# ON THE EVIDENCE BEARING UPON THE EARLY HISTORY OF MAN WHICH IS DERIVED FROM THE FORM, CONDITION OF SURFACE, AND MODE OF OCCURRENCE OF DRESSED FLINTS.[1]

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The enquiry into the early history of man has of late received great impulse. This is partly due to the increasing number of persons interested in the question, and partly to the wide range of modern research which has brought together evidence from many a distant region and has applied many new methods of investigation; but it is also largely due to the recent advocacy of new theories in respect of the age of man by leaders of science whose opinions are always deservedly received with respect even when they offer only a tentative explanation of phenomena in regard to which we cannot feel that we have sufficient evidence before us.

We must always bear in mind that there was strong disinclination to accept the views of those who first stated that they had found traces of man in river gravels, associated with extinct or migrated animals. But we must also remember that this opinion was often supported by inaccurate statements and false reasoning, the exposure of which threw discredit on the whole evidence, and retarded the acceptance of what was true in the theory.

It is, therefore, worth while to review from time to time each part of the evidence upon which any similar statements are based, and carefully sift that which may be considered as proved from that which is only suggestive. With a view to this I venture to offer to the Royal Archæological Institute a few critical notes, first on the forms of flint implements, especially in reference to what is common to the early stages of their manufacture in palæolithic and neolithic times.

I then propose to draw attention to the condition of

[1] Read at the Monthly Meeting of the Institute, May 5th, 1897.

the surface of dressed flints found under different circumstances, with a view to being able by an examination of the character of the fractures and weathering to recognise the vicissitudes through which flints have passed.

I would next examine the mode of occurrence of dressed flints, and, having regard to their condition, would endeavour to read the history of their deposition where now found.

Lastly, in the light of the conclusions arrived at from an examination of those which are undoubtedly of human workmanship, I would criticise the evidence for the supposed occurrence of a more ancient group of implements, for which the name Palæotaliths has been proposed.

In examining any region where dressed stones are fairly abundant, collectors naturally seek and select the most perfect and typical forms. In many cases, as for instance where the implements are all imported, no unfinished specimens are likely to occur, though fragments of finished specimens which had got broken may be found. But, where we have reason to believe that the instruments were manufactured on the spot, we may, of course, expect to find all intermediate forms, from the lump of flint, selected for its quality and shape, to the nearly finished specimen which at last had to be rejected as a misfit owing to some accident or flaw.

We have, therefore, in all cases to deal with the forms which flint naturally falls into or readily assumes under the hand of man; and what is here said of flint applies more or less to other stones used for the same purpose.

We must bear in mind that the quality of the stone must affect the forms of implement. A coarse mottled flint, such as commonly occurs in the northern chalk areas of the east of England, being full of varieties of texture due to sponges and other impurities, cannot be depended upon to break with the evenness and regularity that is found in the homogeneous black flints of the southern areas, and which is so essential for the manufacture of the finer instruments. Now, it is a curious fact that the implements of what we may call the neolithic fen type, which are made of the local black flint, are thin and chisel-shaped, and so frequently

ground only on the edge as to show that they were chipped into almost exactly the form they now present before any attempt was made to grind them. On the other hand, what we may call the northern or imported type, which is made of the impure mottled flint of Lincolnshire and Yorkshire, is generally a thick double wedge, and is ground all over in such a manner, and to such an extent, as to show that the implement was reduced to its present form largely by grinding, a process which would be less likely to be affected by irregularities of texture than would chipping.

This reasoning would have more force were it not that the implements of other material, such as basalt, felstone, and greenstone, belong to the northern thick wedge type, while from their very wide distribution they cannot be supposed to be copies of the form originated in flint.

Now, we have in East Anglia one district in which flint implements have been manufactured from palæolithic to neolithic times, where gun flints have been made down to the present day, and where the best forgeries of arrow heads since the time of Flint Jack have been produced. We have here, therefore, opportunities of studying the forms into which one kind of flint breaks, both naturally and artificially, and the changes it undergoes in the circumstances which are there observed. The flint which seems to have been used from the earliest to the latest times occurs in large tuberous masses along the bedding planes of the chalk. At Brandon, for instance, in neolithic times there were excavations made along certain tracts of high ground to a depth of from 30 to 40 feet to reach the best layer of flint, which was then worked up on the surrounding area, which is consequently covered with fragments and unfinished specimens. I am not aware that there is any evidence as to where the palæolithic folk obtained their flint, but it could be easily dug all along the outcrop on the hill slopes.

