THE PLEISTOCENE DEPOSITS OF KIRMINGTON, LINCOLNSHIRE

by

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Summary

The Pleistocene deposits and associated humanly-worked flints of Kirmington, North Lincolnshire, are reviewed. It is suggested the artefacts probably represent a Clactonian and/or Acheulian Industry of Hoxnian Interglacial age. The deposits are interpreted as representing an earlier glaciation, probably equivalent to the Lowestoft (Elster) Glaciation of East Anglia, and a later glaciation of Weichsel age, separated by a series of Hoxnian Interglacial deposits. It is believed that the interglacial deposits, which contain the artefacts, are much thicker than has previously been suggested.

Introduction

The unique series of Pleistocene deposits, partly exposed in the old Brickyard Pit and Gravel Pit at Kirmington, North Lincolnshire (National Grid Ref. TA 103 116), have attracted a great deal of attention in the past: a good summary of the earlier work was given by Melmore (1935) and a bibliography was also given by Watts (1959). The most detailed account of the stratigraphy of the deposits was given by a special Committee of the British Association (1905), which put down two boreholes in the Brickyard. The section which they recorded may be summarized as follows;

12	Surface soil (at 95ft. above O. D.)	1 ft.
11	Clay with foreign stones	4 ft.
10	Well-worn shingle, mostly of battered flints	8 ft.
9	Estuarine silts, with a thin bed of peat at the base	18½ ft.
8	Clean yellow sand with pebbles of chalk and flint	4¾ ft.
7	Red clay, passing down into tough reddish-brown clay	7½ ft.

6	Purple clay, streaked with silt, passing downwards into tough purple clay with small stones, including erratics	10½ ft.
5	Stoneless purple and yellow clays: flinty gravel; loam with small drift pebbles	9½ ft.
4	Yellow sand with well-rounded quartz grains and specks of chalk; laminated clay with similar yellow sand	12 ft.
3	Tough compact lead-coloured clay, with a few small foreign pebbles	5¼ ft.
2	Tough yellow clay streaked with chalk	1 ft.
1	Solid chalk with flint	more than 3 ft.

The beds from the sand at the base of the estuarine silts upwards are exposed in the Brickyard, but only the shingle (generally known as "Cannon-shot Gravel") and the overlying stony clay are exposed in the Gravel Pit. The beds below the yellow sand (No. 8 above - which is water-bearing, and makes excavations and borings difficult) are only known from boreholes. The British Association Committee tentatively suggested that certain stony clays resembled particular boulder clays of Holderness, East Yorkshire: it was suggested that the uppermost stony clay (No. 11 above) resembled the Hessle Clay; that the reddish clays (No. 7) resembled the Purple Boulder Clay (= Purple Till of the current terminology, such as that used by Catt & Penny, 1966); and the lead-coloured clay (No. 3) was compared with the Basement Boulder Clay of Holderness. These comparisons have been widely quoted by subsequent authors, who have often placed more reliance on these superficial resemblances than did the authors of the British Association Report. In fact, with the exception of the comparison between the uppermost stony clay (No. 11) and the Hessle Till, none of these correlations now seems acceptable. What is not clear in the British Association Report is that estuarine conditions preceded, as well as followed, the freshwater peat phase.

The Cannonshot Gravels, which immediately overlie the estuarine silts, consist mainly of battered flints, which are mostly well rounded and are almost certainly of marine or estuarine origin. Burchell (1931A) suggested that the true Cannonshot Gravel was older than the estuarine silts and peat, and distinguished between what he termed the "Estuarine Shingle" in the Brickyard and the "Cannon-shot Gravel" in the adjacent Gravel Pit. These deposits are of considerable importance, since Burchall (1931A, 1932 & 1935) discovered humanly-worked flints in the Gravels of both pits. He believed that the "Cannon-shot Gravel" contained Lower Palaeolithic (Clactonian) implement only, but that the "Estuarine Shingle" contained a mixture of Lower Palaeolithic implements, derived from the adjacent "Cannon-shot Gravel", and Upper Palaeolithic implements, which he regarded as approximately contemporaneous with the deposition of the "Estuarine Shingle". Burchell correlated the "Estuarine Shingle" with a 100 ft. raised beach of Late Glacial age. More recent workers, however, have not been able to find geological evidence to support such a differentiation between the gravels exposed in the two pits. Since the time of Major Burchell's papers, further worked flints have been found, but the only published reference seems to be that of Dudley (1949, p. 26).

