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# FURTHER INVESTIGATION OF THE ACHEULIAN SITE AT CUXTON

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With contributions from

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## 1. SYNOPSIS

Rescue excavations in 1984 at the well-known Palaeolithic site at Cuxton showed that the deposits were more complex than those accessible in the 1962-63 excavations. Under the hand-axe-rich gravels another assemblage with retouched flake artefacts but lacking hand-axes was found. Both assemblages were redeposited and had been incorporated in gravels tentatively linked to the Kempton Park gravels of the Middle Thames. The gravel was overlaid with redeposited loam, whose fine silt component has been dated by thermoluminescence to greater than 100,000 years bp. Faunal and pollen evidence from this important site has also been examined.

## 2. INTRODUCTION

In February and March 1984, the Maidstone Area Archaeological Group carried out a limited excavation in advance of the construction of a drive at no. 15 Rochester Road, Cuxton (N.G.R. TQ 71126655). The original objective was to seek further evidence of Roman burials associated with the inhumation found in the adjacent garden in 1962<sup>1</sup> and also to investigate whether the nearby Acheulian site<sup>2</sup> extended eastwards from the Rectory across the A228 road.

<sup>1</sup> P.J. Tester, 'A decapitated Burial at Cuxton', *Arch. Cant.*, lxxviii (1963), 182.

<sup>2</sup> P.J. Tester, 'An Acheulian Site at Cuxton', *Arch. Cant.*, lxxx (1965), 30.

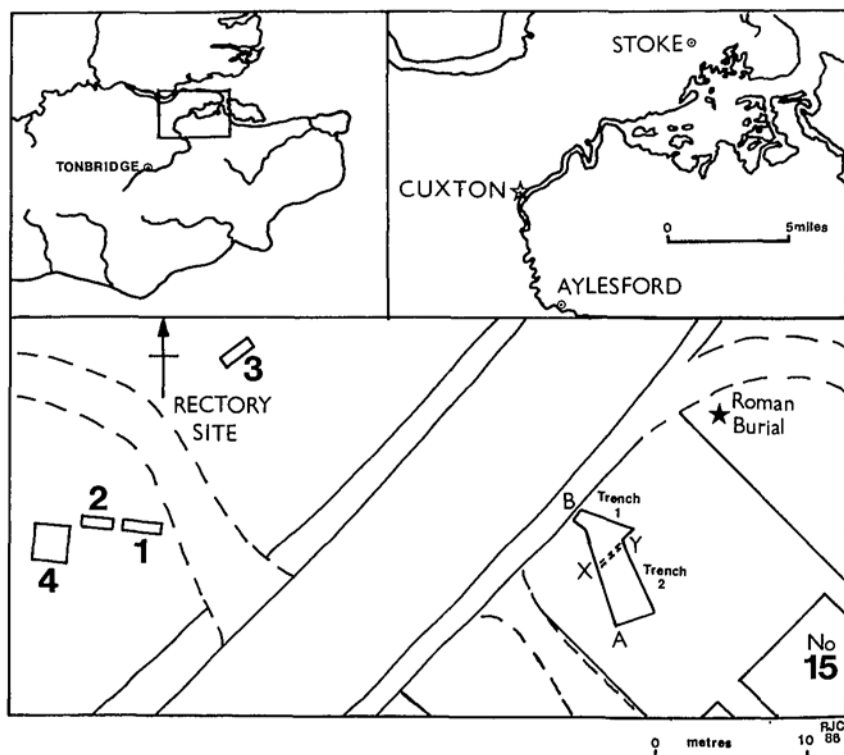


Fig. 1. Location Maps.

An area of 7 sq. m. was examined without finding evidence of further Roman activity. However, the second objective was amply realised when a hand-axe was found in a stratified context in the first day's excavation. At this point, the present writer was invited to progress the investigation of the palaeolithic deposits. From a brief review of the literature, it was clear that Peter Tester's 1962-63 excavations had firmly established the importance of the site to palaeolithic studies and that the major objective should be to obtain as much independent evidence as possible on the formation and characteristics of the gravel deposit and its associated artefacts.<sup>3</sup>

<sup>3</sup> D.A. Roe, *The Lower and Middle Palaeolithic Periods in Britain*, London, 1970.

## 3. EXCAVATION

The area investigated is shown in Fig. 1. Trench 1 extended from the roadside path to the garden hedge (area BXY). When the topsoil was removed, it was apparent that the gravel deposits were best preserved in the south-east corner, where they were furthest from the garden path and from the disturbance associated with the 1921 widening of the main road.<sup>4</sup> A succession of gravel layers was encountered, which were distinguished by changes in their physical and component characteristics (Fig. 2.1 and Table 1). Each gravel layer was carefully trowelled and all potentially worked flint was collected for post-excavation study. The position of each hand-axe and of organic fragments was recorded. Sample areas of the finer gravels were sieved, without yielding any additional flintwork. As trench 1 deepened, its width was rationalised to 0.80 m., following the southern section. A *sondage* at the western limit established the position of the underlying frost-shattered chalk.