In certain places the gravel beds along the adjoining river valleys are full of flint implements, while in other parts of the district, and even in other parts of the same terrace of gravel, none or few have been found. To this point I return later on. If we examine the gravels in

which the palæolithic implements are abundant we find not only highly finished specimens but also many roughly trimmed flints, and, selecting intermediate forms, we soon realise that we have here the sweepings of a surface on which implements had been made from the stone of the district, and, therefore, we find the results of natural fracture and every stage of artificial trimming, so that hardly any two observers would draw the line between them at the same place. Numbers of examples may be picked up respecting which it might be said that probably, or possibly, primeval man had tried whether they would lend themselves readily to his trimming, but, being dissatisfied, had thrown them away: while no one could feel sure that many of the chipped edges which look so like the work of man might not have been produced by accidental causes. These doubts lend great importance to the enquiry as to the mode of formation of the deposit in which the implements and fragments occur. A selection of specimens illustrative of this point, namely the stages in the manufacture of a palæolithic implement, are represented in figs. B.1 to B.7.

If we examine the wasters and rejectamenta round Grimes Graves, the manufactory of neolithic age, we find there every stage in the process of trimming, from the untouched lump of flint to the implement which was finished as far as general form was concerned, and which wanted only the grinding down to make it into a polished celt. If we arrange some of these neolithic unfinished implements alongside of a series from the palæolithic gravels of Mildenhall we shall see at a glance that at any rate the early stages of the manufacture were the same. Although in the finished neolithic celt the sides are generally straight, whereas they are curved in the palæolithic, this difference does not appear in the earlier stages, but the neolithic implements also have in their earlier stages generally a curved outline, as may be seen in Figs. A.1 to A.10.

In fact, if these specimens had been found in the gravels of Mildenhall there would be nothing in their form to suggest that they were not of palæolithic age. Exactly similar forms have been obtained from the pits and surface deposits of the same age at Cissbury, and

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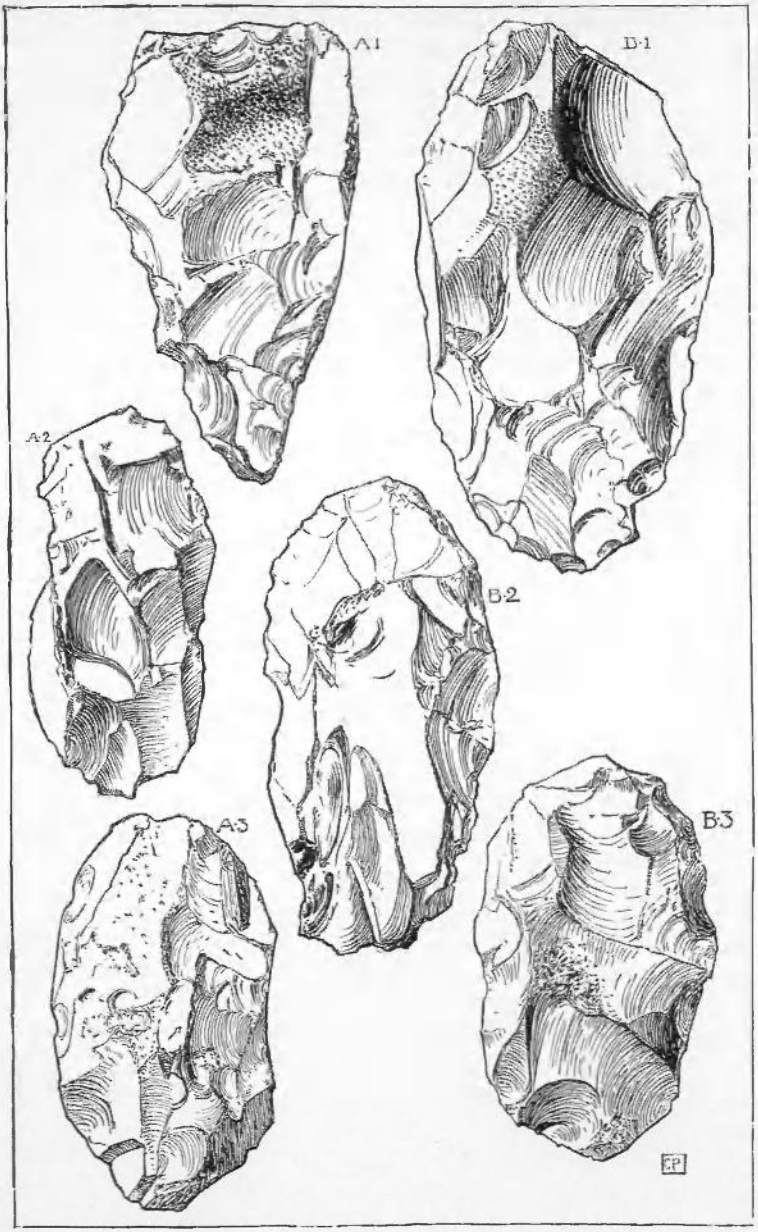
## PLATE I.