More recently, Watts has carried out pollen analyses on the estuarine silts and on the peat (Watts, 1959), and these confirm that the deposit was formed under temperate forest conditions, as was suggested by the earlier pollen counts of Erdtman and Godwin (in Burchell, 1935, p. 329). Watts considers that the spectra suggest a Hoxnian (Mindel - Riss) Interglacial age for the deposit, closely comparable with that of the Clacton Channel deposits described by Pike and Godwin (1953). In view of this work and of the additional finds of worked flints, it seemed most desirable to re-examine all the supposed Palaeolithic implements in the light of current knowledge, especially the major re-interpretation of the Clactonian by Warren (1951) and others. With the co-operation of Major J.P.T. Burchell and of the curators of the various museums with material from the Kirmington pits, the author was able to bring together all of the traceable material for

recording and examination by himself and others, notably by Mr. John Wymer of the Reading Museum. Two of the Scunthorpe Museum specimens (APL 14 and 15) were not seen until after Mr. Wymer left for a year's fieldwork in Africa.

The Palaeolithic material

Compared with many sites there appears to have been little systematic collecting from the implement-bearing gravels of Kirmington: Burchell's discoveries were made only a few years before the pits began to fall into disuse, and his work did not seem to attract the attention that it merited. Some material from the deposits seems to have been discarded as too uncertain to be determinable, and some of the better specimens figured by Burchell cannot be traced. The twenty specimens from the Kirmington Cannonshot Gravel (including the Estuarine Shingle of Burchell's terminology) which have been reviewed can be conveniently divided into four groups, as follows:

A. Flakes with pronounced bulbs and wide, plain striking platforms (12 specimens)

Cambridge University Museum of Archaeology and Ethnology:

Reg. No. 59.459.E: "Estuarine Shingle"; J.P.T. Burchell Collection

Reg. No. 59.459.F: (3 specimens): "Cannon-shot Gravel"; J.P.T. Burchell Collection

Scunthorpe Museum:

Reg. Nos. APL 1, 2 & 3: collected by H. Dudley, 1934. (See Text-Figs. 1, 2 & 3)

Reg. No. APL 13: "Mr. Eric Hill" (no date)

Lincoln City and County Museum:

Reg. Nos. 13.35 and 14.35: "Cannon-shot Gravel, Kirmington Gravel Pit, 25.5. '35." (See Text-Figs. 5 & 6)

Hull Museums:

Reg. No. 23.65.1.: collected by P.J. Boylan from the Cannonshot Gravel, Brickyard Pit, March, 1965. (See Text-Fig. 7)

J.P.T. Burchell's Private Collection:

An unusually large flake from the "Estuarine Shingle, Kirmington", described and figured by Burchell (1931A, p. 269 & fig. 9; 1932, p. 261, 265 & fig.) and regarded by him as Upper Palaeolithic.

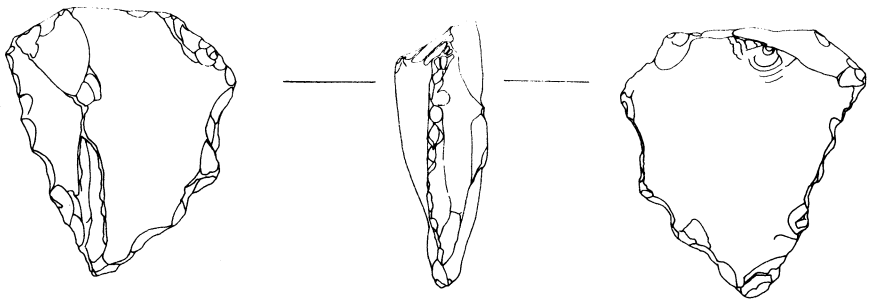
B. Simple primary flakes, lacking the pronounced bulbs and wide striking platforms of those listed above (4 specimens)