Trench 2 was 2 m. wide and continued from the hedge into the garden (Area AXY). It was soon apparent that considerable quantities of the upper gravels had been removed. Layers 10 to 14 only survived in the west-north-west corner. Layer 9 was better preserved in the northern section, but was increasingly severely disturbed towards the south and east. Excavation was, therefore, restricted to a 1.50 m. trench in the northern area against the hedge (XY) and this continued down to the chalky debris. On the final day, the baulk (XY) was excavated down to Layer 8.

The exposed profiles were examined by Dr D.R. Bridgland. Drawings of the main section AXB (Fig. 2.1) and of the baulk (Fig. 2.2) were prepared with his assistance. The trenches were then backfilled and the drive was constructed. In demolishing his workshop to construct a garage, Mr Cogger found an Acheulian hand-axe built into the wall (confirming modern gravel extraction from the garden). A further hand-axe was found c. 1.50 m. below the ground surface when Mr Cogger dug a garage pit. Both these axes, together with four unstratified hand-axes found by Mr Cogger in 1983 when planting rose bushes in the front garden, had the characteristic 'hard limey deposit' previously observed upon the 1962-63 artefacts and upon some of the axes from the upper gravels in Trench 1.<sup>5</sup>

The 1984 excavations yielded c. 20 cu. m. of stratified gravel

<sup>4</sup> D. Church, *Cuxton, a Kentish Village*, Sheerness, 1976, 96.

<sup>5</sup> As they appear to be derived from similar contexts, these unstratified axes are labelled 12 ? in Table 3.1.



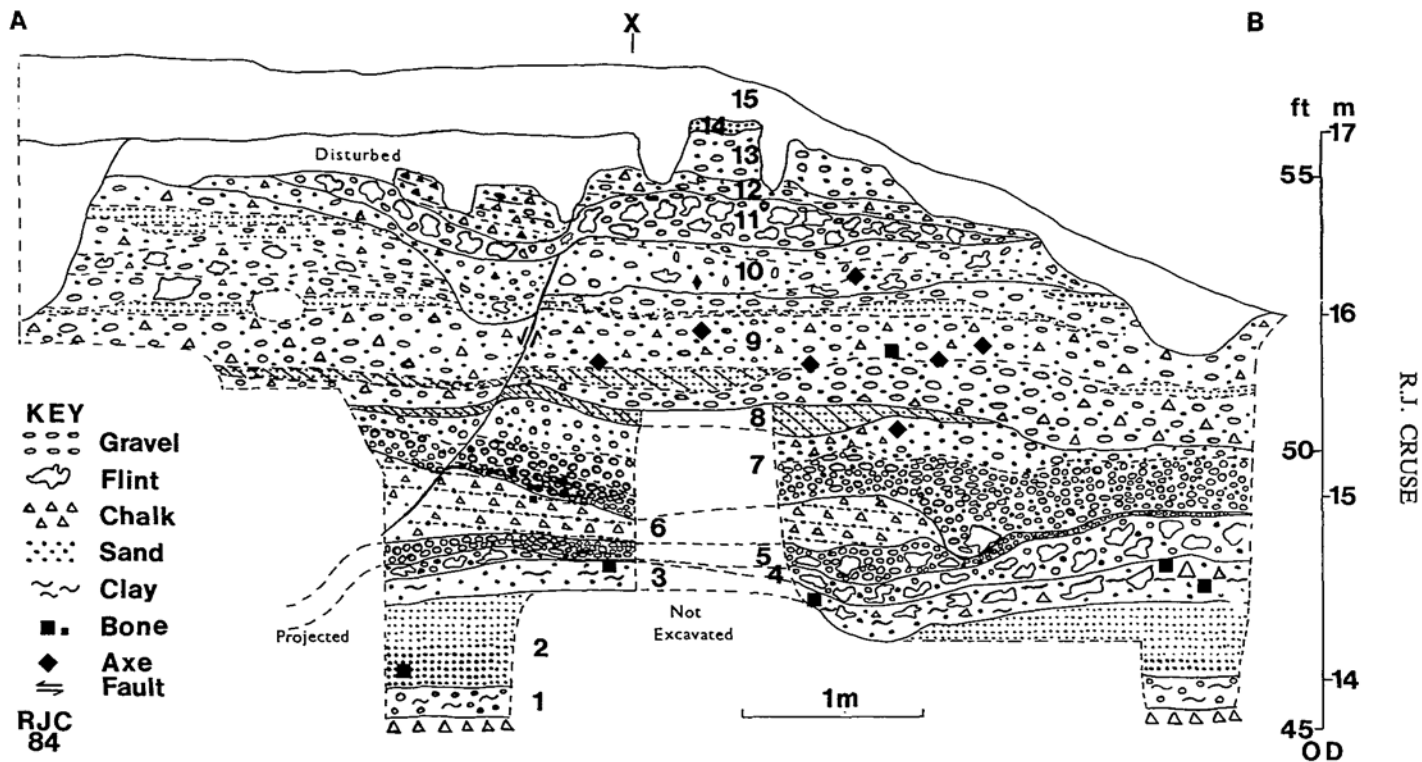


Fig. 2.1. Section AXB (South-west Face).