COMPARATIVE TYPES OF PALÆOLITHIC AND NEOLITHIC FLINT IMPLEMENTS.

similar forms have been found at Pressigny—compare Figs. A.7, A.8, A.9, B.7.

Two inferences of first importance may be drawn from an examination and comparison of a large number of such specimens :

First, that the change of form from palæolithic to neolithic does not of itself indicate any great advance or any sudden incoming of a new race or introduction of new conditions of life ; and,

Secondly, that unless other evidence is forthcoming, it is not possible to determine whether unpolished elongate ovate implements are finished palæolithic or unfinished neolithic forms. The occurrence of the elongate cusp-shaped forms—that is, of tapering implements, the sides of which have an inward curve instead of an outward bulge —is generally an indication of the palæolithic age of the deposit in which they occur, for that form does not lend itself to development into any neolithic implement. There are some neolithic implements with inward curving sides, but they are rare, and never taper to a point.

What seems to have chiefly determined the form of these implements was the desirability of trimming them to the shape which could most easily be ground down afterwards on a polissoir.

The conditions of the surface of flints is a subject which has received but little attention, and yet it must be allowed to be of great significance in the endeavour to trace the vicissitudes through which the implements have passed, and in the explanation of the origin of the deposits in which they occur. Surface or gravel flints are all broken and weathered, and therefore present a very different aspect from the tuberous masses, or the tabular pieces which we find in place in the chalk or in the chalky boulder clay. But when we come to examine them more carefully we soon see that there are fractures due to blows, and fractures produced by the unequal expansion of the mass under changes of temperature, amount of moisture, etc. We also notice that these fractured surfaces have been rolled and worn, been acted upon chemically, have been coloured by infiltration or bleached by exposure to the atmosphere or moisture.

These are effects which can be distinguished, described, and pointed out in actual specimens, but cannot easily be reproduced in illustrations.

The breakages due to blows show a conchoidal fracture which is related to the double cone which I have elsewhere described.[1] The bulb of percussion, which is a portion of the truncating cone, is generally to be detected on the margin of the flint where the blow was delivered.

The fractures due to unequal expansion and contraction appear first as long, curved cracks, sometimes completely circular or oval, sometimes dividing the surface into segments like phases of the moon. When these cracks are developed, pieces come off, leaving large pan-shaped hollows, or the whole flint breaks up into fragments.

These pan-shaped hollows must not be confounded with the small depressions due to blows which are found on "pitted flints." And the general break-up of a flint under atmospheric agencies can be easily distinguished from the "hackly fracture" which is produced by fire, as when flints are caught in burning weeds. Such fractures, whether due to blows or to the unequal expansion and contraction above mentioned, are both of them indications of exposure on the surface of the ground, and differ in their results from the innumerable taps by which an irregular mass of flint is reduced to a pebble on the shore or the protuberant parts are worn down by attrition in a river. It is not at all uncommon to pick up a flint implement the upper and under surface of which are in a totally different condition, the side which has been exposed to the air being often quite white and patinated, and the under side exhibiting almost the original black surface of the flint. Now, if we examine a very large number of flints, so as, by multiplication of examples in all stages of surface decomposition, to get results comparable to those derived from experiment, we shall find that in some cases the black flint is overspread with cloudy blotches of white, while in others it is covered with minute cracks picked out in white. From such

[1] Soc. Antiq. Lond. Vol. IV, March 19, 1868, p. 95. *Geol. and Nat. Hist. Repertory*, May 1, 1868, No. 34, p. 126. Proc. Camb. Phil. Soc., Vol. III, Nov. 6, 1876, p. 12.

