# THE GRAVEL AND FLINT IMPLEMENTS OF BLEAK DOWN, ISLE OF WIGHT

By HUBERT F. POOLE

BLEAK, Blake or Black Down, as it is variously given on maps of the Isle of Wight, is a gravel-capped spur of the Lower Greensand formation, running out from the main mass of the southern range of downs in a northerly direction. On the Ordnance Survey 1-inch map, 1923, sheet 142, it occupies the greater part of squares G. 9 and H. 9, and the whole is contained on sheet 98 N.W. of the 6-inch map. As a down it can only claim the modest maximum height of 278 feet above Ordnance datum, and of approximately 160 feet above the adjacent River Yar, altitudes, however, which enhance the importance of the implements occurring in the local superficial deposits. This elevation being reached by easy stages, the relief of the down appears, from certain points, to be lower than it actually is. The northern end and the slopes are under cultivation or grass and the southern end supports a rough growth of furze, heath and fern, which is rapidly disappearing under the inroads of a mechanical excavator. The main road from Rookley to Niton runs along the western side and a secondary road along the eastern side. There are two main gravel pits on the down, one to the south belonging to the " Vectis Stone Co." and one to the north known as Cheek's Pit. Slightly further to the north is a small pit now only used as a rubbish dump, whilst various old and overgrown diggings between the two main pits somewhat modify the original relief of the down. The sides of the down are gouged with a series of coombes, particularly on the east, the slope of the plateau being slightly in that direction. These coombes run up the down to the boundary of the gravel, having been formed by water thrown out at its junction with the underlying strata. This partly stratified gravel extends the whole length of the down and is of variable thickness, but has been dug to a depth of 9 feet in Cheek's Pit, whilst at one point in the same pit where a cross channel has cut into the underlying clay it reaches a maximum of 15 feet 6 inches. It belongs to the series called " Plateau Gravel " by the Geological Survey, a term used to distinguish the older stratified gravels, laid down before the existing valleys were excavated to their present extent, from the Valley Gravels, which have been deposited along the lower parts of those valleys.

At its highest point the surface of the down is at 278 feet Ordnance datum, the average surface level for the southern area, including the Vectis Stone Co.'s Pit, being 274 feet Ordnance

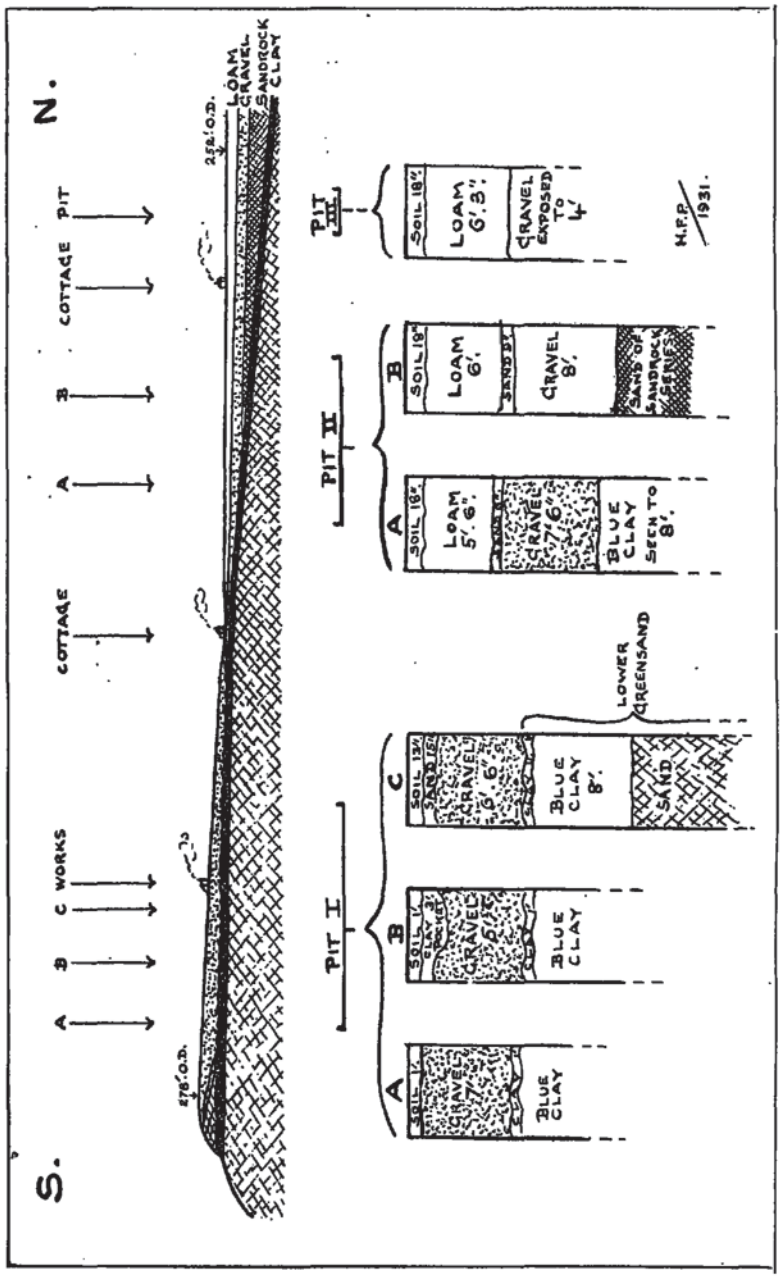


DIAGRAM I.

Longitudinal section, south to north (not to scale), of the superficial deposits on Bleak Down, Isle of Wight. The horizontal distance represented is 1½ miles. Below—measured sections taken at the points indicated above.

datum. Allowing an average depth of deposit, the base of the gravel over this area would be at an elevation of 266 feet Ordnance datum. At first sight the exposures in both the southern and northern pits appear to belong to a continuous gravel sheet laid down at one time, but a more intimate study has shown that the northern gravel has been mainly derived at a later date from the southern spread and rearranged at a slightly lower level. The whole is evidently a series of deposits laid down by flood water in a Pleistocene river valley that followed very closely the direction of the valley of the present Medina River. From 278 feet at the southern end of the down the surface gradually descends to 252 feet at the north, and a series of outliers further to the north appear to mark the extension of a once continuous valley. The elongated spread of gravel at Northwood, distant between five and six miles and at 200 feet Ordnance datum, may probably be assigned to the same valley. The condition of the gravel there is consistent with this, being very much more waterworn. An extensive search at Northwood has failed to produce implements, but the frost-fractured implements such as are found on Bleak Down could only travel a very short distance before separating into unrecognisable fragments. The river undoubtedly extended northward to join the old Solent River and also drew on a larger catchment area to the south of the Isle of Wight, which during Palaeolithic times formed part of the land mass connected with the Continent. The volume of water required to transport so large a quantity of heavy material must have been considerable and can only be accounted for on the theory that a severe climate prevailed. The melting of snow and ice in large quantities would provide the necessary volume of water for flooding the valley, when both surface material and the débris of the frost-shattered rocks would be carried along to be deposited in its lower parts. The Ice Cap is known to have extended as far south as the Thames Valley, and conditions within so short a distance must have been very severe with the land deeply frozen and heavy snowfalls. A large proportion of the flints and many of the implements show evidences of these conditions in their thermal fractures and pittings. Possibly the contortion of the southern patch of gravel, where it rests on the clay, may be due to creep induced by extreme variations of temperature, the gravel having been forced into the clay floor which lies in a series of waves or corrugations throughout its visible length, the main thrust having come from the south.

Since the deposition of the gravel elevation and much erosion have taken place, the Eastern Yar flowing at the present foot of the down on the east side being 160 feet below its summit at the southern end where it is crossed by the high road at Lower Elliot's ; and towards the northern end, at a point about half a mile north

of Godshill where the railway crosses the main road it is 200 feet below the summit, while the Medina on the west side is at approximately the same level. The fact that the strata have been eroded to such depths by subaerial agency, leaving a ridge standing where the bottom of a Pleistocene valley existed, gives a graphic idea of the immense time that has elapsed since the gravel was laid down. The gravel capping, firmly packed and insoluble, resisted much of this erosion and acted as a protective coating to the underlying strata, so that the ridge now forms a divide between the Medina River and the Eastern Yar. It would seem that, with the disappearance of the snowfields and a consequent decrease in the volume of water, the river took the line of least resistance along the eastern edges of the gravel spreads. With the ensuing vertical erosion its course, still running approximately parallel to the gravel spreads, was gradually shifted eastwards, due perhaps to the slight eastward inclination of the Bleak Down plateau. Continuing to flow northward, it joined the Medina *via* Blackwater. At a later date, about the time of the deposit of the Bridgecourt—Little Kennerley gravel terrace, it was captured by the Eastern Yar at a point about five-eighths of a mile S.S.W. of Merstone Station.[1]

