flats, on the alluvium of the valley, occurs the lowest terrace, the gravels of which we have already referred to as yielding remains below Taplow.[4]

The Drift Implements.

Implements made from flint have now for many years been found, in association with extinct Mammalia, in drift gravels in England and in Continental countries. Mr. Prestwich, at an early date, 1860,[5] pointed out the position and character of the drift beds in the Somme Valley, and the relation of the Somme Valley to such valleys as the Thames, the Lark, and the Ouse, and, indeed, to river valleys generally along the sides of which patches of old gravel have been left at different levels by the streams which formerly flowed along them, before they had cut the valleys down to their present depth. The implements dug out of the drifts bear such evidences of design as to be clearly not the result of accident. And that they belong to a rude age, and a very distant period we have sufficient evidence in this district. On the north wall of the Thames Valley, at Caversham, flint implements are found in undisturbed gravel drifts, which represent the Thames when, as a broader and shallower river, it flowed at the

[1] Journal Geological Society, Vol. XII., p. 124.
[2] Journal Geological Society, Vol. XII., p. 132. [3] *Idem*.
[4] Memoirs of the Geological Survey, No. 7.
[5] Philosophical Transactions, for 1860.

level of the drifts. The measure of the time since the implements were buried is to be reckoned by the time necessary to have excavated the valley from the level of the Caversham drifts down to the present Thames level; and the same applies to the Mammalian bones, and implements formed by man, which are found in the Grovelands drift on the opposite side of the Thames.

The implements found in the Reading drift are of various types; and were evidently intended to serve a variety of purposes. But we have no means of ascertaining to what uses the different forms were applied, save that some of them bear a resemblance to objects of a later period of which we have some knowledge, and which, probably, obtained their design from the more ancient patterns. In some cases the character of the instrument suggests its use. The man of the Drift Period was a savage; but a savage must have required shelter, food, and clothing. The first he obtained in caves or under overhanging rocks, which have been called "rock-shelters." We have ample evidence on this head in the caverns of our own Country and in the French caves. As he knew nothing of agriculture, and had no domesticated animals, he must have subsisted by hunting and fishing. Drift man was no potter; but the method he adopted in cooking food, when he did not prefer to eat it raw, can be inferred by the process resorted to by some existing savages, viz., stoneboiling; and as charred stones have been found around the hearths in rock-shelters, it is not unlikely that he resorted to the process of throwing heated stones in amidst the food till it had acquired some pretensions to be considered cooked. His method of obtaining fire was possibly by rubbing pieces of dried wood against each other, or by rapidly rotating a stick pointed at one end in a hole in some very dry wood. Artificial fabrics for clothing have not been traced to him; he must therefore have relied on the skins of wild animals killed in the chase. As the skins must have been prepared in some way, and fastened around his person, it is thought that he used thread made from the sinews of deer, or bone pins for the latter; and pins made of bone are common in caves in association with stone implements of the Cave Period. Among the implements found in the Reading drifts are some small neatly-pointed tools, which are well adapted for piercing holes in leather, or drilling holes in wood (Plate 2, Fig. 10). In the preparation of skins we have examples of the stone tools used by the Esquimaux; and as very similar objects wrought in flint are found in drift-gravels and in caves, it is believed that the drift and cave tools were used for the same purpose. Fig. 11, Plate 2, represents a scraper from the Reading drift of the cave type. A ruder gravel-bed form is shewn in Fig. 7; and some forms from the gravels are so neatly outlined as to approach closely in shape to Neolithic scrapers (Fig. 8, Plate 2). These implements are made from broad flakes, and have a plain surface on one side, the other being beveled at the edge for scraping rather than cutting. A singular form found at Grovelands, which from its edge appears to have been intended for scraping is represented in Fig. 6, Plate 2. It is shaped like a valve of

plate 1.

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St Acheul.

Reading.