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deposits, which contained 220 artefacts, including 9 hand-axes and 23 flake tools. The hand-axes were restricted to the upper gravel levels, which contained between 5 and 25 artefacts/cu. m. This is modest by 1962-63 excavation standards, where the gravel yielded over 200 artefacts/cu.m. The highest stratified concentration found in 1984 was in the lower gravel layers 3 and 4 which yielded c. 75 artefacts/cu.m. (Table 3.1).

TABLE 1

### *Description of Layers*

- 15 Top soil/disturbed.
- 14 Redeposited eolian sand with some silt.
- 13 Unbedded, grey sandy gravel.
- 12 Bedded, fine chalky gravel.
- 11 Unbedded, very coarse dark gravel.
- 10 Unbedded, coarse gravel.
- 9 Planar bedded, sandy gravel with medium coarse chalky layers and fine sandy lenses.
- 8 Cross stratified yellow sand.
- 7 Planar bedded gravel, partially clast-supported.
- 6 Cross bedded, gravelly sand with foresets.
- 5 Dark fine gravel, partially clast-supported.
- 4 Orange-yellow, very coarse, slightly clayey gravel.
- 3 Grey very clayed sand.
- 2 Clean yellow sand with some clay lenses.
- 1 Chalk rubble (presumed upper surface of chalk).

## 4. SPECIALIST INVESTIGATIONS

### 4.1 *Analysis of the Gravel Deposits* (D.R. Bridgland)

#### *Gravel Characteristics* (Figs. 2.1 and 2.2)

Although the limited extent of the excavation did not permit a comprehensive assessment of the sediments, the available sections indicated a considerable preponderance of the gravel, often extremely coarse, over sand. They gave every indication of similarity to the assemblage of sedimentary types of Shakespeare Farm Pit, Allhallows,<sup>6</sup> and thus can probably also be attributed to a braided

<sup>6</sup> D.R. Bridgland and P. Harding, 'Palaeolithic Artifacts from the Gravels of the Hoo Peninsula', *Arch. Cant.*, ci (1984), 41.

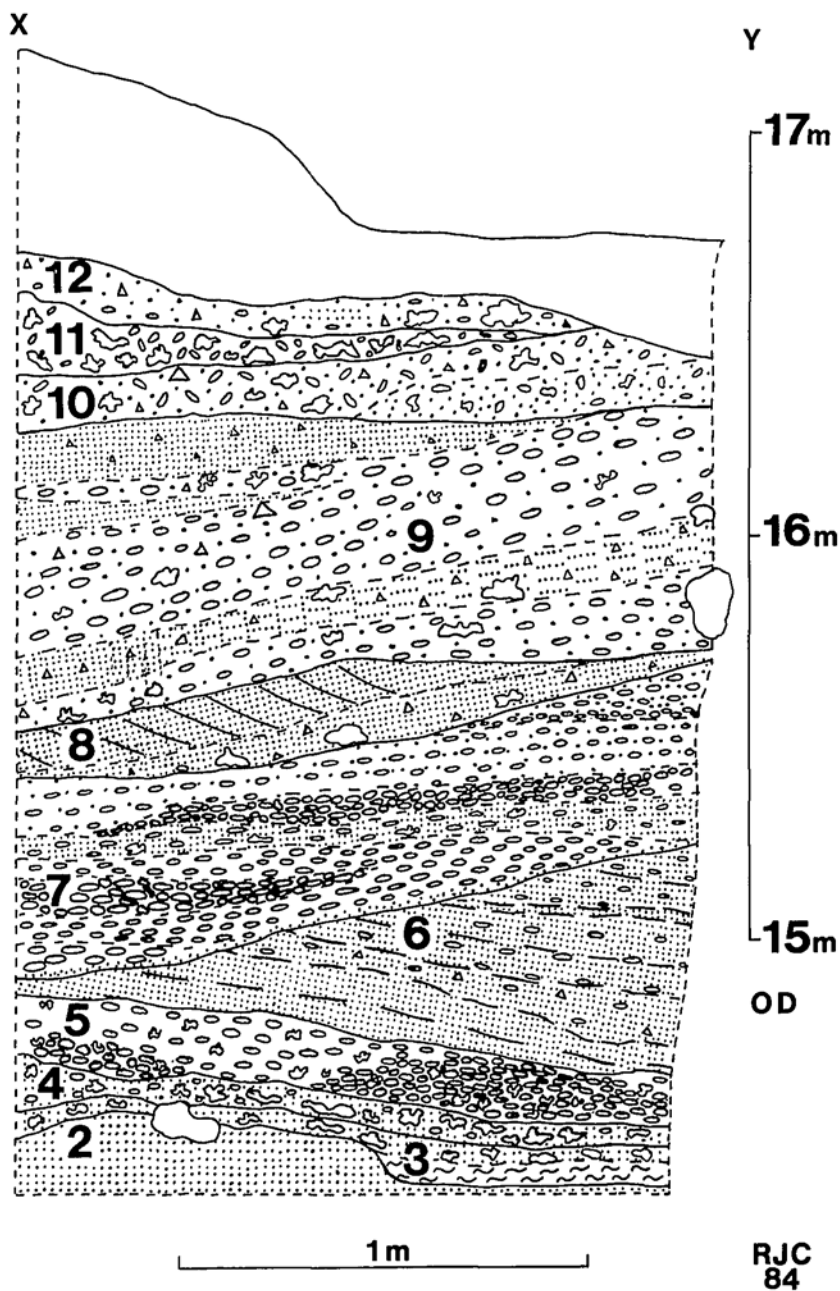


Fig. 2.2. Section XY (from Trench 2).

fluvial environment, laid down during a Pleistocene periglacial episode.