Economically the gravel is interesting as providing employment for about 70 men at the Vectis Stone Co.'s Pit in its various departments, and from 12 to 28 at Cheek's Pit. At the Vectis Stone Co.'s Pit the gravel is dug and immediately loaded, with its matrix, into trucks running on rails and conveyed to the washing and crushing plant which, when in full work, deals with some 800 tons each week. The washed and crushed material finally passes through revolving drums which deliver it in seven grades from 1/8th in. to 2in. in diameter. Certain grades are heated and tar-sprayed for surfacing roads, and this is considered to be superior to granite facing, giving a less slippery surface. The finest grades are used in making cement blocks, posts and a variety of other concrete work. Some 50,000 gallons of water are used each day in washing the gravel, and by conserving the supply by running the used water back to the reservoirs the bulk of it has so far been obtained on the down itself. The Lower Greensand clay underlying the gravel plays an important part by holding up the water, and reservoirs have been dug in it to maintain the supply. At Cheek's Pit the gravel is hand sifted, but a modern plant for washing and crushing is in course of erection

## The Superficial Deposits.

The spur forming the body of Bleak Down consists of the ferruginous sands and clay beds of the Lower Greensand, and over its southern half the uppermost bed is a bluish Gault-like

1. Strahan and Reid, Geological Survey Memoir of 1889, p. 218.

clay, but to the north this dips beneath the Sandrock Series and the gravel rests directly on the sandstone. A section of the Ferruginous Sands may be seen in the sides of the sunk road running transversely across the extreme southern end of the down and the blue clay is exposed in two small reservoirs on its summit, one in each of the main pits. The southern slope of the main anticline of the Isle of Wight being more gentle than that to the north, and being disturbed by a small fold coming in from the direction of Shanklin, the beds below the superficial deposits are inferred to be approximately horizontal in the southern half of the down, whilst in the northern half there is a gentle dip to the north. Diagram 1 gives a longitudinal section of that portion of the down where the strata are exposed in workings, and illustrates this description. The surface of the southern half of the down slopes gently from 278 feet Ordnance datum to 254 feet Ordnance datum, and the northern half is practically horizontal at 252 feet Ordnance datum. At about the centre the relief is interrupted by a slight hollow indicating a point where the head of a coombe reaches the summit of the down.

The blue clay would appear to have an average thickness of about 9 feet, except where it has been eroded at the edges, the upper surface to a depth of from one to two feet showing a colour change to yellow. Over the southern half, where the gravel rests directly on its surface, it has been squeezed into a series of folds or corrugations running transversely across the down as though by pressure of the superincumbent deposits. In one place a well has been dug through the clay with a consequent loss of water in the underlying sands.

The lowest Pleistocene deposit is the gravel averaging 7 feet in thickness exposed in the southern working where, however, its surface is deeply eroded into pockets containing clays and sands, and 8 feet at the northern working. The coarse material of the gravel consists entirely of flint and chert, mainly much rolled and derived from other, earlier, gravel deposits since vanished. A proportion of the flints are angular, due to the disintegration of the nodules by thermal action. Chert occurs in angular and sub-angular form and a softer chert in rolled fragments, the series suggesting that this material has not passed through so long a history of changes as the flint. These materials were gathered during the erosion of the Chalk and Upper Greensand beds, which occur at higher levels to the south, the direction from which the gravel has been drifted. No foreign erratics or material from other local strata have been noticed and contemporary fossils appear to be absent. There are no indications of marine action. The matrix varies from coarse ochreous sand to clay; at the southern end of the down it is generally of a more clayey nature,

and to the north the ochreous sand is a more constant feature. Washed samples of the coarser matrix show it to consist of small worn pieces of flint both ochreous and bleached, small rounded fragments of chert, much fine sand and a few small polished quartz pebbles, the two latter doubtless derived in part from the upper beds of the Lower Greensand. A large proportion of the flints are frost-pitted or fractured, implying extreme thermal conditions. These conditions seem to have prevailed more than once during the accumulation of the Bleak Down gravels, as will be shown in the sequel.

Although the southern and northern gravel-spreads appear to be continuous, this is merely due to a trail of gravel connecting the two. After the deposition of the southern gravel further erosion of the valley took place immediately to the north. Subsequently the surface of the southern gravel was eroded, the material, with some additions, being deposited in this deepened part of the valley. The base levels of the two gravels are: southern, 266 feet Ordnance datum; northern, 236 feet Ordnance datum, a difference in level of 30 feet. It will be seen that the spreads represent two terraces following the general trend of the original valley, but on locally divergent lines. The difference in level is not so apparent on the surface of the down owing to the erosion that has taken place to the south and a deep deposit of loam above the gravel to the north. The loam over the northern gravel averages 6 feet in depth, the lower part stratified, the upper part structureless and plugged or pocketed into the lower. Over this is an average thickness of 18 inches of soil. The terraces mark two periods of deposition separated by a period of elevation and erosion, the subsequent diversion of the river marking another period of elevation and maximum erosion.

Differing so much in their arrangement and in the distribution of the contained implements, the two terraces must be considered separately.

### The Higher Terrace.

Pit No. 1 of Diagram 1, Vectis Stone Co.'s Working, average base level of gravel 266 feet Ordnance datum.

This is the most extensive digging on the down, though continuous sections of any length are seldom available, so that the features to be described could not all be observed at any one time. Diagram 2, a transverse section of the summit and eastern slope of the down at its southern end, will further explain the beds in this pit. Immediately eastward of the section the slope of the down drops much more rapidly. In the diagram the Lower Greensand has been divided into: Ferruginous Sands

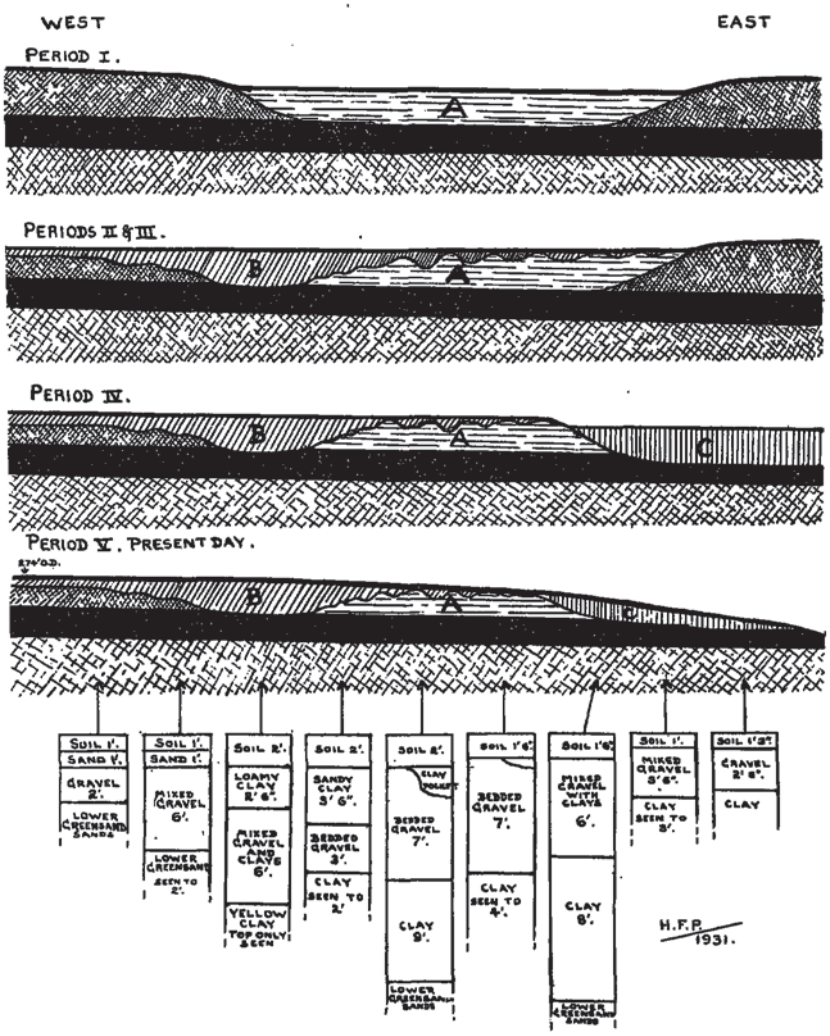


DIAGRAM II.

Transverse section, west to east (not to scale), of the deposits on the summit and eastern slope at the southern end of Bleak Down, Isle of Wight, Vectis Co.'s Pit, higher terrace. The horizontal distance represented is about 300 feet. Periods I to IV represent the theoretical sequence of deposits.

Below—measured sections taken at the points indicated.

(cross-hatching), clay parting (black), Sandrock Series (finer cross-hatching). The Pleistocene deposits are indicated by shading—the oldest gravel (horizontal), the second and third (diagonal), the fourth (vertical). Period V represents the section at the present day. The gravels indicated in the diagram have also been lettered "A," " B " and " C " for text reference.

The commercial excavation on the southern side of the works has been carried out in a series of parallel trenches running from north to south, and the transverse, east to west, section has been compiled by joining up large numbers of measured sections taken during the digging. A few of these are shown at the bottom of the diagram. This transverse section has produced results rather unusual in their completeness and also in the restricted distribution of the implement types. The geological evidence shows that there are three separate deposits lying side by side at much the same level and not superimposed on each other, or occupying separate terraces, as is more usual. It was evidently a long period of stability with little or no change in the relative levels of land and sea. Stratification has only to be considered with regard to the pockets in the surface of the older gravel. Personal finds have been sufficient to prove that implements of similar type may occur at any level in these deposits. An attempt to illustrate the chronological sequence of the deposits has been made in Diagram 2, Periods I to IV.