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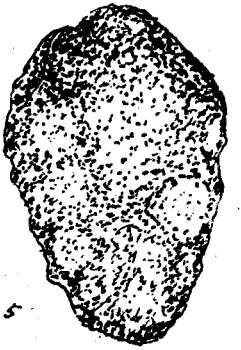

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Quartzite.

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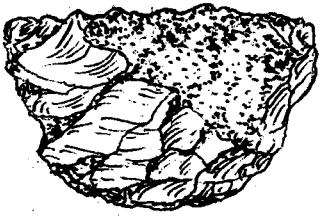

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the mussel; and has a well-wrought edge on its outer facet, its inner surface being hollowed out.

Other instruments found in the drift are suited to meet the requirements of a life so rude and simple as must have been that of the Drift Savage. Among much which is refuse occur large triangular flakes, some of which are pointed, and might very well have served the purpose of knives or darts; and some thick flakes are so neatly trimmed as to have knife-like backs. It is not likely that the man of the Drift Period had advanced to the use of the bow. The better wrought instruments such as Figs. 4 and 9, Plate 1, have been called heart-shaped. These are wrought to a cutting edge at the sides, and are pointed, and they are considered to have been spear-heads. Some pointed instruments found at Grovelands have plain butts and angular shoulders, and appear to point to lozenge forms (Figs. 7, 8, Plate 1). They are too cumbrous and heavy for spears, and might have served the purpose of dibbles for digging up esculent roots. Coarsely wrought circular implements with rude edges, and a thick centre, have the character of objects used for throwing (Fig. 3, Plate 1). It has been thought by Mr. Prestwich, and others, that chisels were employed during the severe winters for breaking holes in the ice of rivers in order to catch fish, and obtain water. For such a purpose Fig. 9, Plate 2, is well adapted. It is flaked on all sides to a pointed cone, and has a heavy, well-shaped butt-end for grasping in the hollow of the hand; some examples of this type occur with unwrought butts. It is well known that the inhabitants of high northern latitudes, when deer, game, and other food becomes scarce, resort to the rivers for the purpose of fishing, and that they cut holes in the ice for that purpose. At the present day they use metal chisels; but when these are not to be obtained they resort to chisels of some kind of stone; and ice-chisels have been made of the points of Elk-antler fixed in handles of wood four or five feet long.[1] Other marvellously heavy, suggestive implements crop up in the drift, one of which is represented on Plate 1, Fig. 11. The specimen has a flat smooth base, and is flaked so as to give it a severe cutting margin. These tools, from their weight and size, are admirably suited for chopping wood, opening the skulls or long bones of animals, or for severing their limbs from their bodies. The implement here represented is 6in. in length, 4½in. in depth, and weighs 2½lbs. It should be stated that the figures on the plates are not drawn to scale, they being intended to represent form; but they are accurate in their proportions as regards length to short diameter.

Among the better wrought implements some are outlined like a shoe, and are worked on both surfaces, and have sharpened edges (Fig. 10, Plate 1). Others are oval, with the edges wrought all around their circumference (Fig. 6, Plate 1), or pointed oval or almond-shaped, also with cutting edges. These latter are more neatly wrought than any found in the Reading drift. They resemble forms

[1] Flint Chips, E. T. Stevens, p. 42.

of the Amiens type, Figs. 1 and 2, Plate 1, representing hatchets from St. Acheul and from Grovelands. The large flat trimmed-flakes (Figs. 1 and 2, Plate 2) have sharply defined edges, and might have been turned to the purpose of knives, scrapers or weapons. A pear-shaped hatched (Fig. 5, Plate 1) is of quartzite, a material of exceptional use in England for implements of this type. The material in common use is flint, as it readily came under the notice of the savage, and is easily flaked. Quartzite and Chert are occasionally used; but the stones which could only be made available by polishing are not found to have been used by the Drift workmen, who had not learned the art of shaping implements by rubbing.