It is likely that both the clast-supported and matrix-supported gravels seen at Cuxton have resulted from deposition on longitudinal bars and as channel 'lags'. Most of the small, thin sand lenses were either cross-stratified or ripple-laminated. The thick sand bed (layer 2) near the base of the sequence, showed little sign of stratification other than a few clay partings and lenses of very clayey sand, which may represent a waning flood event. At its base this sand clearly overlies a 'lag' deposit (layer 1).

Palaeocurrent measurements were possible from the two main cross-bedded sand layers 6 and 8. The former indicated flow towards  $043^{\circ}$  (mean of 2 readings) and the latter toward  $346^{\circ}$  (mean of 3 readings). Given the very low number of measurements, these palaeocurrent records are in keeping with deposition by the main river. A single fault was observed in the section, with a downthrow towards the south-east, which may suggest a partial collapse of the deposits towards the centre of the contemporary Medway channel. On chalk, however, such structures are commonly caused by solution of the underlying bedrock surface.

The length of time represented by the depositional sequence is clearly important. Although each of the gravel units within the sequence probably represents a single flood event, each was truncated by later flood events with varying amounts of erosion of its upper levels. The erosion of layer 6, prior to the deposition of layer 7, was very clear. It is impossible to quantify the extent to which these units have been eroded and reworked by later floods, or the length of any periods of quiescence between flood events, for which there is no record in the sedimentary sequence. The time interval represented by the aggradation of the Cuxton deposits cannot, therefore, be estimated. If the amounts of erosion were modest, it is possible that the deposits could have accumulated in a few years.

### *Clast Lithology*

The composition of the Cuxton gravels has been analysed and compared with samples from elsewhere in the Medway basin: from Stoke (N.G.R. TQ 822748) on the Hoo peninsula, from Aylesford (N.G.R. TQ 726597), where Medway gravel overlies Folkestone Beds and from Lower Hayesden, near Tonbridge (N.G.R. TQ 563459) (Table 2.1). The last of these sites overlies Weald Clay, but is only 2 km. downstream of the Hasting Beds outcrop. As the Aylesford and Cuxton samples contain a high proportion of non-durable calcareous clasts (predominantly Kentish Ragstone and

TABLE 2.1

*Terrace gravel composition in various parts of the Medway valley*

Provenance	Lithology	total sample								excluding calcareous			
		Lower Hayesden		Aylesford		Cuxton		Stoke		Aylesford		Cuxton	
		1	2	1	2	unit 9	unit 7	1A	1B	1	2	unit 9	unit 7
Central Weald	H.B. sst.	32.2	37.8		0.5	3.1	5.9	0.2	0.5		0.7	7.7	7.0
	H.B. slt.	20.2	18.3		1.0	0.3	2.7	0.2			1.4	0.9	3.2
	H.B. iron. clay/iron	23.9	25.4	1.0	1.7	0.3	4.8	0.6	0.5	2.0	2.5	0.9	5.6
					0.2		0.7				0.4		0.8
	TOTAL	76.3	81.8	1.0	3.4	4.5	14.1	0.9	0.9	2.0	5.0	11.1	16.6
Lower Greensand	dense cht.	2.7	2.1	12.7	13.3	6.3	10.7	11.8	8.9	24.7	19.7	15.4	12.6
	porous cht.	3.1	4.4	7.7	5.2	6.3	15.6	8.2	5.6	14.9	7.7	15.4	18.5
	wea. chert	4.4	0.8	7.7	8.1	1.4	2.7	5.7	3.1	14.9	12.0	3.4	3.2
	sst/chert	0.6				0.3			0.2			0.9	
	sil. sst.	0.2	0.3		0.2		1.1	0.2	0.2		0.4		1.3
	ironstone						0.7	0.2					0.8
	ragstone			45.2	26.6	1.0	0.9						
	wea. rag.			1.0	4.8		0.5						
	calc. sst.			1.7	1.2	0.7							
	TOTAL	11.0	7.5	76.0	59.4	16.1	32.2	25.9	18.1	16.1	32.2	35.0	36.6

Chalk escarpment dipslope	n. Tert. flt. Tert. flint TOTAL FLINT <i>Chalk</i>	7.3 5.2 12.5	3.9 6.9 10.8	21.0 0.2 21.2 0.7	31.8 2.7 34.4	18.2 3.8 22.0 57.3	35.4 4.1 39.5 14.3	42.6 30.0 72.6	53.8 27.2 81.0	41.0 0.3 41.4	47.2 3.9 51.1	44.4 9.4 53.8	41.9 4.8 46.8
Exotic	Pal. chert metaquartz.			0.2	0.2			0.2		0.3	0.4		
Non Secific	ironstone			1.0	2.6	0.7		0.2		2.0	3.9	1.7	
TOTAL COUNT		481	389	575	421	286	441	636	426	295	284	117	372

Notes: 16-32mm size range counted.