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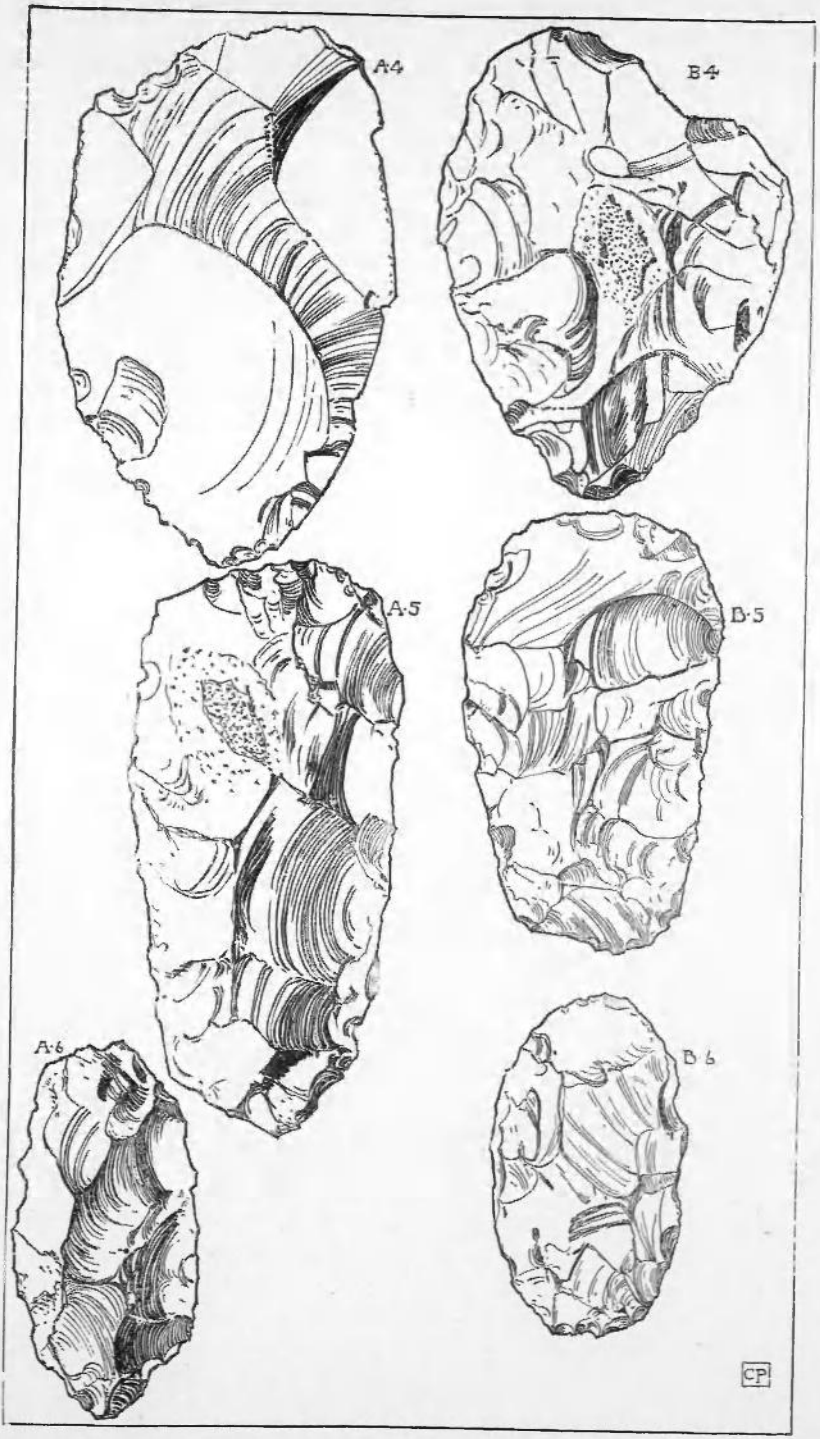
# PLATE II.

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observations we arrive at the conclusion that the bleaching of the flint is due to the alteration of the exterior portion, and that the process is facilitated by the production of a great number of very small cracks. In fact, we find by experiment that the whitening may be caused by the cracks alone, but, as a matter of observation, it seems probable that it is produced chiefly by the removal of the more soluble colloidal portion of the flint, and that this process is made easier by the breaking up of the surface of the flint by cracks. But this removal of the colloidal flint is not a sub-aerial process. The most conspicuous examples of it are seen in tertiary pebbles imbedded in moist clays and loams, where the whole pebble is often affected, being converted into a white chalk-like substance of comparatively small specific gravity, but consisting, according to the analyses of Rammelsberg, of pure silica. It may be observed in this connection that the surface of all flint pebbles is scarred over with minute curved cracks, which are the sections of the small cones produced by the pounding of the stones upon the beach.

The white porcellanous patina of flints that have long been subjected to sub-aërial weathering without wear is different from that porous, chalky texture which is the result of the removal of part of the flint as described above. Under this patina, however, there is often a layer of the more porous material, so that, if a flint which has obtained a smooth patinated surface, with a layer of the porous residue of solution beneath it, has subsequently suffered wear and tear of any kind, we frequently find the porous under layer showing in patches through the shiny patina. Thus making it probable that the patina is not merely the surface condition of the porous white silica, seeing that it occurs on flints which have no layer of the porous silica beneath it, but is not reproduced on the porous flints which have once been covered with the porcellanous patina, but have afterwards been subjected to abrasion or fracture which has removed it in places.