The methods of hafting such implements as were not calculated for use in the hand were of the simplest. A withe of wood might have been twisted round the instrument, and clipped to it by a thong of deer's-hide. Or it might have been secured by a thong in a forked branch, or in a thick stick cleft at the end. And some of the long hatchet-like forms might have been driven through the end of a club of wood.

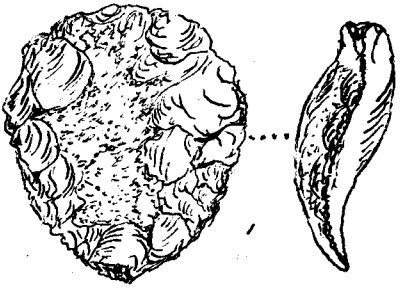
Rude cores, some of which are very cumbrous, appear in the Reading drifts. Their surfaces shew the facets at various angles from which large flakes have been stripped off. And some heavy battered flints suggest that they might have been appropriated for flaking. For whatever special purposes some of the drift implements might have been designed, there can be little doubt that most of the forms were made subservient to any use suited to the wants of the moment. In later Neolithic times the implements became less generalised, and more adapted to definite ends. Sir John Lubbock has well stated this in writing of the probable uses of Palæolithic implements :—"It is useless to speculate upon the use made of these rude yet venerable weapons. Almost as well might we ask, to what use could they *not* be applied? Numerous and specialised as are our modern instruments, who would care to describe the exact use of a knife? But the primitive savage had no such choice of weapons; we see before us perhaps the whole contents of his workshop; and with these implements, rude as they seem to us, he may have cut down trees, scooped them out into canoes, grubbed up roots, attacked his enemies, killed and cut up his food, made holes through the ice in winter, prepared firewood, &c. When, however, we shall have considered the physical evidence as to the then condition of the country, and the contemporary animals, we shall be better able to form an idea of the habits of these our ancient and long lost progenitors."[1]

The Thames Valley.

The river Thames, in its course from the base of the Cotswolds to its embouchure, drains chiefly a line of country associated with the Oolites, Oxford Clay, Greensands, Chalk, and the Tertiaries; and we

[1] Pre-historic Times, p. 280. *1st Edition*.

plate 2



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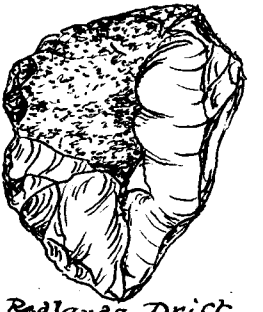
.....Caversham Drift...



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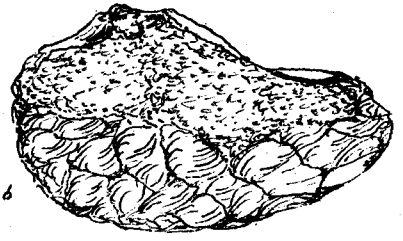
Redlands Drift.



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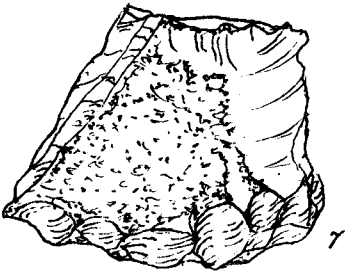

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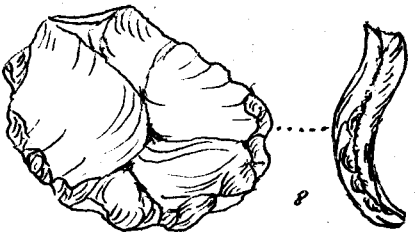

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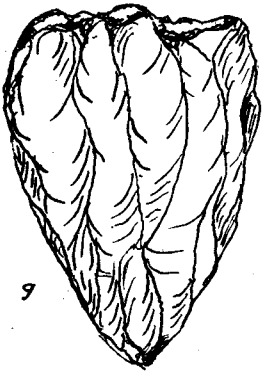