Abbreviations - H.B. = Hastings Beds; sst. = sandstone; slt. = siltstone; iron. = ironstone; cht. = chert; wea. = weathered; sil. = siliceous; rag. = ragstone; calc. = calcareous; n. Tert. = non-Tertiary; flt. = flint; Tert. = Tertiary; Pal. = Palaeozoic; metaquartz. = metaquartzite. sst./chert = cherty sandstone/sandy chert

Chalk), material which rapidly disappears from the gravels downstream of its source outcrops, data are also presented for these sites which exclude this non-durable material. The presence of substantial quantities of material from the Central Weald and the Lower Greensand in the Cuxton samples provides a strong argument in favour of a mainstream Medway origin. The upstream component of the gravels would be expected to become progressively less common with distance downstream as a result of dilution by rock types from the lower reaches of the Medway valley. This is evident from the Lower Greensand component, which decreases between Aylesford and Cuxton. In the durable fraction, however, this decrease is rather less than might be expected, since considerable quantities of flint ought to have been added to the river's bed load as it passed through the gap in the North Downs. A probable reason for this is that, although it is upstream of the North Downs Chalk outcrop, the Aylesford gravel already reflects the input of flint from tributary valleys flowing in the Gault Vale, along the southern side of the escarpment. The increase in Hastings Beds content between Aylesford and Cuxton is somewhat surprising, as this material is typically soft and friable and would be expected to dwindle rapidly downstream. This may be a consequence of different erosion and transport régimes in the Medway when the two types of gravel were deposited, as exact contemporaneity between the three sites has not been established. The substantial incorporation of chalk in the Cuxton gravel is noteworthy, as this material rarely survives more than a few kilometres downstream from its source.<sup>7</sup> Not surprisingly, there is a marked decrease in the amount of Lower Greensand and especially, Hastings Beds material between Cuxton and Stoke, particularly when the non-durable are excluded from the Cuxton data.

### *Discussion*

The composition of the Cuxton gravel in comparison with deposits both upstream and downstream in the Medway valley, supported by the evidence from palaeocurrent measurements and the thickening at the deposits towards the modern river channel, strongly suggests that the main river was responsible for its deposition. The suggestion by Zeuner<sup>8</sup> that the deposits were indicative of a small tributary stream cannot therefore be supported.

A most important consideration is the relationship of the Cuxton

<sup>7</sup> D.R. Bridgland, 'The rudaceous Components of the East Sussex Gravels', *Quaternary Studies*, 2 (1986), 34-44.

<sup>8</sup> Tester, *op. cit.* in n. 2, 34.

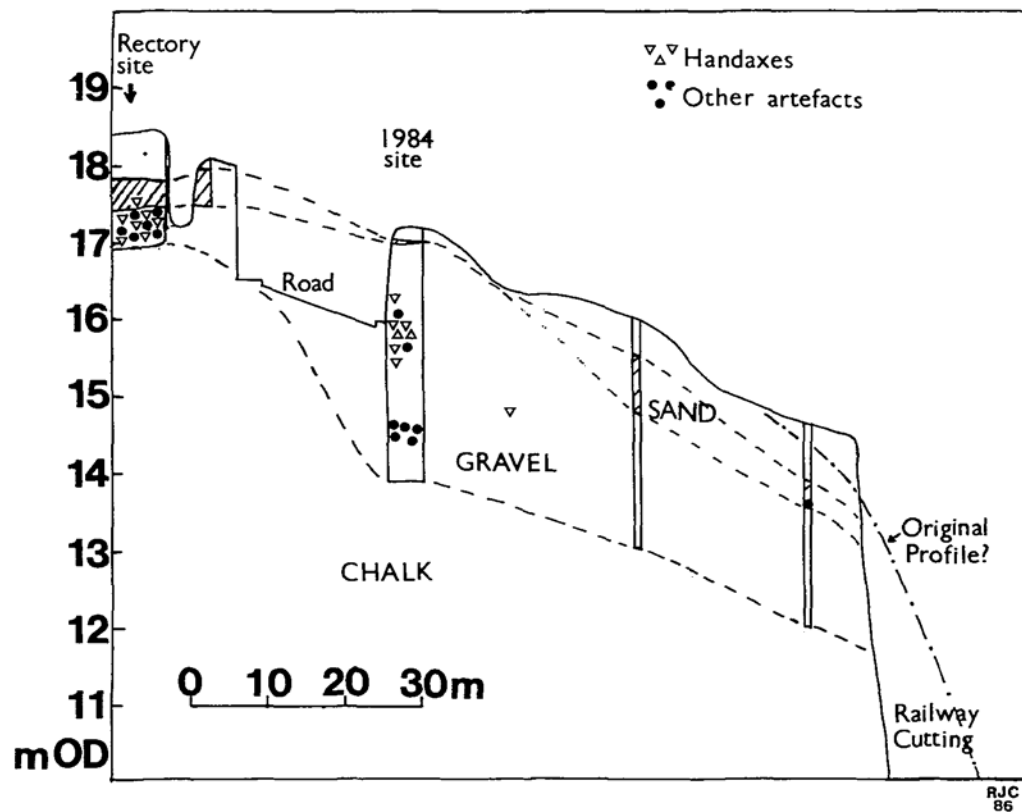


Fig. 2.3. North-west—south-east Section across Terrace.