### Period I.

The original deposit of the valley is represented by " A." This is a distinctly stratified gravel. At the base the corrugations of the clay of the Lower Greensand are filled with gravel which occasionally repeats the corrugations in its bedding, but stratification is not often so clear at the base. Higher up in the gravel seams of pale clay and sand occur, when stratification becomes more easily visible, some of the seams being contorted into wavy bands. The gravel is ochreous in its lower parts and but little stained or whitish towards the top ; occasional seams of more ochreous staining occur throughout. The matrix varies from pale clay, yellowish or grey, to coarse sand and fine ballast. In the sandy matrix it is more compact than in the clay, the face of which is more liable to part and fall unexpectedly.

The implements found in this deposit are greatly worn and deeply patinated types of Chelles and St. Acheul I.

### Period II.

Position " B " of Diagram 2 represents the second stage of deposit, and is seen from its contained implements to be separated from gravel "A" by a long time interval. On its eastern side it

rests against the eroded slope of the stratified gravel " A," at its deepest point it just reaches the upper surface of the clay, and to the west it thins out over what appears to be a fragmentary outlier of the Sandrock Series. The clay surface is corrugated, as at " A," and the surface of the Sandrock has been forced into transverse ridges of a similar but much less regular character. Lying to the west, it shows a slight change in the course of the river and erosion of the western edge of the original deposit. The gravel is very faintly stratified for short distances in its deepest parts, but the bulk is composed of a confused and jumbled mass of gravels alternating with clays and occasional sands. These changes may occur within a very few feet, and where slight signs of bedding are occasionally seen in the gravel masses they end suddenly against a mass of a different nature. The clays and sands contain flints scattered in their mass. The arrangement of the deposit warrants the assumption that much of the material originated from masses of gravels and clays drifted into position in a frozen state. This has become mingled with matter derived from "A" and redeposited with some new loose material. The deposit thins off to the west, where the limit of its extension is probably marked by a section showing less than two feet of gravel resting on the sandstone. The faintly stratified gravel at the base of the deepest section very possibly belongs to the older deposit " A," but it has not been possible to separate them in the field.

The implements found are derived specimens of the Chelles and St. Acheul I cultures with the addition of St. Acheul II, a fine pointed ovate of the latter, totally unworn, dating the deposit. This specimen is illustrated as Fig. 12, Plate 3.

**Period III.**

The pockets in the upper surface of the original gravel "A" fade gradually into the western gravel and may belong to the last phase of deposit " B," but more probably, as the only three implements found in them suggest, are a later deposit laid down under conditions of less severity and lying between the deposition dates of " B " and " C." These pockets are very distinct over the surface of "A" and are mainly filled with pale grey clay containing scattered flints throughout its substance which is entirely unstratified. Occasionally the pockets are filled with sand varying from pure white to yellowish in colour, or with ochreous loam. They have been seen in longitudinal sections to vary from a few feet to more than fifty feet in length.

The implements found here are all types of Le Moustier, totally unworn.

### Period IV.

This is deposit " C " of Diagram 2, and is quite distinct from "A" in the manner of its occurrence. It appears to have been laid down at a slightly lower level than "A" and " B," probably during the commencement of the period of minor elevation to which the lower terrace is due. The gravel has dug itself deeper into the blue clay than either "A" or " B," and where seen in section, the top of the underlying clay is without corrugations. Masses of the discoloured upper part of this clay are incorporated in the body of the gravel as seams and lenticular masses. Stratification is very obscure, and beyond the restricted seams of clay the gravel consists of confused masses. Pockets are absent from its upper surface. Actual contact with "A" has been inferred rather than observed, though in one or two places the sudden ending of a line of bedding has been thought to mark the junction. The whole is less firmly compacted enabling it to be easily dug by the excavator, a thing it had been found impossible to do at "A" without damage to the mechanism. The upper half of the gravel in this division consists of greatly altered and rough-surfaced nodules in a dark sandy matrix and suggests long exposure on the surface, the matrix, darkened by decayed vegetation, appearing to have been slowly accumulated under subaerial conditions.

An unworn but extremely frost-fractured implement of Le Moustier type dates the deposit, and though it is of the larger and earlier form, two other specimens, both abraded and deeply patinated, attest the fact that a considerable time must have elapsed since the commencement of that culture.

### Remaining Gravel of the Higher Terrace.

At about the position of the Works the deposits described above cease to be distinct, and from here to the cottage near the centre of Diagram 1 the gravel presents the appearance of redeposited material. It was doubtless largely drawn from the erosion of the southern gravels. Over this area it is most probably to a great extent contemporary with gravel " C," which it closely resembles in the arrangement of its material. Little digging has been done here in recent years, and the only implement finds are one of late Chelles form and one of St. Acheul form. These two implements are not included in Table 1, which deals with the section shown in Diagram 2 only.

The surface soil over the higher terrace has so far proved barren. A feature of the gravels has been the occurrence of underground water channels. One of these, immediately over the clay, was traced through positions "A" and " C " for over 50 yards, running towards one of the coombes which it had no doubt assisted in making.

### The Lower Terrace.

Pit No. 2 of Diagram 1, Cheek's Pit, average base level of gravel 236 feet Ordnance datum.

The entrance to this large pit is from the road running along the east side of the down. The gravel at its southern end rests on the blue clay, but, as the Lower Greensand strata commence to dip to the north slightly south of this point, the clay gradually disappears below the Sandrock Series on which division the northern part of the gravel accordingly rests. The gravel is from 6 to 9 feet deep and clearly stratified horizontally without contortion. At a point near the southern end of the pit a cross channel, containing the lowest known deposit of the terrace, has cut deeply into the clay, the total depth of gravel here being 15 feet 6 inches. In this restricted area the base level of the gravel would be at 228 feet Ordnance datum. The gravel consists of flint and chert only, as in Pit 1. The heavier, larger rocks are at the base, where also it is usually most deeply stained, the upper third is usually bleached. About halfway down interrupted bands and seams of darkly-stained flints occur with manganese coating. The flints are frost-pitted and fractured and the chert occurs in angular and sub-angular form with the softer natured sandy chert as rolled pebbles. The whole is very compact in a gritty matrix and very occasionally it is conglomerated at the base. Towards the surface it is in places interrupted by seams and bands of sand and fine gravel showing current bedding. An underground water channel has been noted at about the middle of the gravel. One of the largest rocks from the extreme base is of chert, considerably rolled and waterworn, measuring about 20 inches by 12 inches. Inclusions of clay, like those of the higher terrace, are totally absent. The implements occur at all levels in the gravel and are types of St. Acheul I and II and Le Moustier. Though the pit has been entirely worked by hand and the gravel hand sifted, only eleven implements can be accounted for, any frost-fractured specimens transported from the higher terrace having probably been destroyed during the interval of erosion.

Immediately above the gravel is a band, 6in. to 12in. thick, of sharp sand with small flints. This is fairly constant and distinct throughout the pit but occasionally mingles with one of the sandy seams of the gravel proper. A Le Moustier point was found here by one of the diggers, its horizon confirmed by its porcellaneous lustre which is frequent on flints at this level. Some months personal search in this band produced a flake, *in situ*, of the same lustre and patination, which may also reasonably be assigned to the Le Moustier period.

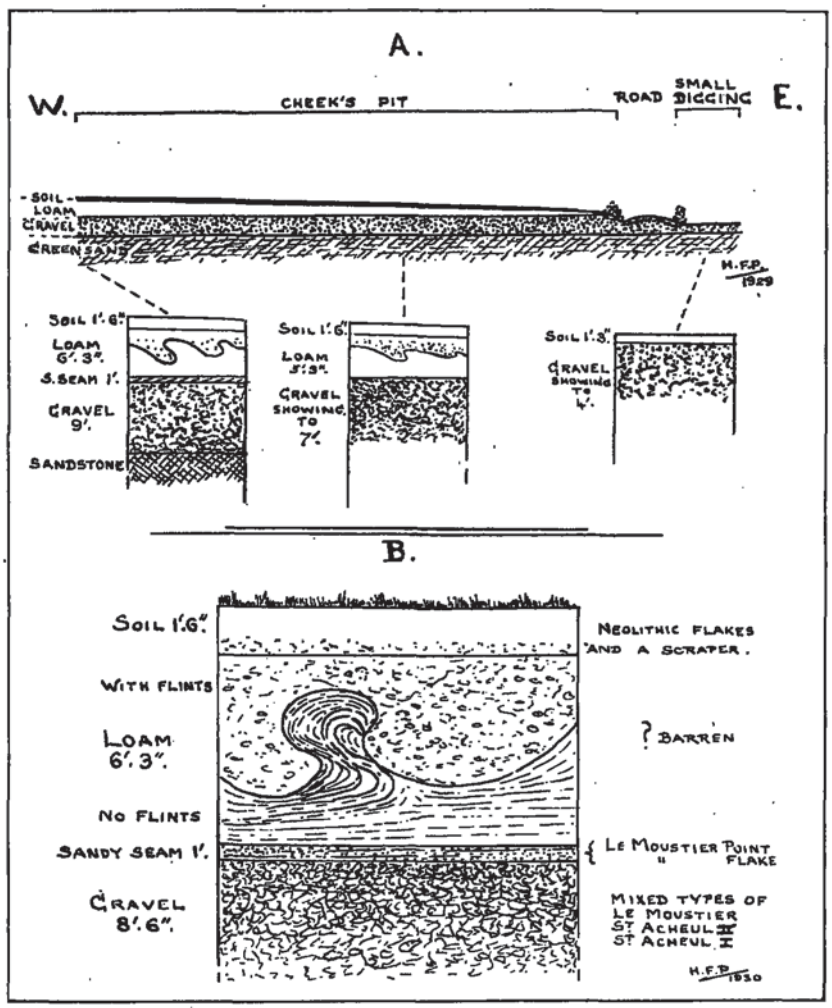


DIAGRAM III.