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should expect to find in the drift-beds ingredients derived from these several geological formations. Such, indeed, is found to be the case, the drifts and their contents marking the lines of drainage, and the stratifications cut through by the Thames, and its tributaries, during the very lengthened period since the process of wearing down their channels commenced. Under these circumstances the constituents of the drifts are found to differ considerably along the course of the valley. The drift-gravels at Reading contain but a small percentage of materials from the Oolites; while matters from the Greensands, and especially from the Chalk, and the Tertiaries of the Woolwich and Reading series make up the greater part of their bulk. To these should be added chert, quartzites, and other constituents of the high-level gravels, which extended far and wide as a gravel-flat over the district at the time that the erosion of the valley commenced.

It has been thought that the direction of the waterflow of the Thames was determined by some conditions of the old Tertiary sea-bed at the time the slow-rising of the land, or the sinking of the water, introduced estuarine conditions. Sea, river, and ice have each been advocated as the chief agent in the formation of the drift-gravels; but it is now generally understood that their deposition has been due to the river itself acting on the materials of the valley. When we consider, as Sir John Lubbock writes,[1] "that the constituents of these river-drift gravels, are, in all cases, derived from the beds now *in situ* along the valley *(the Somme Valley, but Mr. Prestwich has pointed out that the same holds good in English rivers)*, that they have not only followed the lines of these valleys, but have done so in the line of the present waterflow, and without in any case passing across from one river system to another, it seems quite unnecessary to call in the assistance of diluvial waves, or indeed any other agency than that of the rivers themselves."

"The beds of gravel," writes Sir C. Lyell,[2] "often called drift, which contain antiquities of this age (Palæolithic), may be said to have been deposited by the existing rivers, when these ran in the same direction as at present, and drained the same areas, but before the valleys had been scooped out to their present depth. The height above the present alluvial plains at which the old drift occurs is often no more than 20 or 30 feet, but sometimes 100 or even 200 feet."

The waterflow at its outset must have been determined by a dip; and the subsequent flexures, and modifications of level must have been due to the comparative resistance to wear and tear of the materials forming the walls of the valley. It is known that rivers continually tend to shift their courses; this is due to the sinuosity of the river in its course causing the current to cross over at its curves. In "its general line of descent, it eats out a curve in the opposite bank, or in the side of the hills bounding the valley, from which curve it is turned back again at an equal angle, so that it recrosses the line of descent, and gradually hollows out another curve lower down in

[1] Pre-historic Times, p. 292.
[2] Principles of Geology, Vol. II., p. 566.

the opposite bank," causing the sides of the valley or river-bed to "present a succession of salient and retiring angles."[1] As the river thus wanders from side to side along the valley, it undermines and carries away the gravels which it had deposited at an earlier period; and this accounts for the upper level gravels so often occurring in patches, or for their being altogether carried away, as at the west end of the Grovelands gravels.

In Memoir 7 of the Geological Survey, Mr. Whitaker points out the somewhat remarkable course taken by the Thames from Reading to the Nore. He states that, "From Reading to Twyford its southern flank is formed by the combined escarpment of the London Clay and Reading Beds, and it seems strange that the river should not have held its easterly course in like manner along the boundary of the soft Tertiary beds to Bray. Instead of this, however, it turns at right angles northwards through the chalk to Henley, where it cuts into the Lower Chalk; then takes again to its easterly direction, parallel to the outcrop of the Tertiary beds from Twyford to Bray, but still in Chalk; at Cookham turns sharply south, and enters the Tertiary district near Maidenhead, when it again takes that easterly course which it keeps thence to the Nore."

"That part of the valley that is cut through the Chalk is comparatively narrow, often with sharply sloping flanks, which are mostly covered with noble woods of beech, as may be well seen opposite Marlow and Cookham, but sometimes form a bare cliff, as at Cook Marsh. That part of the valley, on the contrary, that is in the Tertiary district is broad, and with gently sloping sides; though near Egham and south of Richmond, where the river flows near to the bounding hills, these latter are fairly sharp. This difference in the form of the ground is clearly owing to the different nature and hardness of the formations in which the valley is cut."