gravel, with its Acheulian implements, to the Pleistocene succession in the Medway basin and its links with the Thames sequence. The occurrence of this impressive Acheulian industry at a lower (and therefore younger) position in the Medway valley than that occupied by the comparable site at Swanscombe in the Thames valley has been a problem since the Cuxton site was first discovered. The discovery at Shakespeare Farm Pit, Allhallows, of comparable pointed hand-axes in the higher (and therefore presumably older) Shakespeare gravel<sup>9</sup> underlines the difficulty with the Cuxton occurrence (Fig. 3.1).

The most recent work upon the correlation of the lower Medway terraces with those of the Thames<sup>10-12</sup> has traced the terrace aggradations downstream in each valley to the confluence area between the Hoo Peninsula and Southend. These elevation studies indicate that the Cuxton deposits are most likely to be an upstream extension of the Binney Gravel (Fig. 3.1), which is correlated with the Kempton Park Gravel in the Thames valley (Fig. 3.2). A mid-Devensian age is, therefore, indicated.

The occurrence of well-preserved and abundant Acheulian artefacts in gravel low down in the Medway terrace sequence at Cuxton remains a problem, as hand-axes are not abundant in the Kempton Park Gravel and when found are normally rolled and very obviously derived. Tester suggested<sup>13</sup> that Cuxton represented a low sea-level phase within the '100 ft.' aggradation period (comparable with that cited by King and Oakley to explain the Clactonian gravel at Little Thurrock),<sup>10</sup> as he wished to retain a close chronological link between the typologically similar Middle Acheulian industries. There is little geological evidence for such a drastic and short-lived rejuvenation interval and palaeolith typology would rarely be claimed these days to be sufficient grounds for proposing such disruption to conventional terrace stratigraphy.

Perhaps the most plausible explanation is that the Cuxton artefacts were formerly contained in earlier fine-grained deposits, which preserved them in near mint condition and they were then incorporated by reworking into the Binney Gravel. This hypothetical early deposit must have been situated very close to the present Cuxton site, as most of the material has experienced very little transport. It may well have been entirely eroded away.

<sup>9</sup> Bridgland and Harding, *op. cit.*, 52.

<sup>10</sup> W.B.R. King and K.P. Oakley, 'The Pleistocene Succession in the lower Parts of the Thames Valley', *PPS*, i (1936), 52-76.

<sup>11</sup> Bridgland and Harding, *op. cit.*, 52 and Fig. 3.

<sup>12</sup> D.R. Bridgland, *The quaternary fluvial Deposits of north Kent and east Essex*, unpublished Ph.D. thesis, City of London Polytechnic, 1983.

<sup>13</sup> Tester, *op. cit.* in n. 2, 43.