Cambridge University Museum:

Reg. No. 36.120: (2 specimens): "1931"; L. Armstrong Collection

Hull Museums:

Reg. No. 23.65.2.: collected by L.F. Penny from the Cannonshot Gravel, Gravel Pit, Kirmington, March, 1965.



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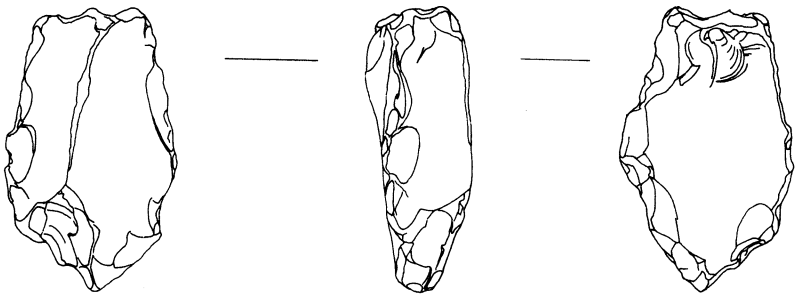

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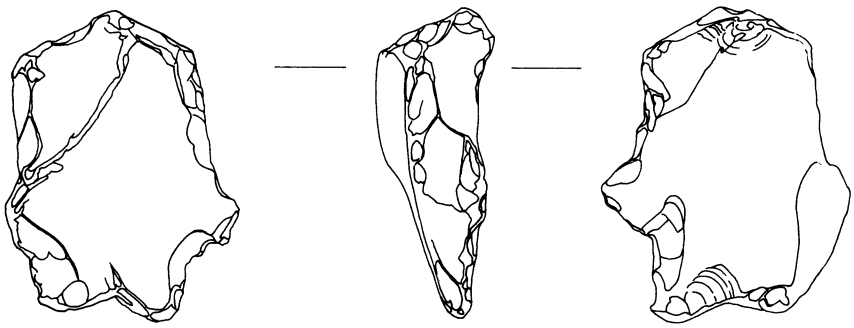

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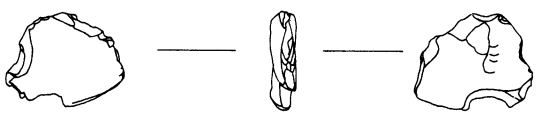

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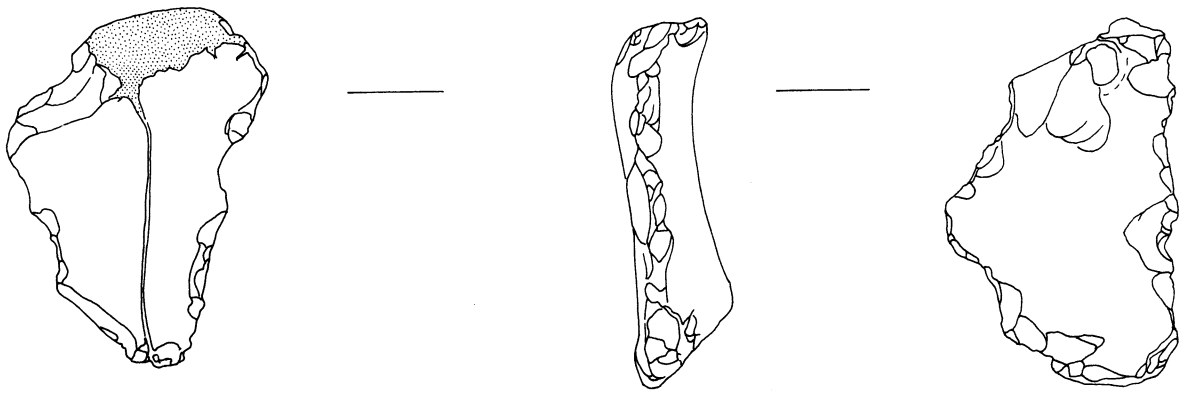
PALAEOLITHIC FLAKES FROM KIRMINGTON, LINCOLNSHIRE