"On the north of this main valley there are others, formed by streams, which, rising from the Chalk, flow south-eastwards in the direction of the dip, that is in the line of greatest fall of the beds, or, in other words, the line of drainage. These valleys, therefore, are for the most part parallel. They partly cut through the great escarpment, but not wholly; and it seems likely that they have been caused by the slow wearing and dissolving action of the streams. . . . . Nearly the whole of the district must have been influenced by the general disturbance which was the cause of the slight south-easterly dip of the beds. . . . . Many of the valleys may have had their first cause in some small depression or fracture of the beds. These, however, would not themselves form the valleys, but simply cause water to flow, and wear out a channel, in a certain direction."

The ordinary agents in the excavation of valleys are rain and mist, which soften soils and supply springs; frost, which splits up soils, causing landslips, and rendering soils more accessible to water; and water carrying carbonic acid dissolves and bears away to the sea,

[1] Lyell's Principles of Geology, p. 206.

particularly in elevated chalk districts, hundreds of tons of material annually. But the sub-aerial forces in Palæolithic times were more torrential and violent. The ice and frozen snow massed during the lengthened cold of sub-arctic winters loosened in the spring, and accompanied with heavy rains, brought down the materials from the higher grounds, and precipitated them along the valleys. Referring to the denudation of the high-level gravel-flats, at the commencement of the present state of the land surface, Prof. T. R. Jones writes :—"As this extensive gravel-flat or sub-marine plain came nearer to the surface, and finally appeared above it, the shallowing water, becoming sea-creeks, ate out the rising plateau, with the aid of winter-ice, and roughly carved out the present valleys. Then sub-aerial agencies took part in the further alteration of their features. The valleys were deepened and widened by rain and snow. The heavy rainfall of the Pluvial Period, with its fierce storms, not only cut out the spurs and ridges more definitely, but formed lakes in the lines of drainage, having gravel lips or beaches which were to be the benches and terraces of the valley-gravels at different levels, as we now see them."[1]

The following are some further references regarding the valley-drifts from eminent geologists, who have made the subject a special study. Mr. Godwin-Austen, in combating the opinion that for the rivers to have been larger than at present the land must have been lower, writes :—"Along every valley through which a river takes its course alluvia are to be found at elevations such as the existing streams never attain. . . . . The volume of the rivers of a district depends directly on the amount of moisture precipitated over it, and this depends on its elevation above the sea; so that to depress any given area will not tend to increase its rivers. . . . The conditions which alone will account for these appearances are obvious—the country, instead of having been placed at a lower level at the period of these broad alluvia, had a much greater elevation above the sea. . . . This condition is applicable to every considerable river-course in the island, along every one of which we can find indications of the larger dimensions of the former rivers. The Thames and the Severn are striking examples.[2] Mr. Prestwich also is of opinion that an uplifting of the land was essential in producing the effects in question :—"The effect of this slow elevation would be to increase the velocity and erosive power of the rivers."

Prof. Morris writes :—"From the general features, both physical and fossil, of this deposit (near Brentford) I am inclined to consider it as resulting from fluviatile action, and that at a period when a river, far more deep and extensive than the present stream (the Thames), flowed along the valley. Even allowing the base of the deposit to be level with high-water, a river of considerable depth must have existed, to have accumulated and arranged twenty feet of

[1] On the Geology and Physical Features of the Bagshot District, p. 440.
[2] Journ. Geolog. Soc., Vol. VI., p. 93.