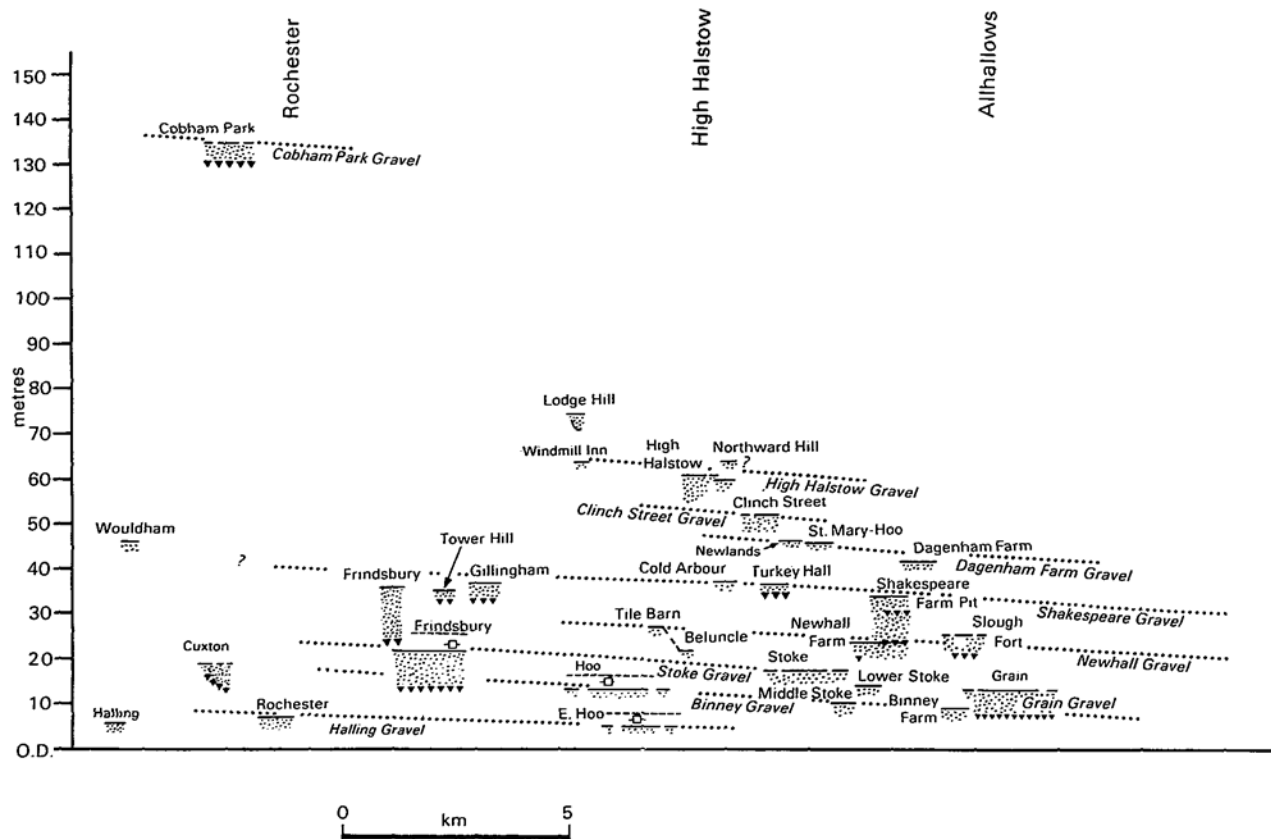


Fig. 3.1. Long Profile of Lower Medway Terraces (modified from note 6, Fig. 3).

4.2 *Analysis of the 'Sandy Loam'*

(R.J. Cruse)

Particle size analysis was carried out by Dr J.A. Catt upon samples from layer 14 and from the loam exposed in the rectory garden (Table 2.2). He considered layer 14 to be a very well sorted fine sand, with only traces of clay, silt or coarse sand and interpreted it to be a windblown sand. Although the analysis of the rectory sample has a peak at the same particle dimensions as layer 14, it is less well sorted, with more silt, clay and coarse sand. Dr Catt suggests that this may be the result of an eolian sand being mixed with some loess. As layer 14 was only vestigial, the rectory sample is probably more representative.

In his 1962-63 excavations, Mr Tester found the loam to contain fragments of water-worn flint and a few 'unrolled' artefacts. There is thus little doubt that the loam is a redeposited mixture of materials. Dr P.A. Gibbard's recent review of the loams and brickearths in the Middle Thames valley (his 'Langley Silt complex'), has confirmed that they often overlie Taplow or younger gravels and that they have given thermoluminescence (TL) dates ranging from the late Wolstonian to the late Devensian.<sup>14</sup>

TABLE 2.2

*Particle Size Analysis*

Size ( $\mu\text{m}$ )	Cuxton layer 14 'loam'	Cuxton Rectory 'loam'	Middle Thames 'Langley Silt'*	Typical Loess+
1,000 - 2,000 )	1.4	2.3	1.3	0.0
500 - 1,000 )	3.3	5.4	2.1	0.0
250 - 500 ) Sand	17.4	28.7	6.4	0.0
125 - 250 )	68.4	26.5	7.3	0.1
63 - 123 )	2.0	10.1	8.7	0.8
31 - 63 )	1.4	7.0	19.0	27.2
16 - 31 )	0.7	3.4	14.1	30.9
8 - 16 ) Silt	0.6	4.3	7.7	11.7
4 - 8 )	0.7	2.7	4.4	4.7
2 - 4 )	0.6	2.2	3.4	1.9
2 Clay	3.5	7.4	25.6	22.7

\* Average of nine sediment samples (from note 14, Table 1)

+ from note 15, Table 1.

<sup>14</sup> P.A. Gibbard, *The Pleistocene History of the Middle Thames Valley*, Cambridge, 1985, 56, 139.

## 4.3 Section Across the Terrace

(R.J. Cruse)

Investigation of the Cuxton terrace profile by Mr A. Daniels established the section shown in Fig. 2.3 by augering at locations halfway down the kitchen garden and in its extreme south-east corner. Once the topsoil and disturbed ground were penetrated, he encountered a sandy loam with a few flints which continuously capped a series of gravel deposits with variable amounts of chalk in them. At the base of this gravel was a narrow band of stained flints in a darker coarse gravel (as was observed in 1962-63) and then chalky debris was encountered. This profile demonstrated that the chalk bench and the terrace deposits slope gradually (1 in 24) towards the south-east.

Having established that the sandy loam overlies the gravel, a convenient location for a loam sample for thermoluminescence (TL) dating was sought. The exposed loam in the garage cutting of no. 11 Rochester Road, some 30 m. to the north, was selected and the TL determination gave a minimum age of 100,000 years bp (Appendix 1).