1. Scunthorpe Museum APL 1. 2. Scunthorpe Museum APL 2. 3. Scunthorpe Museum APL 3 4. Scunthorpe Museum APL 15.



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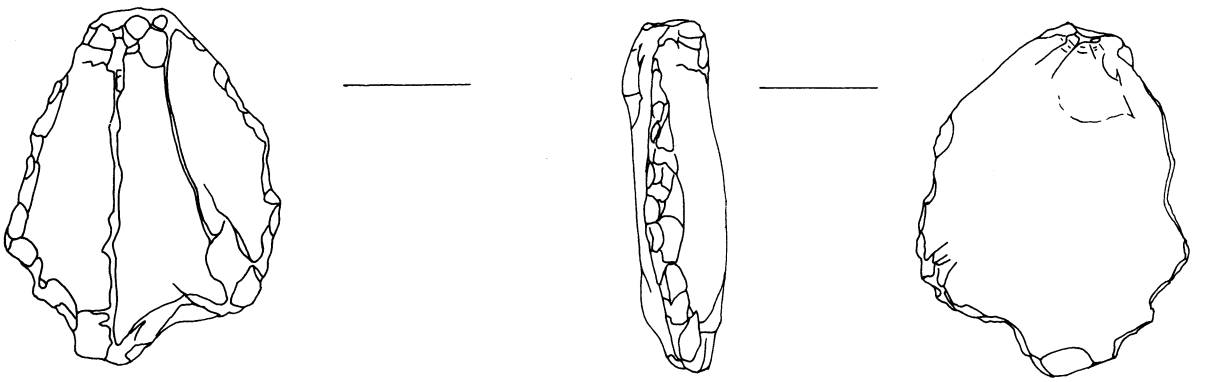

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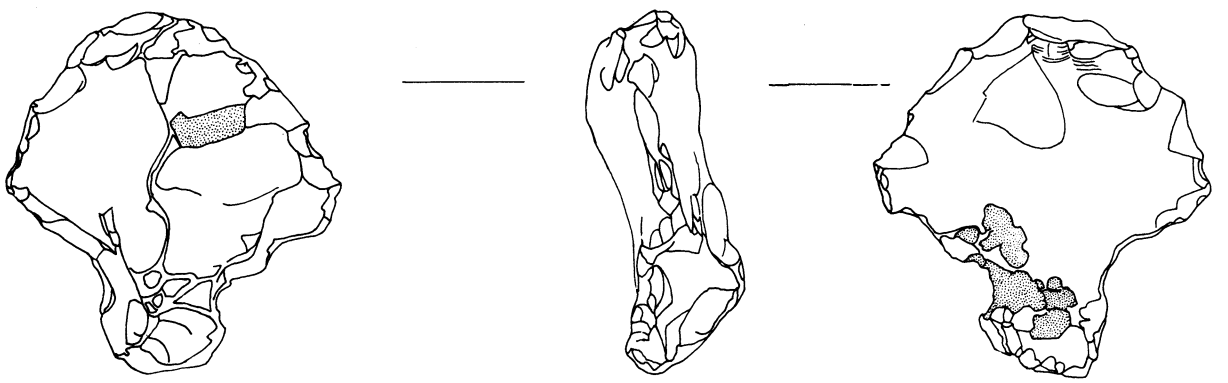

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PALAEOLITHIC FLAKES FROM KIRMINGTON, LINCOLNSHIRE

5. Lincoln Museum 13.35. 6. Lincoln Museum 14.35. 7. Hull Museum 23.65.1.

Scunthorpe Museum:

Reg. No. APL 15: H.E. Dudley, 10.6.1934.