solid materials, and that not in a very violent manner, for scarcely any of the bones exhibit the least trace of attrition, most of them being perfect, and many of them belonging to the same individual; thus rendering it nearly certain that they could not have been drifted from any great distance, but were probably the remains of those animals which lived and died not far from the banks of that stream, where they subsequently became entombed in the same deposit with the fluviatile mollusca. It is generally along those valleys where the present drainage of the country is effected that we find the most extensive deposits of mammalian bones and recent shells; and consequently very little alteration can have taken place as regards the physical configuration of the country since the period of their deposition."[1]

In another paper, it would appear that Mr. Prestwich considers that the terrace-gravels resulted from river-action at a time before the valleys were being deepened, and that when the materials are portions of rocks which have travelled some distance the transporting power has most likely been river-ice. From the great quantity of débris, the prevalence of gravels, the coarseness of the sands, and the general absence of mud-sediments, the rivers must have been larger than now. That the shells (river-shells) are scarce in the terrace-gravels, and that they are like those living in the same district. That the mammals appear to shew that the climate was colder; and the flint-implements in the terrace-gravel more frequently occur where there is the greatest evidence of ice-action, and that some may have served the purpose of ice-chisels. Winter snows with possibly a larger rainfall rendered the Low-level-gravel rivers more torrential; and with these, other forces in operation, as apparently requisite to produce the effects, were the freezing of the ground and ground-ice. The Low-level gravel does not show the same evidence of ice-action as seen in the terrace-gravel, and this, with the evidence furnished by the animal remains, would imply an amelioration in the temperature, ending in the present conditions of climate.[2]

Taking the Somme Valley as a type of such river-valleys as that of the Thames, the appearances, at the time of the terrace-gravel, would present "a shallow and broad river, with numerous, generally dry, shoals and shingle-banks, but during floods, arising from the melting of the winter-snows, and a greater rainfall than at the present day, rising to a height of 40 to 50 ft. above its ordinary level, flooding the adjacent country, and depositing out of the course of the main current, the fine silt now forming the Loess (Brick-earth). . . . As the valley was by degrees excavated, such portions of the old river-bed as escaped denudation emerged gradually from the level, first of the river, and later of the river floods."[3]

In later times, as the Thames Valley approached its present level, the climate appears to have undergone a gradual amelioration, which

[1] Journ. Geolog. Soc., Vol. VI., pp. 203-4.
[2] Proceedings of Royal Soc., March 27, 1862.
[3] Journ. Geolog. Soc., Vol. XIX., pp. 500, 501.

brought about a diminished rainfall, and a consequent diminution in the volume of water flowing down the valley. The stream, becoming languid and less powerful, gradually narrowed its course with river-silt, which confined the stream within a smaller area. This resulted in the formation of wide marsh-flats, on which in places grew peat. And in shallows where, either from the interference of man, or the operations of the beaver, or from the stream obstructing its course with shingle, the current divided, giving rise to "mud-islands," where now osiers are encouraged for making baskets. It is in these along the Thames Valley, and in the silt along the river-banks, and, indeed, in dredging the river-beds, that we find occasional relics of Neolithic Man, in the shape of hatchets of flint, greenstone, and quartzite; and it is quite probable that these were used by him in constructing pile-works over the river, which he occupied as a combination of home and "fishing-box."

Whatever might have been the date of man's arrival in this country, ample proofs are furnished that his advent is of very great antiquity. The man whose remains are found in the drift, then a savage hunter, of the same type perhaps as the Esquimaux (this at all events is the opinion of Mr. Boyd Dawkins with regard to the man of the Reindeer Period), must have seen from the elevations above Caversham, a mile wide river rolling at the level of 100 feet above the present Thames. His contemporaries, then occupying the forests and plains of Berkshire, and the south and west of England, were the Mammoth, Woolly Rhinoceros, the great Urus, and the Shaggy-maned Bison, Reindeer, Red-deer, small hardy Horses, Musk-Buffalo, and Lions of larger species than any now living; and Hippopotami lived along the river-courses. The Mammoth and Rhinoceros are characteristic of the upper river-drifts, but are not met with in formations anterior to them. The Tiger and the Hippopotamus are found at a somewhat lower level in the Thames Valley, implying that they were here when the climate had moderated. But, as we find with them Reindeer and Musk-Buffalo, the climate must have been severe. These natives of warmer regions might, however, have been summer visitants, although it is known that the Tiger and Hippopotamus traverse a wide range, and can live under varying climatic conditions. From the presence of their remains in terrace gravels of different levels, Rhinoceros and Mammoth were inhabitants of the Thames Valley during the greater portion of the period of its excavation; while man is met with in the upper and middle divisions. Flint implements are never so common in the lower as in the upper drifts, and they are more water-worn, probably, in some instances, from their having drifted from higher levels.