(A) Transverse section, west to east, drawn to scale, of the deposits on the eastern slope at the lower terrace, Bleak Down, Isle of Wight, Cheek's Pit. The horizontal distance represented is 275 feet.

Below—measured sections taken at the points indicated.

(B) Contortion of stratified loam and details of section.

The next stratum is a greyish-green stratified loam into which has been forced an ochreous loam of a darker colour, unstratified and containing stones scattered throughout its substance, the whole loam series being about 6 feet thick, rather less to the south and increasing slightly towards the north. The whole may best be described as a loamy brick-earth. The *Geological Survey Memoir*, 1889, p. 218, states : " Sometimes a layer of loam 1 to 3 feet thick, lies above the gravel, but nothing that could be mapped as brick-earth." At that date the pit had evidently only been dug back so far as to show 3 feet of loam (see Diagram 3). The loam with flints appears to have been plugged into the stratified loam, which is without flints, whilst in a semi-frozen state, pressure coming from the south. This has caused contortion of the stratified loam which is in places folded over on itself by pressure from separate adjacent pluggings. (Diagram 3 B.) The flints in the plugged-in loam are mainly small, greatly altered and both angular and worn. Occasional specimens of large size occur, greatly altered, very severely frost-fractured and rolled. Chert is present in small rolled fragments and, for the first time, fragments of ironstone from the sandstone beds of the Lower Greensand. Many of the altered flints resemble chalk, but give no reaction when treated with acid.

The surface of the plugged-in loam has been eroded, and above this the soil is 18in. in thickness. The surface-soil consists of dark sandy loam with decayed vegetable matter and below it is mixed with numerous small flints, rolled chert and rolled ironstone fragments. Very rarely struck flint flakes and wasters have been found, and one scraper of a type that may be either Neolithic or Bronze Age.

A small digging has been opened on the opposite, east, side of the road, where the loam and the upper portion of the gravel have been denuded, the section showing gravel immediately overlaid by the soil.

Pit III of Diagram 1 is a continuation of the Lower Terrace. This digging is a small one at present unused and the gravel obscured by falls. The section was taken in 1927, and showed : soil 18in., loam 6ft. 3in., under which the gravel was exposed to 4 feet. The upper portion of the gravel is bleached and the whole is of the same nature as in Pit II. The only noticeable feature is the thickness of the loam. The general arrangement of the coarser material below, followed by sands and loam, point to a slackening of the stream on reaching its base level.

### Cold Periods.

More than one period of extreme low temperature seems to be indicated in the condition of the materials composing the gravel. A large proportion of the flints show frost-fractures and pittings,

and though frost action cannot be traced in the chert owing to its different nature the fragments have most probably been split off by this means. The study of large numbers of flints from all parts of the workings show that the thermal indications may be divided into three main groups each bearing the marks of extreme cold and apparently separated from each other by long intervals of time. Specimens are to be met with bearing the marks of two and, very rarely, all three of these periods. Taking the simplest representatives—unworked nodules of flint bearing marks of one cold period only—the following characters may be defined :—

(*a*) Flints with frost-pittings which have occurred before the present deep crust patination had been acquired.[1]

(*b*) Flints with frost-pittings which have occurred after a deep crust patination had been acquired.

(*c*) Frost-shattered flints lying with the fragments in position in the gravel, with no appreciable subsequent wear or patination on their fractured faces.

Classes (*a*) and (*b*) may also be frost-fractured but it is not always easy to say at what stage, though in some cases the edges of the fractures are open and much worn, showing that they occurred before the deposition of the gravel. These two classes were certainly frost-pitted before inclusion in the gravel, whereas class (*c*) cannot have been shattered until after the deposits had been laid down.

The change in the surface of flint known as "patination," which is as yet so imperfectly understood, appears to be an exceedingly slow process taking place whilst the flint is exposed to the elements either on or slightly covered by the soil, and controlled to some extent by the nature of the soil and the decay of vegetation. Little change appears to take place after the flint is deposited in a gravel.

Thermal action may either take place on the surface or at some depth in a deposit according to the severity of the conditions. Observation in this particular gravel points to frost-pitting as taking place on the surface, there being no evidence of the pitted flints with the fractured fragments *in situ*, whereas such forced-off fragments as have been found are waterworn and must have travelled to the deposit as separate entities. That frost-fracture may occur at some depth in the gravel is instanced by hundreds of flints of class (*c*) which could not have travelled any distance in so severely fractured a condition. The difference between a surface pitting and the usually deeper seated fracture is only one

1. NOTE. The term 'crust patination' is here used to indicate the cortex of a greatly rolled flint which has been changed in mineral character to an appreciable depth, replacing wholly or in part the original cortex of the nodule.

## 1. Higher Terrace.

| Horizon | Le Moustier | St. Acheul II & III | St Acheul I | Chelles |
|---|---|---|---|---|
| Gravel at "C". | /// | //// //// | | |
| Pockets over "A". | /// | | | |
| Gravel at "B". | | ////// ////// | ////// ////// | // |
| Gravel at "A" | | | ///// ///// | ////// ///// |

## 2. Lower Terrace.

| Horizon | Le Moustier | St. Acheul II | St. Acheul I | Chelles |
|---|---|---|---|---|
| Soil | | | | |
| Loam | | | | |
| Sandy seam | // | | | |
| Gravel | // | /// | //// | . |

## 3. Higher Terrace.

| Type | Great Abrasion | Moderate Abrasion | Slight Abrasion | Not Abraded |
|---|---|---|---|---|
| Le Moustier | | // | | //// |
| St Acheul II & III | ///// ///// | ///// | ////// | / |
| St Acheul I | ////// ////// | ////// | | |
| Chelles | ////// ///// | / | | |

## 4. Lower Terrace.

| Type | Great Abrasion | Moderate Abrasion | Slight Abrasion | Not Abraded |
|---|---|---|---|---|
| Le Moustier | / | | // | / |
| St Acheul II | | /// | | |
| St Acheul I | /// | / | | |
| Chelles | | | | |

## 5. Higher Terrace.

| Type | With Thermal Fractures | With Thermal Pittings | No Trace of Thermal Action. |
|---|---|---|---|
| Le Moustier | //// | // | |
| St Acheul II & III | ////// ////// | | ///// ///// |
| St Acheul I | ////// ////// | | ///// //// |
| Chelles | ///// ///// | | //// |

## 6. Lower Terrace.

| Type | With Thermal Fractures | No Trace of Thermal Action |
|---|---|---|
| Le Moustier | / | /// |
| St Acheul II | // | / |
| St Acheul I | /// | / |
| Chelles | | |

H.E.P. 1931.

Tables 1 to 6.

1. Distribution of Implement Types, Upper Terrace.
   The references are to Diagram II.
2. Distribution of Implement Types, Lower Terrace.
   References to Diagram III.
3. Distribution of abrasion, Upper Terrace.
4. Ditto. Lower Terrace.
5. Distribution of Thermal Action, Upper Terrace.
6. Ditto. Lower Terrace.

of degree, but the evidence offered seems to divide the pitted from the fractured in this case by a considerable interval in time. That these fractures are due to thermal action and not to creep or pressure of the strata is shown by flints incompletely fissured, a light touch with the hammer being sufficient to complete the fracture. Also the flints lying *in situ* in several fragments have the fragments occupying exactly their original positions and the edges are never pressure-chipped or worn. The fractures are also most frequently of the saucer type so typical in frost-pitting but on a larger scale.

Class (*a*).—Under the present crust of these flints lie frost pittings, both the pitted and unpitted areas having approximately the same depth of crust patination, showing that this change in the mineral character of the crust has taken place since the pittings occurred. The interior of the nodule is changed in mineral character throughout and is of dull opaque material with a rough matt surface on the fractured face of a freshly broken specimen. The crust patination frequently fades into the interior change. All are very waterworn, the edges of the pittings being greatly worn down. The interior frequently shows deep iron staining, often with a grey centre, and the crust is bleached white or cream. Some specimens are cream-coloured throughout. They are found in all stages of the gravel and are the least frequent of the three classes. These flints carry a long history of exposure to the elements, staining in gravel and wear by successive transportations.

Class (*b*).—Flints with a distinct crust patination, the average depth of crust in 100 purposely fractured and measured specimens being 3 · 5 mm. Through this crust patination frost-pittings have penetrated showing the different colouration of the core. The lower area of the pittings may be grey and lustrous, brown and lustrous, or a thin filmy patination may have taken place through which the colour of the core can be seen. The mineral character of the core is altered, but not to anything like the extent of the previous class. They have also been much rolled, subsequent to pitting, but the edges of the pittings are more distinct and the hollows impinge more sharply on the cortex than in class (*a*). Iron staining of the core appears to be also less frequent and when present is often confined to the inner surface of the crust patination. They occur throughout the gravels and are very common.