C. "Finishing Flakes" (see Wymer, 1964, p. 29) (2 specimens)

Cambridge University Museum:

Reg. No. 59.459.F (the smallest of the four specimens in this group): "Cannonshot Gravel": J.P.T. Burchell Collection

Scunthorpe Museum:

Reg. No. APL 15: H.E. Dudley, 10.6.1934 (see Text-Fig. 4)

D. Non-artifacts (2)

Cambridge University Museum:

Reg. No. 36.120 (the largest of this group): L. Armstrong Collection

Scunthorpe Museum:

Unregistered specimen labelled "R.H.A." (= R.H. Arrand)

Interpretation of the Palaeolithic material

There are no definite finished implements present, and since none of the specimens shows any clear secondary working, it is difficult to reach a conclusion on the typological position or age of the material. The predominant type is undoubtedly the flake with a pronounced bulb of percussion, indicating the use of a stone hammer, and a wide, plain (and often oblique) striking platform. Such flakes were once widely regarded as typical "Clactonian" or "Early Mousterian" implements, but these characteristics are, however, by no means restricted to the Clactonian, or even to the Palaeolithic: they are commonly met, for example, at Neolithic stone axe factories, and can occur in any Palaeolithic, Mesolithic or Neolithic culture, providing suitable material was available. In his classic review of the Clactonian of the type locality, Warren (1951) has re-interpreted the Clactonian in terms of finished implements, particularly nodule tools, and has shown that the "Clactonoid" flake or flake-tool is far less diagnostic of the industry than has previously been supposed: he specifically warned (p. 132) that such flakes "should not be called Clactonian in the absence of more reliable associates." Nevertheless, although such flakes can and do occur in later industries, Mr. Wymer (personal communication) states that "with the more evolved and less wasteful techniques that were practiced from the Middle Acheulian Culture onwards, such flakes are generally much less common or virtually absent." However, they are very common in the Clactonian: careful statistical work at Lion Point, Clacton, showed that simple "Clactonian Type" flakes made up approximately 61% of the total (Warren, 1951, p. 133). Thus the predominance of such flakes at Kirmington (12 out of a total of 16 worked flints) certainly suggests that a Clactonian industry is present, although it would be rash to be more specific than this at present.

Of the other material, Mr. Wymer considers that the finishing flake in the Cambridge Museum could be a bar-hammer from hand-axe manufacture and states (personal communication) that it is "particularly interesting as it would be much more typical of an Acheulian industry and most unlikely to be found in the Clactonian." The Scunthorpe Museum have recently found two small flakes, apparently in the personal collection of the late H.E. Dudley, and at least one of these (Reg. No. APL 14) also appears to be a secondary waste flake of the "finishing flake" type, in which a concave scar has been used as the striking platform in the removal of the flake. The remaining specimens are not determinable.

Most of the specimens are well patinated and rolled, although they are much less rounded than the majority of the unworked pebbles of similar size in the shingle. Burchell (1931A, 1932, & 1935) distinguished between the "Cannonshot Gravel" and "Estuarine Shingle" of his terminology partly on the

grounds that the large flake in his private collection differs in material and degree of wear from the others, and he considered this to be of Upper Palaeolithic age. Whilst this is not impossible, as has been stated above, it really differs very little from the flakes that he regarded as Clactonian, and such a crude flake certainly would not be regarded as typical of an Upper Palaeolithic industry. Similar material to that of this flake is quite common in the gravels: the natural flake in the Armstrong Collection (Cambridge University Museum) is of a similar type of flint. Moreover it is unwise to assume too much from the presence or absence of evidence of rolling or natural batter on worked flints: although there seems to be little experimental data on this, in suitable conditions, such as those of a marine shingle beach, the degree of rolling seen on the Kirmington flakes could be produced in a matter of months rather than millenia.