Such a process is gradual, and we find flints in every stage of weathering, from the black flint slightly clouded here and there with flocculent patches to the white

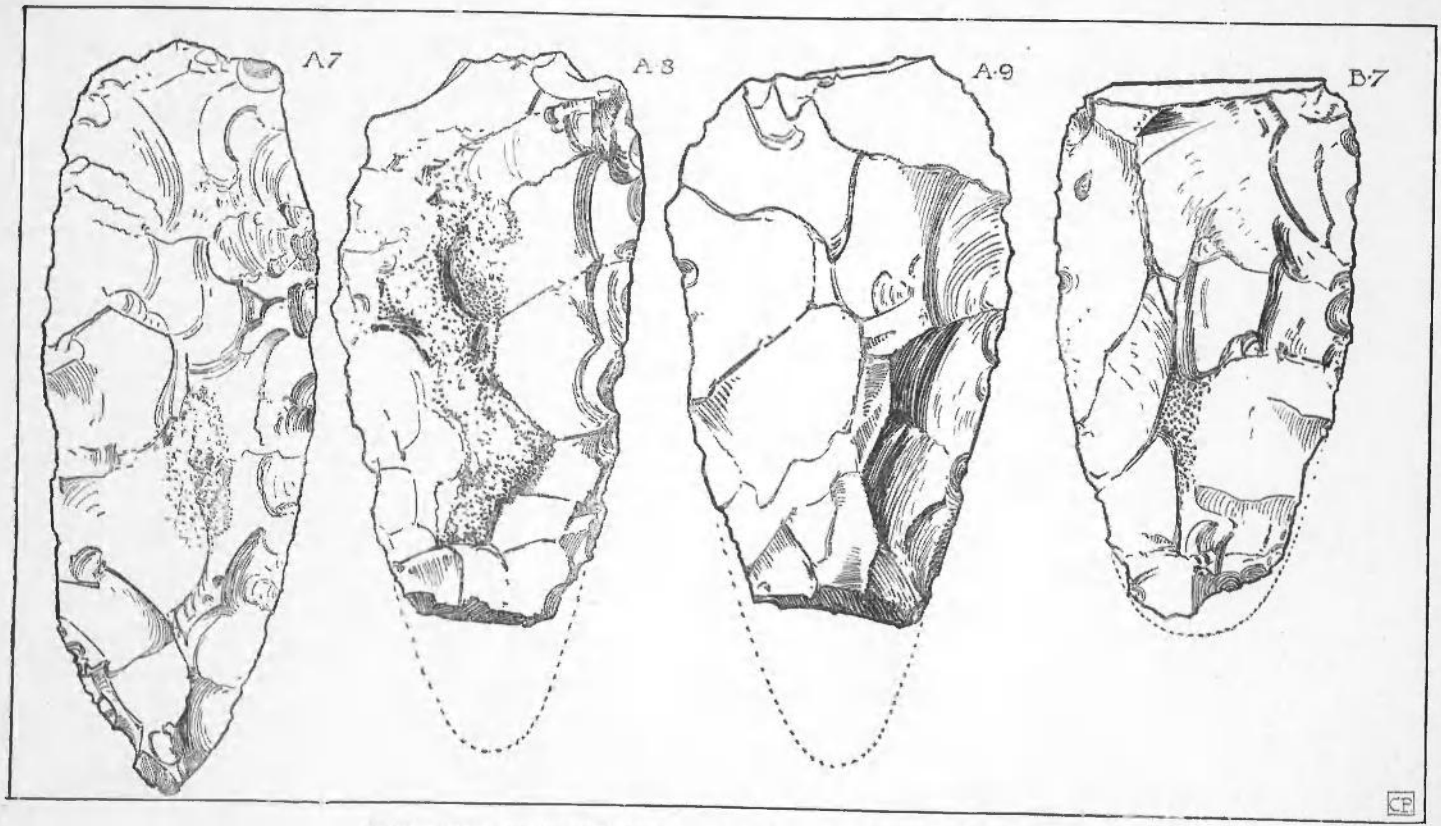
porcellanous patina covering the whole surface. If a flint suffers a new fracture during the process, the different stage in the weathering of the newly exposed surface is apparent; or, if the flint has been turned over we notice the difference between the face which had been long exposed and that which had been in contact with the damp soil and been protected from the light and heat. Every new fracture is, therefore, characterised by its own stage of weathering, and it can generally be seen at once whether any implement is the result of dressing all at one time, so that all the faces are uniformly weathered, or has been retrimmed at any time after the fracture, perhaps, of the original specimen. From such observations also it can be determined whether any flint which is claimed as the result of human agency has received its form at one time or whether the specimen does not, on the contrary, show that the fractures which have given it a worked appearance have been produced at various times so as to suggest surface accidents rather than design.