Class (*c*).—Flints lying in the gravel matrix, frost-fractured, and with the fractured faces in position. This applies to large numbers of flints lying *in situ* in the gravel and can best be studied in Pit No. I, where they are seen to be most frequent towards the surface of the gravel, their numbers gradually decreasing

| CULTURE PERIODS | MAIN THERMAL CONDITIONS | EROSION AND DEPOSIT | EVIDENCES |
|---|---|---|---|
| PRE-CHELLES | COLD | ALTERNATING PERIODS OF ELEVATION AND STABILITY EROSION AND DEPOSIT. | ALTERED AND FROST PITTED FLINTS, CLASS (a). |
| CHELLES | MILD | | WEAR AND MINERAL CHARACTER OF CHELLES IMPLEMENTS. |
| ST ACHEUL I | COLD | | CONDITION OF ST ACHEUL I IMPLEMENTS. FROST PITTED FLINTS, CLASS (b) |
| | MILD | STABILITY. DEPOSIT OF GRAVEL 'A' HIGHER TERRACE. | CONTAINED IMPLEMENTS AND FLINTS AS ABOVE. |
| ST ACHEUL II AND III | | STABILITY. DEPOSIT OF GRAVEL 'B', HIGHER TERRACE | ST ACHEUL II AND III IMPLEMENTS WORN TO UNWORN. |
| LE MOUSTIER (EARLY) | COLD | ELEVATION. DEPOSIT OF GRAVEL 'C', HIGHER TER$^{E}$. FORMATION OF LOWER TERRACE. | LE MOUSTIER IMPLEMENTS WORN TO UNWORN. |
| LE MOUSTIER (MIDDLE) | | ? DEPOSIT OF SAND AND LOAM LOWER TERRACE | FROST FRACTURED IMPLEMENTS AND FLINTS CLASS (c). |
| LE MOUSTIER (LATE) | | ELEVATION AND EROSION OF PRESENT VALLEYS. VALLEY DEPOSITS. | LE MOUSTIER IMPLEMENTS OF VALLEY GRAVELS, NEW TYPES. |

H.E.P. 1931

TABLE 7.

Attempt to correlate the main periods of extreme cold as shown in the flints and implements of Bleak Down, Isle of Wight.

below, whilst at four feet from its surface they are uncommon. These flints often fall to pieces on extraction from the matrix, either immediately or after a short exposure to the air, consequently they could not have travelled any distance in such a condition and fracture must have occurred after their deposit in the gravel. The angles of the fractures are sharp and totally unworn, the fractured faces being usually of a dull matt texture surface-stained by the infiltration of iron from the gravel matrix. Some of the implements have been fractured in the same manner and several have been recovered from which angular fragments are missing, having fallen off on removal from the matrix. Implement No. 9 (Plate I, Fig. 3), found personally *in situ* and extracted with the greatest care, left its point in the matrix and an hour or so later the remainder fell into three pieces necessitating repair. This cold period would appear to have commenced before the final rearrangement of gravel " C," as Le Moustier implements have reached it in a frost-pitted and patinated state, and to have continued, or recurred, after its deposition as both flints and implements with the fractured faces in position occur throughout.

## Correlation of the Implements.

The artefact types conform to a series of generally accepted groups, and reference to Table 1 will show that the two earlier of these groups antedate the deposition of the original gravel, the remainder coming in with the later deposits. This forms a starting point, and the remainder of the evidence must be taken from the condition of the implements themselves (Tables 3 to 6), which is best seen in viewing the series as a whole when arranged in accordance with their type-groups. In Tables 3 and 4 abrasion is seen to follow very closely the succession of types as indicated by their form and technique, taking into consideration that some of the specimens of the later forms have been re-deposited.

Chelles types. With one exception, given by Mr. R. A. Smith as " late Chelles or St. Acheul I," which is only moderately abraded, all the implements are greatly worn and have a bleached white or dull ochreous surface. Where fractures show the interior the flint is greatly altered in mineral character. In two implements the frost-fractures are slightly open on the surface and their edges show much wear which must have taken place before deposition in the gravel. Their general wear most nearly approaches that of flints of class (*a*), using the worn edges of the flake-scars for comparison with the frost-pittings. Their place would appear to be between classes (*a*) and (*b*) of the pitted flints.

St. Acheul I types.—In sixteen cases from the higher terrace these closely approach the Chelles types in wear and patination, whilst seven are less severely abraded and have a more lustrous

surface. At the higher terrace these types first occur in gravel "A," and their patination in several cases is paralleled by the patination on the frost-pitted surfaces of flints of class (*b*). Abrasion also compares most favourably with the same class.

St. Acheul II and III types.—The St. Acheul II specimens range from greatly worn to unabraded examples, less altered in mineral character than the former types, whilst St. Acheul III is represented by one specimen of La Micoque form which is almost unabraded. Specimens have not been found earlier than Period II, gravel "B."

Le Moustier types.—Of the ten examples five are unabraded and the remainder have very evidently from their positions and abrasion been re deposited. Only three are without trace of thermal action and these come from the lower terrace, two from the sandy band above the gravel and the other about halfway down in the gravel. They are surface-bleached or stained, but their mineral character is otherwise little altered and the unabraded specimens are most probably contemporary with the gravels in which they occur.

From the foregoing, and Tables 1 to 6, it will be seen that two distinct periods of cold may certainly be traced, one in the flints pitted before inclusion in the gravel and the other in the flints frost-fractured after inclusion in the gravel.

The division of the pitted flints into two classes with a time interval between is certainly more venturesome, for it is obvious that with each rearrangement of gravel all the flints would not pass through a precisely similar series of conditions in precisely the same way. It is even possible that the pittings of the two classes of flints may be contemporary, Class (*b*) having been comfortably laid up in a gravel, subsequent to pitting, whilst Class (*a*) was left exposed on the surface to receive further wear, deeper patination and greater mineral change. Yet, after carefully weighing the evidence of a large number of specimen flints, the condition of the implements, and the general conditions prevailing in the different periods of the gravel, the balance seems to be in favour of a time interval between the two classes. These evidences have been arranged in the form of a Table (Table 7), but correlation with any of the various Glacial chronologies has not been attempted, nor has the alternation of thermal periods been carried to too fine a point. The history of the deposits is extremely complicated, and it is quite probable that future discoveries in the direction of patination and frost-fracture may necessitate some adjustment in the scheme outlined above.

## THE IMPLEMENTS.

The implements dealt with in this paper are 76 in number and for each of these a definite position in the gravel can be given. A number of other specimens have been recovered for which the positions were not accurately determined. The types range from Chelles to Early Le Moustier in the gravel, the latter being rather unexpected in a deposit as high as this above existing river level. All the type attributions have been kindly made by Mr. Reginald A. Smith, F.S.A., of the British Museum, and this without knowledge of the distribution or character of the gravel. In so mixed a collection some of the attributions are, naturally, approximate. The confirmation given by the types to the theory, made on the geological evidence, of four stages of deposit in the upper terrace is therefore of great importance. (Diagram 2 and Table 1.) The series is a particularly complete one, there being links connecting each period. As a whole the extreme wear of the early grading to the totally unworn condition of the later specimens is a very noticeable feature. Maximum measurements are given for the described specimens and in all cases the flaking is of one period only. The whole of the wear with its incidental freckling of incipient cones-of-percussion is consistent with the water-borne nature of the gravel. Staining is here of little help in zoneing the implement finds, as in the bulk of the gravel both bleached and stained flints and implements lie side by side, except in the heavily iron-stained bands, the bands of manganese-coated flints, and the grey clay pockets. A number of the implements have been personal finds *in situ*, but the majority have been obtained by the workmen, their observations being carefully checked by the matrix remaining on the implement and, occasionally, its class of patination and staining. The digging in the upper terrace has moreover been in a series of north to south trenches and the positions of the implements with regard to the transverse section certain. Over 200 visits have been paid to the pits in the last seven years, during which the diggers have been trained to take an intelligent interest in their finds.

Description of the whole of the 76 implements is unnecessary, the more important information being contained in the Tables. Detailed descriptions are accordingly mainly confined to the specimens illustrated in the plates, these having been selected as locally typical of their class or as dating the deposit in which they have been found.

### Chelles Types.

These greatly worn implements have been many times derived and we must look a long way beyond the age of the Bleak Down gravels for the time of their production. They come from all levels in the gravel, the only noticeable feature in this respect being that those known to be from the lowest level have escaped frost-fracture. Ten are frost-fractured, two of these certainly before inclusion in the gravel, the others doubtless after its formation. So far they have not been found in the lower terrace but occur throughout the upper.

Medians for the 14 specimens: Length 134 mm., width 82 mm., thickness 45·5 mm.

No. 1 (Plate 1, Fig. 1, two views). Chelles, from gravel "A," upper terrace. Length 5¼in., width 3¼in., thickness 1 7-8th in. A thick, heavy implement of pointed form with double curved, reversed S edges, in whitish, bleached flint with small patches of faint iron staining. Very water worn. Stated to have come from the base of the gravel. No evidence of thermal action.