It is sometimes enquired, why Palæolithic implements are found over such a limited area in the British Isles? This question might be answered by the enquiry, whether it is not the case that districts barren of implements commonly contain no remains of the Pleistocene mammalia? Thereby leading to the inference that the absence of both animal remains and implements may be traced to the same

cause. The districts destitute of Drift implements and of animal remains, include nearly the whole of Wales, a large part of Lancashire, Yorkshire, Cumberland, Westmoreland, and almost the whole of Scotland. The whole of Ireland may also be added. Now, as these areas are distinguished by the freshness of the ice-marks which they present, the absence of the animal remains and the implements may probably be traced to the fact that, while these districts were lying underneath glaciers, man and the Pleistocene mammalia were occupying the south and east.

Changes of great magnitude in the geography of Europe occurred during the Pleistocene Period, which was one of long duration. In the previous Pliocene age a temperate climate had marked northern and middle Europe; but at the beginning of the Pleistocene the climate gradually assumed the extreme Arctic severity of the glacial period. From the tops of the mountains the glaciers moved down until they united to form a continuous ice-sheet over the lesser hills and valleys down to the lower grounds, over North Britain, Wales, and Ireland. This constituted the first glacialisation. A period of depression followed, during which the mountains of Wales were submerged to at least 1,300 feet. On the land re-emerging from the sea, the second glacial period began; but the cold was not so intense as during the first glacialisation, and the glaciers were of less extent, occupying only isolated areas, instead of enveloping in an icy mantle the country continuously. They nevertheless extended over a large part of Wales, Scotland, and Ireland. This last glacialisation is thought to make a rude line between the Palæolithic and the Neolithic Period, the former being marked by the presence of chipped implements, the latter by polished ones. There is also a broad line of demarcation between the animal remains belonging to these two periods. There are various opinions regarding the precise period when man and the mammalia characteristic of the Pleistocene first occupied Britain; but it would appear that man followed the retreating ice of the north of Europe, the remains of his works being found high up in many British valleys, which at that time must have begun forming by the natural drainage out of the deposits of the first Glacial Period. Besides, the detritus washed down over the plains, on the retreat of the ice of the second Glacial Period, is found to cover the remains of man and his works, and must therefore be later in time.

The animals of the Pleistocene are very remarkable, as we have already observed, including such as the Lion, Hippopotamus, and Hyæna, which are adapted to live in a warm climate; and the Musk-Buffalo, Lemming, Marmot, Glutten, and Reindeer, animals suited to endure an Arctic climate. It is difficult to understand how such incongruous elements could have co-existed; but it should be borne in mind that the range of the Pleistocene mammalia was not at that time confined to Britain. There was then no Channel between England and the Continent; and there was land communication southwards to Africa by the way of Sicily, Malta, and Gibraltar. Over the

whole of this vast tract of country the wild animals had free means of migration. What are now the Irish Sea, and the German Ocean were dry land covered with herbage, which fed the wild Oxen, Elephants, and Deer; and our Thames River was a tributary of the Rhine. On the approach of winter the Arctic animals probably went farther south, and occupied the area which had been the summer feeding grounds of the animals that could not endure severe cold; these latter during the winter months in Britain retreating still farther to the south. In spring the opposite would occur, the natives of warmer climates would pass north to feed on the summer herbage, which had been the winter quarters of the Arctic group of animals. In this way there would be a continued swinging to and fro over the same area of Arctic and Southern animals, as in North Asia and North America at the present day. Being dwellers for a time in the same districts, their remains would naturally become mingled in the same river deposits, as we now find them. Of animals adapted to a temperate climate some are found among the Pleistocene fauna; among such are the Beaver, Brown Bear, Grizzly Bear, Cave Bear, Wolf, Fox, Hare, Wild Cat, Horse, Urus, Bison, Wild Boar, Roe Deer, and the Stag.