We may now consider the mode of occurrence of the implements between which we are instituting a comparison.

The neolithic instruments of Grimes Graves or of Cissbury occur in almost identical circumstances. A number of pits were sunk to win the layer of flint which was considered to be the best adapted for the purpose. When as much of the flint had been got out as could be conveniently obtained from any one of these excavations without undermining too far, a new pit was sunk, sometimes with a tunnel into it from an adjoining pit, and the disused pit was filled up again with the chalk and surface deposits which had been dug out in sinking it. As the work of dressing the flint was carried on all round the pits, the infilling was full of the waste, and therefore we find here cores, flakes, and chips and various "misfits," with the certainty that they have been lying there in the chalky soil since the pits were filled.

These flints show, therefore, many stages of surface weathering which they had undergone before they were buried, and the results also of such changes as were brought about in the soil in which they have been so long imbedded. They have generally a black mottled or

PLATE III.

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wholly white surface, but only in very exceptional cases any iron stain.

Thousands of fragments from the old workings never did get buried, but still lie scattered over the surface of ground where they are subjected to every kind of accident producing fracture and weathered surfaces. We see some on which the direction and character of the blows given by design are obvious, but which have subsequently been knocked about and chipped at different times as they lay on the surface of the ground, and the weathering, as we have explained above, tells us exactly the order of occurrence of these later accidental fractures. Others have yielded to the expansion and contraction due to changes of temperature and moisture.

The same processes attacked these dressed flints as have been acting upon the natural fragments which cover the ground. If such a collection of flints were swept together by any agency we could easily see that they had once been scattered over the ground, and subjected to fracture at various intervals, and also to long continued surface weathering.

The palæolithic implements, on the other hand, are most commonly found in terraces of gravel having a definite relation to river valleys.

They are sometimes found on ancient surfaces, even when there is no gravel beneath. But the specimens with which we are more especially concerned with a view to our present enquiry are found in connection with valley terraces. The gravels in which they occur are never much rolled. So obvious is this that we are able to pick out the pebbles of eocene age, for instance, from the flints which belong to the pleistocene gravel. There is no such thing as a much-rolled gravel among these pleistocene deposits. Further we see that the fractures on the flints of which they are composed are of many different dates, and that they were weathered for longer or shorter periods before they were imbedded in the gravel. Moreover, they are fractures, which by their character are seen to have been the result of surface accidents, of blows, and of expansion and contraction. Flint implements imbedded in these gravels partake of the same characters. Those that were buried soon after they were made, before they received

any accidental fractures, are equally and evenly weathered on all the faces; those that were long exposed on the surface before they were imbedded in the gravel show by the different ages of the weathered surfaces the successive accidents that caused the newer fractures. In fact, we may safely infer that all the valley gravels in which the implements have been found are made up of ancient surface soils, the downward creep of which has been arrested by the river bed, but they have suffered very little onward rolling. A great talus received by the flooded river was heaped into a gravel bed, which was then left at rest until some change in the path of subsequent floods shifted it to another part of the valley. But there is never in the whole mass, and rarely in individual bones, implements, or naturally fractured stones, any evidence of continuous rolling action of the river. There is generally evidence of transport seen in the rough sorting of the material in any section of such gravel and sand, but there is nothing like what is done by the sea, such as may be seen, for instance, in the case of the originally angular flints and implements of the Solent gravel, where masses of it have fallen on to the seashore at the foot of the Barton Cliffs, and the sub-angular flints are being rolled into pebbles. Bands stained by oxides of iron show where the water levels have been long stationary, but this stain does not obliterate the evidence of the successive fractures and weatherings which the fragments underwent when exposed on the surface of the ground long before they had been arrested at the bottom of the valley.

In this way we may perhaps account for the variety of forms of palæolithic implements found in one gravel bed. They may not be of the same age, for we infer that they were not dropped into the river, but came down with the soil creep and the rain wash, and represent an enormous lapse of time. Here is a satisfactory explanation of the occurrence of rudely dressed fragments and of flakes all showing signs of wear and weathering. We have here the refuse of an implement manufactory. Instead of imagining that early man sat in a canoe, or on the ice, or on the shore to make an implement, and threw the refuse into the water, we see by the state of the implements and fragments that they lay long on the surface of