No. 2 (Plate 1, Fig. 2). Chelles, from gravel "A," upper terrace. Length 6 1-8th in., width 3½ in., thickness 1½in. A brown-stained, battered and greatly worn specimen with a portion of the original cortex on the face figured

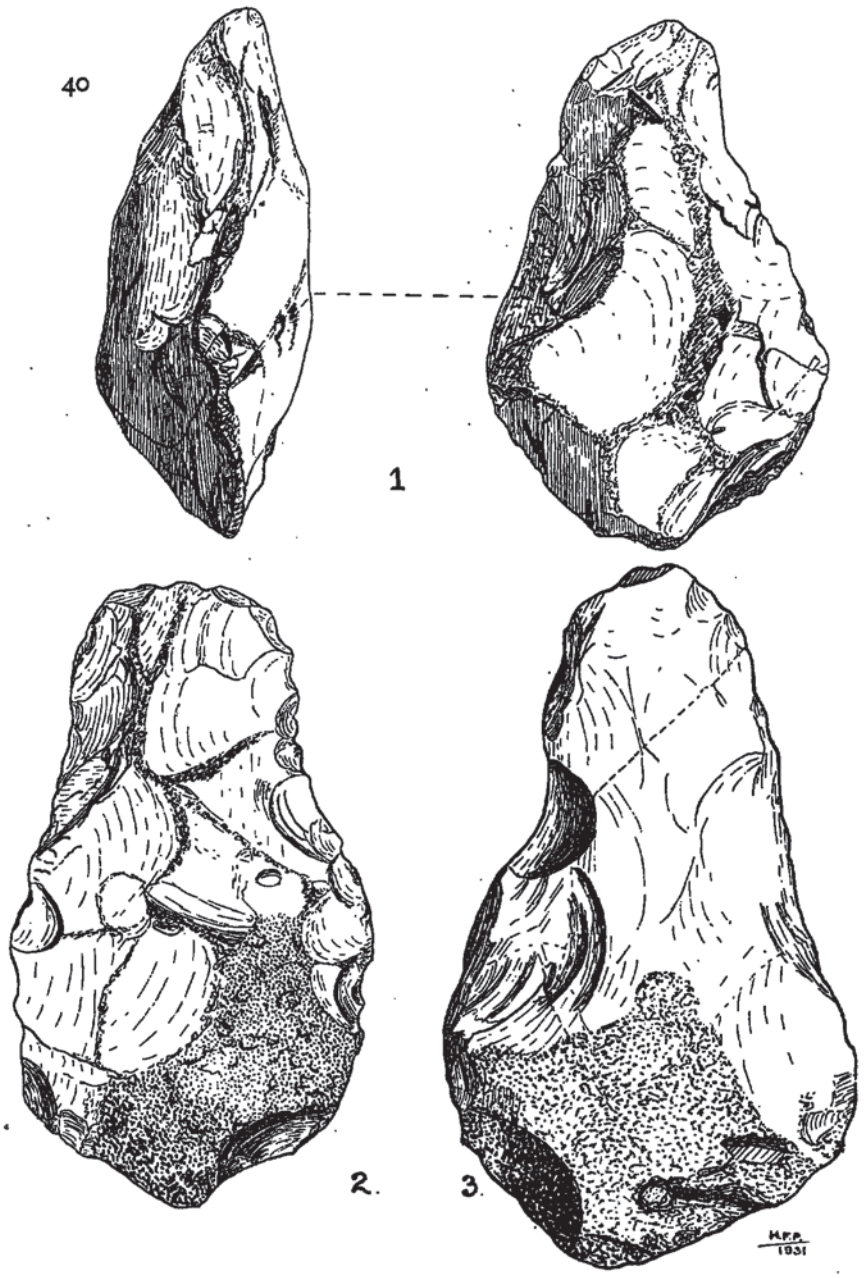


PLATE I. Implements from gravel 'A,' Vectis Co.'s Pit, higher terrace, Bleak Down, I.W.
Fig. 1 (two views). Chelles. Fig. 2. Chelles. Fig. 3. Late Chelles.

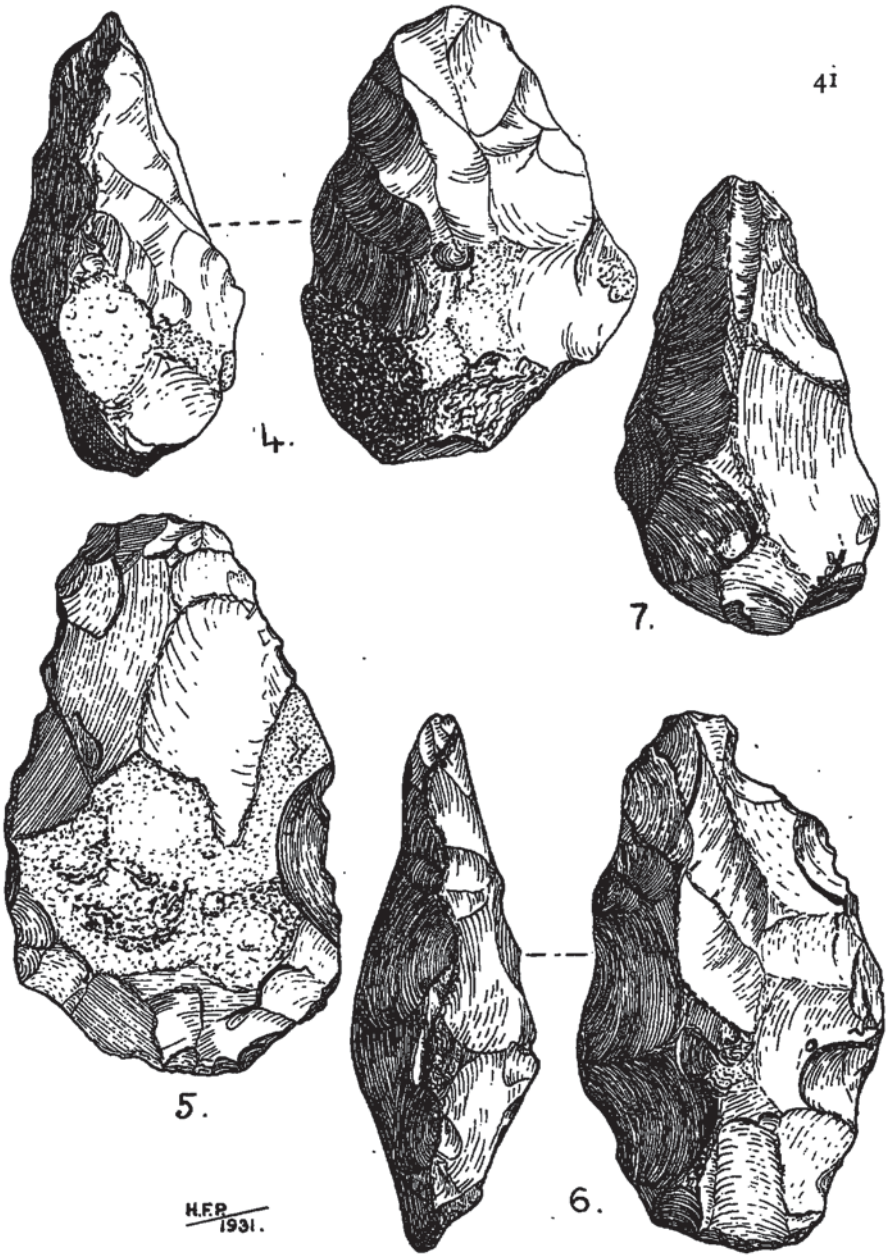


PLATE II. Implements of St. Acheul I types from Bleak Down, I.W.
Fig. 4 (two views), from the upper terrace at 'A.'
Fig. 5, ditto. Fig. 6 (two views), ditto.
Fig. 7, from the lower terrace.

and at the base, the left edge is S curved and the right edge in a more direct line but coarsely waved. It is closely freckled with incipient cones-of-percussion. From the base of the gravel. No evidence of thermal action.

No. 9 (Plate 1, Fig. 3). Late Chelles, from gravel " A," upper terrace. Length 6 7-8th in., width 4in., thickness 2in. A pointed form with comparatively straight edges, greatly worn, surface dully lustrous, stained light brown. A patch of crust at the base and on the figured face is yellowish-white. This was a personal find, *in situ*, the implement being 2 feet below the surface of the gravel, with 5 feet of gravel below it. Severely frost-fractured, as has been previously detailed on page 37.

ST. ACHEUL I TYPES.

Ten of these implements are from the undisturbed portion of gravel " A," thirteen from gravel " B " and four from the lower terrace. As a whole they are slightly less abraded than the Chelles forms. They present a series in which the general tendency is towards a more ovate and thinner form, with a rather more fully-worked surface and finer touch. One is a Clactonian form, made from an outer flake, the angle between the striking platform and the bulb face being 120°.[1] It is in yellow to greyish-brown flint with a slightly lustrous surface and with a patch of dirty-white crust at the base of the worked face. Length 4¼in., width 2 9-10th in., thickness 1 in. The flaking is coarse and the implement may be considered an ill-formed ovate. Almost in its centre is a circular hole 5-8th in. in diameter, penetrating through the implement; it is due to the decay of a fossil sponge. Slightly to moderately abraded, no frost-fractures. From near the surface of gravel " B."