Although a certain determination of the material cannot be given, it seems fairly safe to assume that a Lower or Middle Palaeolithic Industry is present at Kirmington, and one may reasonably postulate that a Clactonian and/or Acheulian Industry is represented. The evidence from several British sites which have recently been investigated suggests that the Palaeolithic material from the Hoxnian Interglacial is either predominantly Clactonian, as for example at Clacton itself (Warren, 1951) or else a Clactonian Industry is succeeded by, or mixed with,an Acheulian Industry, as at Hoxne (West and McBurney, 1955) and at Swanscombe (Wymer, 1964; also Cotton, 1938). Thus the Kirmington material appears to be consistent with the Hoxnian age of the Kirmington interglacial series indicated by the pollen analysis of Watts (1959), and is therefore a useful addition to our knowledge of the site. However, it is clear that much more careful fieldwork needs to be done at Kirmington to extend our knowledge of the Palaeolithic material: one undisputed "chopper" or hand-axe would be of far more value than all of the specimens discovered so far.

Local comparisons of the Palaeolithic artefacts

Lower and Middle Palaeolithic material is very scarce in the North-east Midlands and Yorkshire, so there is very little from the area which can be compared with the material from Kirmington, which seems to be the only locality in north-eastern England where such material has been found in a clearly stratified context. A fine Middle Acheulian ovate hand-axe has been found at Risby Warren, near Scunthorpe, Lincs. (Lacaille, 1946; Dudley, 1949, pp. 27-28) and a hand-axe of Acheulian type was found at Huntow, near Bridlington, East Yorks., during the last century (Evans, 1897, p. 572; Elgee, 1930, pl. III, fig. 4), but neither of these can be satisfactorily placed stratigraphically. Other surface finds, possibly of Middle Palaeolithic age, are flakes of Levalloisian type from Lake Welbeck, Nottinghamshire (Posnansky, 1958) and from Holmpton, near Withernsea, East Yorks. (Bartlett, 1964). Burchell (1931B) described and figured a flake, which he regarded as Levalloisian, from the mammaliferous Kelsey Hill Gravels at Burstwick, East Yorks., along with other, less certain, flints from the same deposit. These gravels form part of the Newer Drift topography, usually attributed to the retreat stages of the Weichsel Glaciation, (Penny, 1964; Catt and Penny, 1966): Burchell's artefact, therefore, cannot be regarded as in situ if it is in fact Middle Palaeolithic. Bartlett (1964) has refigured this specimen and suggests that the Levalloisian attribution cannot be certain with such a specimen; in fact the present author considers that in some ways it more closely resembles an Acheulian "finishing flake", as defined by Wymer (1964). In short, therefore, it seems that there is no palaeolithic material in North-eastern England which is directly comparable with that of Kirmington.

The Age of the Kirmington Deposits

The major reviews of different aspects of the Pleistocene of the past few years, together with more local work such as that of Watts (1959) and of Penny and Catt (1966), have thrown new light on the geological history of Kirmington, so that a re-interpretation is now possible. The present author considers that at least four major phases can be recognised, and these are outlined below.

Phase 1: The erosion of the so-called "Kirmington Fiord"

The Pleistocene deposits lie in a deep buried channel, which stretches (approximately) from near Barnetby-le-Wold to beyond Immingham Docks. This channel must have been eroded at a time when the sea-level was relatively much lower than at the present time, since borings at Immingham indicate a base-level in excess of -200 ft. O.D. (Shillito, 1937), and it is clear that, with the higher world-wide sea-levels which were general in the earlier part of the Pleistocene, such a low base-level could only be expected during a glacial phase. This phase must have preceded the Hoxnian Interglacial, but there is no evidence to show whether the erosion of this deep, narrow valley took place during the Lowestoft (Elster) Glaciation, or in some pre-Lowestoft phase. The channel has been of great importance in preserving the series of Pleistocene deposits from erosion.