Of this singular association of animals some became extinct; others migrated to warmer climates. The Mammoth, Woolly Rhinoceros, and Cave-bear died out. The Reindeer, the Lemming, and the Musk-Buffalo went north; perhaps man retired there also. Those inhabitants of southern climes, the Hyæna, the Hippopotamus, and *Felis Caffer* retired to Africa, where they are now living.

How many thousands of years must have elapsed since man first entered Europe it is impossible to say. Something, however, may be suggested as regards time, when it is taken in relation to the vast operations which have been at work in changing the physical contour of the country, and in effecting equally remarkable changes in its fauna and flora. An enumeration of some of the more important of these in the south and west of England will be sufficient to indicate that, although on a minor scale to the operations connected with our Island immediately preceding the human period, the changes which have been effected since, and mostly slowly by the agency of water, speak of a period, as necessary to their completion, altogether beyond the calculations assigned in any of our historical Chronologies. Thus, since man appeared in this country, the last tie between England and the Continent has been severed, by the cutting through the Straits of Dover. The valley of the Weald of Kent has undergone denudation; and the Isle of Wight separated from the mainland. The Bristol Channel has in great part received its formation. Sea-beaches have been upheaved; much forest land has been destroyed, and peat formed. And nearly all the valleys in the district east of a line from King's Lynn to Portland have been excavated, and the river-sources carried back. A slow upheaval of large areas appears to have accompanied the excavation of the valleys upon them; and a subsidence of equally large areas appears to have attended the recession of the second glaciers; and it is probable that another upheaval followed.

Some account of the measure of time has been attempted to be formed from the growth of successive forests in Denmark, the accumulation of the Alluvium and peat in Switzerland, and the thickness of the deltas in the Nile, and Mississippi; but all of these are liable to considerable modifications. Sir C. Lyell fixes man's advent at or before the time of the milder interval in the Glacial Period, or at least 90,000 years ago; without reckoning the Pre-historic Period, and the 2,500 years of known European history. If, however, man came here before the Glacial Period, he may have seen this land as it existed more than 150,000 years ago.[1]

Although much has been stated and written on the subject, I am not aware that any objects have been discovered, bearing the impress of man's handiwork, that can with certainty be referred to a greater antiquity than the Pleistocene Period. And nothing has been met with to prove that the maker of the rude stone tools of that period was not of similar intellectual capacity to some of the lower races of the present day. He was undoubtedly a savage man of small mental capacity; but he had constructive powers altogether beyond apes, which placed him on the high road to advance his condition. Who his ancestors were has not up to the present been ascertained; but it is demonstrable that the further man has been traced into antiquity the ruder his state has been found to be. And if his ancestors were superior to himself, it is remarkable that no traces of their higher civilization have been met with. On the other hand all the evidences we find of man, in very early times, tend to prove that his condition, although slow, and occasionally for a time interrupted, has been marked by steady progress. "From early Neolithic times," as Mr. Geikie writes, "a gradual improvement and progress attended the efforts of our predecessors, until at length a period arrived when man began to abandon the use of stone implements, and for these substituted bronze. And so passing on through the Age of Bronze, and the days of the Builders of Stonehenge, we are at last brought face to face with the Age of Iron, and the dawn of History."[2]

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1 Antiquity of Man, Prof. T. R. Jones.
2 Great Ice Age.