Medians for 20 implements, the remainder being incomplete: Length 123·5 mm., width 79·3 mm., thickness 33·7 mm.

No. 13 (Plate 2, Fig. 4, two views). St. Acheul I, from gravel " A," upper terrace. Length 4¼in., width 3 1-8th in., thickness 1 15-16th in. A dumpy-pointed form with S curved edges, in dullish-white flint, a small patch of crust near the base, moderately worn. Found 5 feet down in the gravel. Frost-fractured.

No. 14 (Plate 2, Fig. 5). St. Acheul I, from gravel " A," upper terrace. Length 5 1-8th in., width 3in., thickness 1 3-16in. A long ovate with wavy edges in yellow-stained flint with a slightly lustrous surface, a patch of crust on the face figured, greatly worn. No trace of thermal action.

No. 15 (Plate 2, Fig. 6, two views). St. Acheul I, from gravel " A," upper terrace. Length 5in., width 2 7-8th in., thickness 1 11-16th in. Long ovate with wavy edges in dull cream-coloured flint, greatly worn. Frost-cracked and fragments removed at the top of right edge and on opposite face by thermal action, leaving saucer-shaped depressions.

No. 24 (Plate 2, Fig. 7). St. Acheul I, from the gravel of the lower terrace. Pointed form with slight S twist, in greyish to white flint marked with incipient cones-of-percussion, greatly worn. No trace of thermal action.

ST. ACHEUL II.

A sharp division occurs in the distribution of these and the earlier forms at the upper terrace, no specimen attributable to St. Acheul II having been found at " A," whilst they occur at " B " and " C," and in the lower terrace. Wear is not so severe as in the earlier forms. Whilst showing some variation, the interiors of the implements appear to be less altered in mineral character. Most of the St. Acheul II specimens are ovates, only two are pointed forms, whilst one is wedge-shaped with wide squared end such as have also been found at Belbins, near Romsey, Hants.

1. Using the method illustrated by Mr. R. H. Chandler in *Proc. Prehis. Soc. East Anglia*, Vol. VI, p. 85.

Medians for 23 implements : Length 99·7 m.m., width 70 mm., thickness 29·5 mm.

No. 27 (Plate 3, Fig. 8). St. Acheul II, from gravel " C," upper terrace. Length 3 5-16th in., width 2 5-8th in., thickness 1 1-16th in. A small ovate with comparatively straight edges, in brown-stained slightly lustrous flint, moderately worn, no sign of frost-fracture. Found at about 2 feet from the base of the gravel.

No. 30 (Plate 3, Fig. 9). St. Acheul II, from gravel " C," upper terrace. Length 5in., width 3 1-16th in., thickness 1 3-8th in. Almond-shaped implement, the right edge of figure with reversed S twist, the left edge comparatively straight. Dullish brown flint, only slightly abraded and with no trace of thermal action. Found on the clay at extreme base of gravel.

No. 50 (Plate 3, Fig. 10). St. Acheul II, from gravel " B," upper terrace. Length 5¼in., width 3 7-8th in., thickness 1 7-10th in. Totally unabraded but severely frost-fractured and freckled with incipient cones-of-percussion. The condition of the flint is practically unchanged, the surface is dull to slightly lustrous, colour grey on the figured face, very lightly brown stained on the other. There is a patch of white crust, the almost unworn cortex of the original nodule, at the base and slightly up the figured face. The edges are straight. Found towards the western limit of the gravel where the section shows : soil 1ft., grey sand with flints 2ft., gravel 2ft. The specimen lay between gravel and sand, the stained face in contact with the gravel. This fine implement dates deposit " B " with which it is contemporary.

No. 35 (Plate 3, Fig. 12). St. Acheul II, from the lower terrace. Length 3¼in., width 2 9-16in., thickness 15-16in. Small ovate with S twist, rather coarsely made, in creamy-surfaced flint with a large patch of manganese. Greatly abraded and frost-fractured. Found 3 feet down in the gravel in a band of flints blackened with manganese.

ST. ACHEUL III TYPE.

No. 34 (Plate 3, Fig. 11). La Micoque = transition to Le Moustier, from gravel " C," upper terrace. Length 5 3-8th in., width 2¾in., thickness 1 9-16th in. Pointed type with a patch of crust at base, the edges slightly waved. The face opposite to that figured is flat and the section triangular, the apex lying to the right when viewed from the base. It is practically unabraded and shows no sign of thermal action. Stained lustrous brown. Found at the base of the gravel at the extreme east of position " C."

LE MOUSTIER TYPES.

These make their first appearance in the clay pockets in the surface of gravel " A," and continue throughout the later deposits. A fine Tortoise core comes from the gravel of the lower terrace. The Le Moustier culture had commenced some time before the isolation of the Bleak Down ridge, as three of the recovered implements reached the gravel in a worn and frost-pitted state. It would also appear to have persisted throughout the excavation of the existing valleys, as Le Moustier forms are frequent and quite unworn in the gravel at Great Pan Pit, Shide, situated about three miles to the north in the same valley,[1] and at 25 feet Ordnance datum base level, this also representing the height above the present river level. The immense amount of erosion implied by the difference in altitude of these two Mousterian gravels indicates a time interval of great length, despite the fact that much of that erosion was at the expense of the comparatively weak Lower Greensand strata. Comparison of implements from the two sites shows that the Bleak Down series belongs to the earlier phase of Le Moustier, the implements are

1. 'Palaeoliths from Great Pan Farm, I.W.,' *Proceedings Hants Field Club.*, Vol. IX, 1925, pp. 305-319.

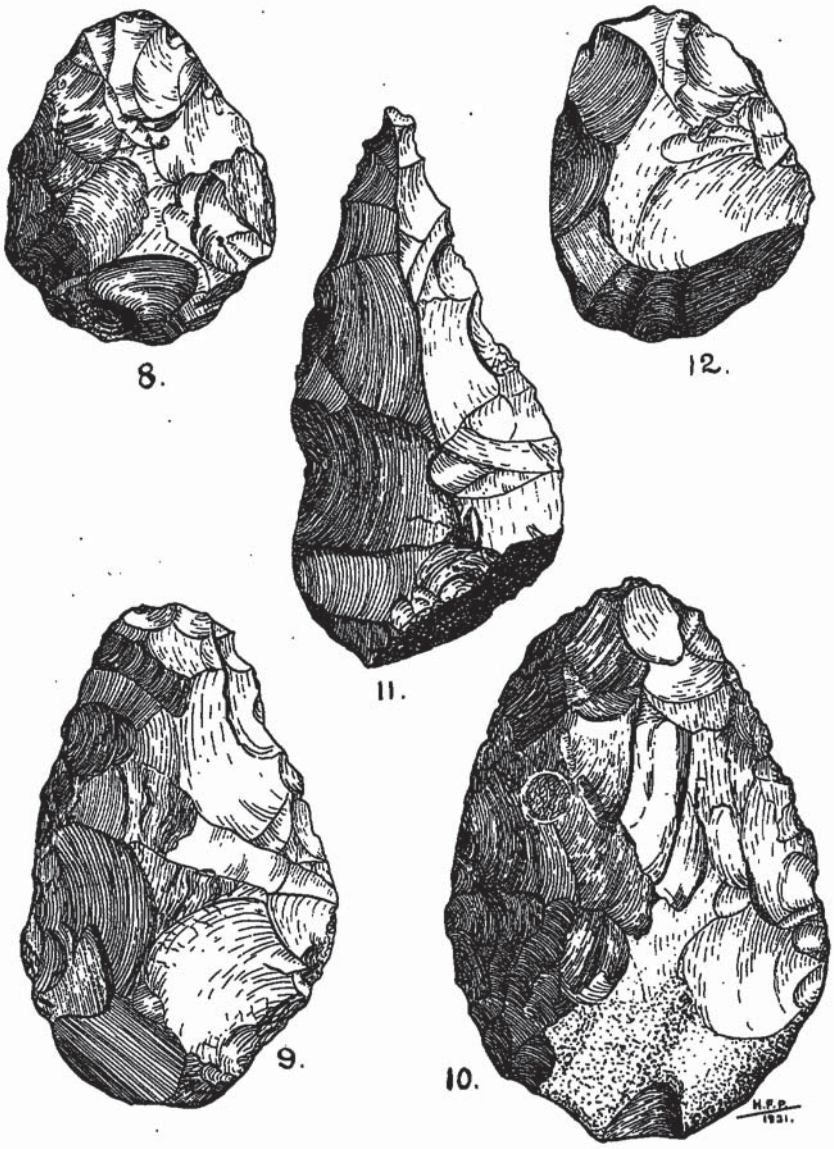


PLATE III. Implements of St. Acheul II & III types from Bleak Down, I.W.
Fig. 8, St. Acheul II, from the upper terrace at 'B.'
Figs. 9 and 10, ditto.
Fig. 11, La Micoque, from the upper terrace at 'C.'
Fig. 12, St. Acheul II, from the lower terrace.