Phase 2: The earlier glaciation

Tills of the Continental "Elster" Glaciation do not appear to have been recognised in North-eastern England, although Elsterian deposits are of considerable importance in, for example, East Anglia, where the "Lowestoft Glaciation" (West, 1955; West and Donner, 1956) is well recognised. It seems inconceivable that such a major glaciation should have by-passed Yorkshire and Lincolnshire, and the absence of recognisable deposits must be attributed to subsequent erosion. There is some indirect evidence to support this view, in that recent studies of the heavy minerals of deposits in East Yorkshire and North Lincolnshire, which are believed to be Hoxnian in age (the Speeton Shell Bed, the Bridlington Crag, and the Kirmington interglacial deposits), suggest that these deposits contain material derived from pre-existing glacial deposits (Catt and Penny, 1966).

Since pre-Lowestoft glaciations are unknown in Britain, one may tentatively conclude that such earlier glacial deposits were Lowestoft in age.

In the British Association borehole, one of the lowest beds recorded was a "lead-coloured clay, with a few small foreign pebbles" approximately $5\frac{1}{4}$ ft. thick (no. 3 above) which was tentatively compared with the "Basement Clay of Holderness". Since the Basement Till must now be regarded as Saale in age (Catt and Penny, 1966) this correlation cannot be accepted. Unfortunately, there is at present no sample of this clay available for examination, but it does seem possible that this is a till of the Lowestoft Glaciation which has been locally preserved at the bottom of the deep valley, beneath later deposits. It is possible that more of the lower part of the borehole sequence may be of a similar age, but such evidence as is recorded is inconclusive.

Phase 3: The Hoxnian Interglacial

The estuarine and freshwater deposits exposed in the Brickyard have been carefully studied recently (Watts, 1959) and therefore serve as a useful reference horizon from which the earlier and later Hoxnian deposits may be considered. As has previously been mentioned, Watts suggested that the estuarine and freshwater deposits were comparable in age with the later Hoxnian deposits of Clacton-on-Sea. The evidence suggests that the silts were deposited in a period of rising sea-level, during which the conditions at Kirmington were probably little different from those occurring in the Humber estuary today. During this period there was a short freshwater phase representing a temporary regression, or a period in which the salt-water of the estuary was held back - perhaps by a bar - to give a freshwater lagoon, such as is seen at Spurn, East Yorks., at the present time.

The lower limit of the interglacial deposits was not discovered by the British Association, although it was suggested that the reddish clays (no. 7 above) beneath the sand in the floor of the Brickyard were boulder clays. By a stroke of good fortune, the personal Field Notebook of G.W. Lamplugh (Chairman of the British Association Committee) was presented to the Hull Museums at the end of 1964, in a collection of local geological manuscript material. The Notebook was found to include Lamplugh's first-hand

records of the Kirmington boreholes. Examination of these records showed that there was a discrepancy between some of the descriptions in the published account as compared with Lamplugh's notes. On July, 20th 1903, Lamplugh described the red clay (no.7 above) as follows: "tough red clay like Bcl [boulder clay] with small ch. [chalk] stones, small peb [pebble] of qtze [quartzite] , rotten sst [sandstone] etc., very streaky at top, purple below with grey streaks, & at bottom scarcely any glac. st.[glacial stones] seen but most likely to be a bcl [boulder clay]." This description certainly did not suggest to the author that the clays resembled the Purple Clay of Holderness, as was suggested in the official report, so an auger borehole was put down in the floor of the Brickyard by L.F. Penny, J.A. Catt and the author, and samples of this clay were obtained. Further study and larger samples are needed, but it can be stated that the clay is a laminated estuarine deposit, with a relatively abundant microfauna, as has been briefly mentioned by Catt and Penny (1966), who show that the heavy mineral content is comparable with that of the Kirmington sand and estuarine silts (nos. 8 and 9 above) and with that of the Bridlington Crag and the Speeton Shell Bed of East Yorkshire.