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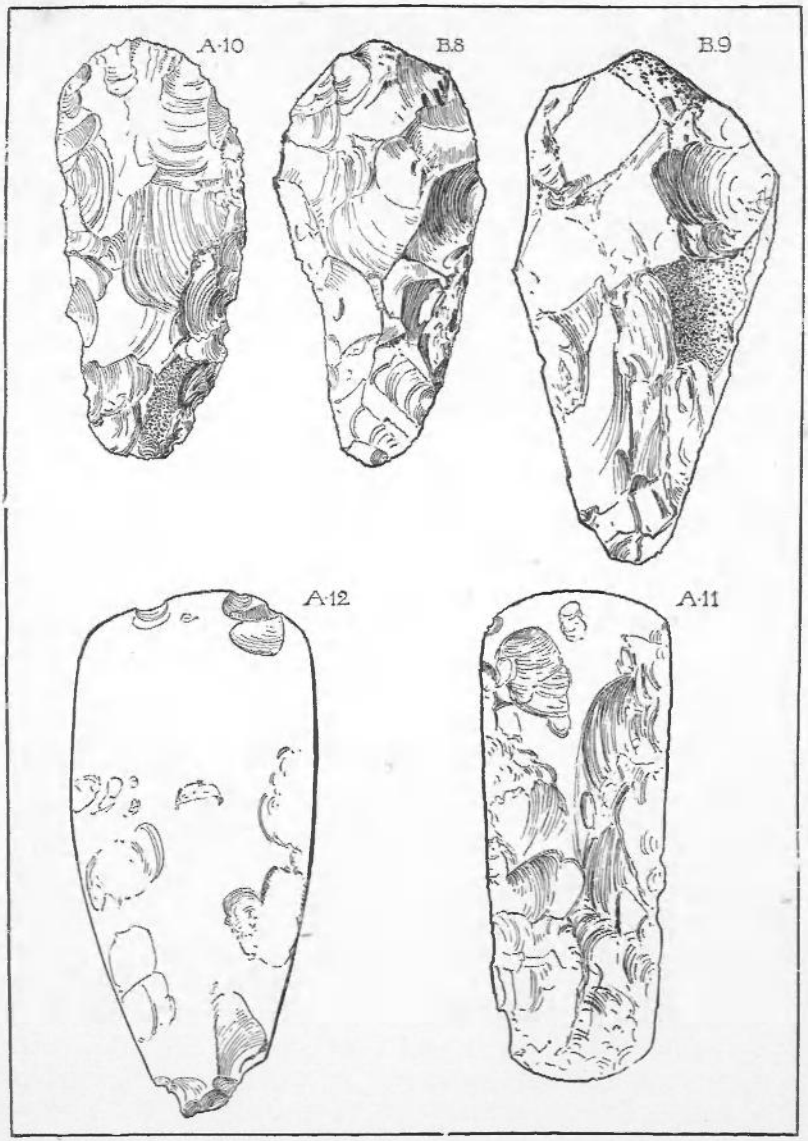
## PLATE IV.

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the ground. Through those ages important geographical changes were brought about, so that at the close of the period many plants and animals which were common at its commencement no longer existed in the same area. From these considerations it would appear not improbable that the duration of the palæolithic age has been underestimated while the interruption between palæolithic and neolithic times has been exaggerated.

The impression that there is a great break between palæolithic and neolithic seems to have arisen from the belief in the difference in the character of the implements belonging to the two ages, from the contemplation of the biological changes which have taken place since the time of palæolithic man, and from the study of the relation of the gravel terraces to one another and to the physical geography of the district.

If we have regard to the manner in which the rude instruments of savages are suddenly superseded by those introduced by more civilized races, we see that that kind of change does not imply any great lapse of time, although there may have been any interval between the newer and the older conditions.

This kind of importation of different forms seems, as we have shown, to have taken place along the east coast of England, where the bulging polished stone weapons, similar in form whether made of greenstone, felstone, or the mottled flint of the northern area, appear to have been introduced into the district where the polished implements manufactured out of the black flint of the country were of the thin chisel form. But the sudden incoming of something quite different does not appear in the manner in which the neolithic types occur in a district in which palæolithic implements had long been made. There is not between the palæolithic and neolithic of East Anglia that change in the material which we see between the bulging northern neolithic celt (Fig. A.11) and the chisel shape of the fenlands (Fig. A.12), but only an advance in the manufacture from rough chipping to polishing, and a gradual modification of form to facilitate grinding down the edges and sides.

The second point seems at first to be more difficult to explain. If between palæolithic and neolithic times

animals and plants had become largely modified, that would in the present state of our knowledge lead us to infer that there had been a great lapse of time between the two periods, and considerable geographical changes which it is generally supposed require a long time for their consummation. But most of this evidence breaks down on closer examination.