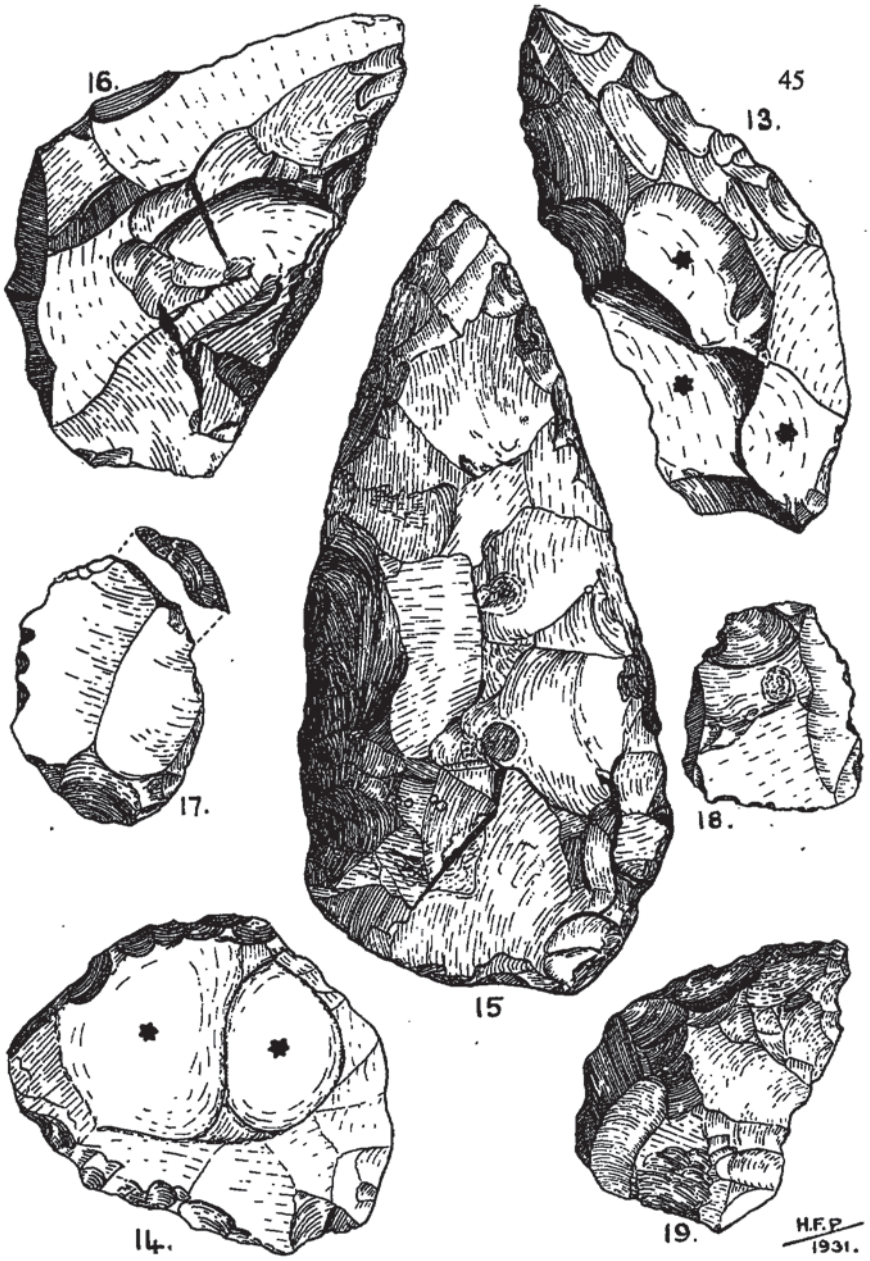


PLATE IV. Implements of Le Moustier types from Bleak Down, I.W.

Fig. 13. Le Moustier, from gravel 'C,' upper terrace.
Fig. 14. Beginning of Le Moustier, from gravel 'C,' upper terrace.
Figs. 15, 16, 17. Le Moustier, from surface pockets in the upper terrace gravel at 'A.'
Fig. 18. Le Moustier, from the lower terrace.
Fig. 19. Ditto from sandy seam above the gravel, lower terrace.

of comparatively large size and produced by a technique mainly derived from that of the preceding period. The majority show very strongly the effects of extreme cold.

The Shide series contains implements of later types, strikingly smaller in average size, of finer work, and showing a much greater variety of form. With one exception, probably derived, they are quite unworn, and this exception is also the only specimen showing signs of frost-fracture. Flake implements are numerous, sometimes retouched on both faces, sometimes only on one.

Six specimens only of the Bleak Down series are complete enough for length and width measurements and original thickness is only possible in three owing to the removal of portions by thermal action.

Medians for 6 specimens: Length 118 mm., width 63·5 mm.

No. 37 (Plate 4, Fig. 13). Le Moustier, from gravel at "C," upper terrace. Length 5¾ in., width 2 3-8th in., thickness 1 in. A long, pointed implement, worked on both faces. The areas marked with a star on the figure are large saucer-shaped depressions caused by thermal action. It is in dullish surfaced, pale yellow stained flint, moderately abraded. Found about halfway down in the gravel.

No. 38 (Plate 4, Fig. 14). Beginning of Le Moustier, from gravel "C," upper terrace. Length 3 7-8th in., width 3in., thickness ¾ in. An implement of semi-ovate form, worked on both faces, in creamy flint. Slightly to moderately abraded on what remains of the original work and also on the edges of the frost-pittings which are indicated by stars. The edges have a slight twist.

No. 40 (Plate 4, Fig. 15). Le Moustier, from a clay pocket over gravel "A," upper terrace. Length 8in., width 3 5-8th in., thickness 1½ in. This remarkably fine *coup-de-poing* was found by one of the workmen, who saw the point sticking out of the face of the working, at the bottom of a clay pocket. It is of fine workmanship, skilfully chipped on both faces, with straight edges, sharp, symmetrical and unworn. The surface is thinly bleached through which the grey colour of the interior shows in places, dull to lustrous in patches. There is a band of crust at the base averaging ¾ in. in width and a small patch runs slightly up one face. A patch of some fossil organism near the base on one face has proved difficult to flake, and on this thickened part are four well-marked incipient cones-of-percussion as though removal of the prominence had been attempted without success. There are slight indications of thermal fracture. This specimen dates the pockets as early Le Moustier, comparison with No. 50, Plate 3, Fig. 10, will illustrate the persistence of the St. Acheul technique.

No. 41 (Plate 4, Fig. 16). Le Moustier, from a clay pocket over "A," upper terrace. Length 5 3-8th in., width 3in., thickness 1¼in. Pointed form, probably a chopper, with one wide edge suitable for the palm of the hand. Made from a heavy flake retouched at the thin edge on both faces. In grey flint with a thinnish white patination, unworn, frost-fractured.

No. 42 (Plate 4, Fig. 17). Le Moustier, from a loamy pocket over "A," upper terrace. Length 2 11-16th in., width 1 13-16th in., thickness 7-16th in. Oval flake implement with facetted butt, from a tortoise core. In greyish-brown, lustrous flint. No sign of frost-fracture.

No. 43 (Plate 4, Fig. 18). Le Moustier, from the gravel of the lower terrace. Length 2in., width 1 11-16th in., thickness ½ in. Flake with slightly facetted butt in brownish stained, lustrous and semi-translucent flint. Unworn and shows no sign of thermal action. Found about halfway down in the gravel.

No. 45 (Plate 4, Fig. 19). Le Moustier, from the sandy seam above the gravel, lower terrace. Length 3 3-8th in., width 2 3-8th in., thickness 13-16th in. A well-made "point" in grey flint clouded with a thin white

bleaching in places and in others with a bleached white surface of porcellaneous lustre. It is well worked on both faces and there is a small patch of creamy crust on the face opposite to that figured. Unabraded, no sign of thermal action. Though it is dangerous to generalise on the evidence of a single specimen, it certainly seems to be of later date than the heavier forms of the upper terrace.

**Conclusions.**

The more important conclusions arrived at in studying the gravels of this area are :—

That the gravel of Bleak Down is completely isolated, occupying the summit of the down from 278 feet Ordnance datum to 252 feet Ordnance datum, and approximately from 160 feet at the south to 200 feet at the north above the bottom of the existing valleys on either side.

That it consists of purely local material and was deposited by flood-water in the bottom of a valley through which a river ran from south to north.

The deposits mark two of a series of intervals in the upward movement of the land with their consequent accumulations of flood-plain debris, and form two terraces running in the direction of the Pleistocene Valley.

That the break in the series of implement types so far found makes it most probable that the oldest deposit of the higher terrace preceded the local culture, producing implements of St. Acheul II types.

That the Le Moustier culture had commenced before the isolation of the Bleak Down gravels and the formation of the existing adjacent valleys.

Though there is no Faunal evidence as to climate, the thermal cracks and pittings in large numbers of both flints and implements point to the effects of extreme cold.

That three main periods of extreme cold appear to be represented and are referable to pre-Chelles, the close of St. Acheul I and the earlier part of the Le Moustier period.

---

My thanks are due to Mr. Reginald A. Smith, F.S.A., who, with his usual kindness, has examined the finds and, at my request, given them type attributions ; to Mr. R. J. Sprake, Director, and Mr. E. V. Harvey, Manager of the Vectis Stone Company for permission to conduct the investigation and for their general courtesy and help ; to Mr. F. T. Cheek, for permission to visit the lower terrace pit ; and to Mr. H. J. Osborne White, F.G.S., who has taken a keen interest in the work from its early stages and to whose kindly criticism this paper owes much of its present form.