Lamplugh's field notes on the beds below this clay are also enlightening. In 1903, Lamplugh described the Purple Clay (no. 6 above) as follows:- "Purple stiff clay with a few dark ch. [chalk] stones... redder streaky clay with a $1\frac{1}{2}$" dark porp. [porphyrite] pebble at [-] $21\frac{1}{2}$ [ft.] Very plastic red and yellow streaked clay with sm[small] chalk st. [stones], like a streaky warp ..... very pale red and yellow streaked, not like any bcl. [boulder clay] I know..." The stoneless purple and yellow below this (no. 5 above) were described in 1904 as" ... fine silty clay, purplish grey, yellow and red streaked, yellow below (no fossils) no stones."

If Lamplugh's descriptions are correct, it seems unlikely that either of these two deposits are glacial: both are more likely to be part of the interglacial series. If this is so, then more than 30 ft. of interglacial sediment underlies the estuarine silts. However, nothing short of a new borehole is likely to clarify the situation.

The Cannonshot Gravels (including Burchell's "Estuarine Shingle") immediately overlie the estuarine silts and have the appearance of a beach shingle in situ, probably dating from the period of high sea-level of the climatic maximum of the later part of the Hoxnian. The Gravels appear to be quite conformable with the estuarine silts, and may represent a beach, spit or bar which formed over the silts: again one may make a comparison with Spurn Point. There appears to be no real evidence to suggest that the Palaeolithic artefacts are not contemporaneous with the formation of this deposit: differences in degree of abrasion on individual worked flints can easily be explained by the variable length of time during which an individual flake was exposed to the elements. Indeed it is quite possible that the flints were actually worked in the near vicinity, since a coastal shingle beach, composed of well-sorted good quality flints, would be an ideal locality for flint working.

Phase 4: Further erosion and the later glaciation

Although the uppermost stoney clay is deeply weathered and decalcified, the macrofabric suggests that it is a true till (Watts, 1959). This deposit has frequently been correlated with the Hessle Till of East Yorkshire but caution must be exercised, since the criteria used for recognising the "Hessle Clay" in the past are not sound; a "Hessle" appearance can be the product of the weathering of a till of a different type, as has been shown by Catt and Penny (1966). Nevertheless, detailed fieldwork by a number of authors (e.g. Jukes-Brown, 1885; Straw, 1961) has shown that the brown clay of Kirmington is part of the Newer Drift of eastern Lincolnshire, and one may therefore suggest that the deposit is a till of Weichsel age, although it does differ from the true Hessle Till of East Yorkshire - perhaps through admixture of material from the interglacial beds below, as suggested by Catt and Penny (1966). During the long interval between the interglacial and the later glaciation there must have been a great deal of erosion: clearly the interglacial material must have been deposited over a large area, possibly along the banks of a Middle Pleistocene "Humber Estuary", but these deposits seem to be preserved only in the Kirmington buried channel. [Silts similar to those of Kirmington are recorded at Great Limber nearby (TA 1308), but appear to be unfossiliferous,

and the late T.B. Parks claimed to have found the Cannonshot Gravels during the excavation of a well at Ulceby (TA 1014) (personal communication), but no details were published.] It seems likely that much of this erosion took place during the Ipswichian (Eemian) Interglacial.

Although the whole region appears to have been heavily glaciated during the Gipping (Saale) Glaciation, there is no evidence that any of the deposits at Kirmington are of this age, so one must assume that they have been removed by subsequent erosion. Carruthers (1948) regarded the whole series of deposits as the product of a single ("Riss") ice-sheet, in accordance with his "undermelt theory", and ascribed the estuarine silts and peat to an "englacial raft." There is, however, no evidence to support this view: there is no indication that there has been any major disturbance of the beds, such as would be expected if such a composite ice-sheet had melted over the "Kirmington Fiord". Moreover, the interglacial series as envisaged by the present author may be as much as 60 ft. thick, so the raft postulated by Carruthers would be a very substantial mass indeed.

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