In the first place a very large proportion of the forms of life which characterise the palæolithic deposits are only locally extinct. Some seem generally to have attained a larger size, and to have been of coarser build, but that is only what we observe if we compare the red deer of the fens with the smaller animal still common in the British Isles. The bison of the rivers of East Anglia disappeared, but we have seen the bison disappear in America in one generation. The wolves have been driven to the forests and mountains, and the lions to the deserts in recent times.

The hyæna, hippopotamus, bear, and lion, and other animals of the gravel which formerly were assigned to extinct species, are now found to be the same as those still living. They have only been compelled to move on.

Other animals, such as the urus and Irish elk, seem to have lived through the age of transition.

The relation of the river terraces to one another, and to the physical geography of the district, points to a long period, during which the material which we find in the river terraces was being accumulated on the surface. The terraces in which these old surface soils are preserved are themselves of different ages. There is no proof of any gap or break or cataclysm, but only of continuous changes, sometimes delayed sometimes hurried up by earth movements, of the recurrence and importance of which we have abundant evidence.[1]

If these views are correct we may expect to find some of the ancient surface soils caught on ledges, or on slopes of small gradient on the flanks of the hills. There are areas over which the soil-creep is slow and the surface soils are of great antiquity. There are conditions where the flints are buried in the "head" or "rain wash," or

[1] *Journ. of Trans. Vict. Inst.*, March, 1880. *Proc. Camb. Phil. Soc.*, 1893, pp. 98, 219; Vol. IX, 1896, p. 114.

"run o' th' hill" or trail, or whatever we may call the surface accumulation. Such flints, after lying embedded for ages, are again exposed by sub-aerial agents, and again subjected to surface wear and tear. The stain they received when buried sticks to them long after their exposure, and they may show evidence of many successive ages of entombment and exposure.

What wonder, then, that in high terraces which represent old surface soils, on high grounds where ancient surface soils still lie, there should be found many a flint curiously fractured by frost and sun, or by the tramp of heavy animals!

What more likely than that some should be much chipped along an edge which the form of the flint caused to be oftenest presented to accident! But unless the fractures are along the parts of the flint which are not exposed to accidental blows, unless the *condition* of the exterior shows that these fractures were all made at one time, there is no evidence of design. If the terrace gravel is not distinctly a gravel of water transport, and not merely a terrace of arrested soil-creep, there is no evidence of great antiquity.

I must say that I have never yet seen any evidence which would justify the inference that any implements older than palæolithic have yet been found. Palæolithic implements finished and unfinished are frequently to be picked up on the surface, and with them many flints naturally fractured into curious forms, and if any one lays himself out to find bill-shaped, hook-shaped, half-moon-shaped flints, with the inner or outer edge chipped, he can easily obtain such a number as would allow him to urge with some plausibility that there was evidence of design shown in the frequent occurrence of similar forms. The design is in the selection of accidental forms, not in the manufacture of serviceable instruments. The term palæotalith seems, therefore, unnecessary at present, as there is nothing to which it can be applied, and as it will be long before it can be asserted that we have discovered the very earliest trace of man it will probably be long before the word is wanted.

## DESCRIPTION OF PLATES.

The figures are grouped so as to facilitate comparison between the Neolithic and Palæolithic forms, especially in their earlier stages. A. indicates Neolithic; B. Palæolithic.

### Plate I.

A.1 to A.3. Unfinished implements from Cissbury (Neolithic).
B.1 „ B.3. „ „ „ the gravels of Mildenhall (Palæolithic).

### Plate II.

A.4. Unfinished implement from Grimes Graves (Neolithic).
B.4. „ „ „ Mildenhall (Palæolithic).
A.5. „ „ „ Cissbury (Neolithic).
B.5. „ „ „ Mildenhall Gravel (Palæolithic). This specimen approaches the Neolithic type in the straightness of the sides.

### Plate III.

A.7. Implement almost ready for grinding. Grimes Graves (Neolithic).
A.8. Oval tapering form from Grimes Graves (Neolithic).
A.9. „ „ „ „ Pressigny (Neolithic).
B.7. „ „ „ „ Mildenhall (Palæolithic).

### Plate IV.

A.10. Tongue-shaped implement. Cissbury (Neolithic).
B.8. „ „ St. Acheul (Palæolithic).
B.9. „ „ Allington Hill, Cambs. (Palæolithic). This specimen was found *in situ* in the gravel by Mrs. Hughes.
A.11. Straight-sided thin chisel, fen type, ground at one end only. Burwell Fen, Cambs. (Neolithic).
A.12. Bulging thick wedge-shaped, northern type, ground all over. Horningsea, Cambs. (Neolithic).