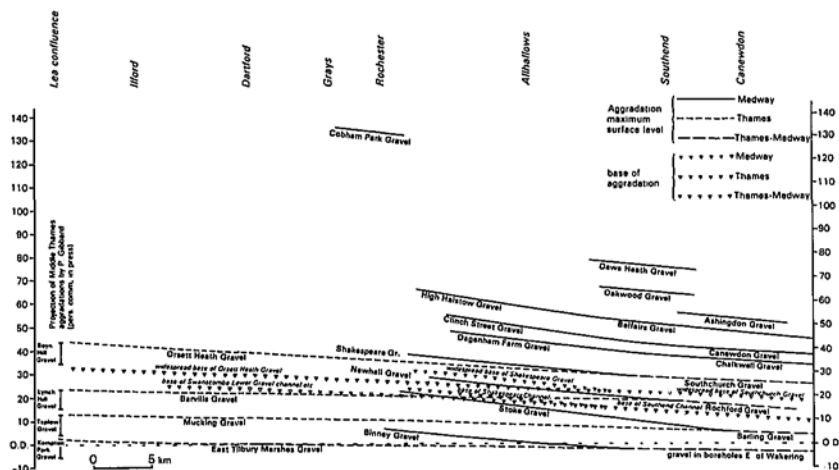


Fig. 3.2. Comparison of Lower Thames Terrace Profiles with Lower Medway.

<sup>15</sup> P.A. Gibbard, A.G. Wintle and J.A. Catt, 'Age and Origin of the clayey Silt 'Brickearth' in the west London, England', *Journal of Quaternary Science*, 2 (1987), 3-9.

<sup>16</sup> Tester, *op. cit.* in n. 2, 36.

4.4 *The Artefacts*

(P. Callow)

*Introduction*

The finds from the 1962–63 excavations were briefly described by Tester<sup>17</sup> and assigned by him to the Middle Acheulian (by typological analogy with the series from Furze Platt and Barnfield Pit). Roe<sup>18–19</sup> placed them in his Group I (Pointed tradition, with cleavers) together with Furze Platt, Baker's Farm, Whitlingham, Twydale and Stoke Newington, on the basis of the hand-axe morphology. In a more extensive study using multivariate statistical techniques on 87 hand-axe series from Britain and France,<sup>20</sup> Cuxton paired fairly consistently with Baker's Farm, while Group I proved remarkably well characterised (and particularly British, in that none of the Continental series fell within its compass). The hand-axes and cleavers from Cuxton were further described by Cranshaw in her investigation of Group I industries.<sup>21</sup>

The approach used here is essentially that of Bordes,<sup>22</sup> which has been extensively applied to the Lower and Middle Palaeolithic of western Europe and elsewhere. Although it has been used by several workers on British material, their results for the most part remain unpublished; nevertheless, the method is sufficiently familiar and well-documented to be an obvious first choice in this instance. In general, it satisfactorily accommodated the Cuxton artefacts, in that no impression was gained of forcing them into inappropriate categories. The only real problems arose when dealing with the bifacial pieces; as previously noted by the writer<sup>20</sup> and also by Ashmore,<sup>23</sup> a number of basic hand-axe shapes is not distinguished in the type list.

The identification and classification of flake tools from river gravels is usually complicated by damage occurring during transport, which may either mimic deliberate retouch or mask it. Evidence of crushing, regularity in the arrangement of the edge scars, and traces

<sup>17</sup> *Ibid.*, 29–39.

<sup>18</sup> D.A. Roe, 'British Lower and Middle Palaeolithic Handaxe Groups', *PPS*, xxxiv (1968), 1–82.

<sup>19</sup> Roe, *op. cit.*, in n. 3.

<sup>20</sup> P. Callow, *The Lower and Middle Palaeolithic of Britain and adjacent Areas of Europe*, unpublished Ph.D. thesis, University of Cambridge, 1976.

<sup>21</sup> S. Cranshaw, *Handaxes and Cleavers, selected English Acheulian Industries*, BAR (British Series), 113 (1983).

<sup>22</sup> F. Bordes, 'Typologie du Paléolithique Ancien et Moyen', *Publications de l'Institut du Quaternaire de l'Université de Bordeaux*, Mémoire no. 1, 1961.

<sup>23</sup> A.M. Ashmore, 'The Typology and Age of the Fordwich Hand-axes', *Arch. Cant.*, xcvi (1980), 90.

TABLE 3.1.

*Frequencies for major artefact categories (by layer)*

Layer	2	3	4	5	6	7	8	9	9/10	10	11	12?	15	Unstr	Total
Flake tools	0	8	10	1	0	1	0	3	0	0	0	0	0	8	31
Broken flake tools	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Handaxes	0	0	0	0	0	1	0	4	2	1	0	4	2	2	16
Handaxe tip fragments	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2
Tranchet accident	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Cores	0	2	2	1	0	0	0	0	1	0	1	0	0	1	8
Waste flakes	3	14	71	4	2	14	0	52	2	6	10	0	20	48	246
Hammerstones	0	0	0	0	0	1	0	1	0	1	0	0	2	0	5
TOTAL	3	24	83	6	2	17	0	60	5	10	11	4	26	59	310
Volume examined (m <sup>3</sup> )	0.4	1.0	0.4	0.4	4.0	4.7	0.5	6.3	~	0.5	0.5		7.5		
Artefacts/m <sup>3</sup>			76							12					

of abrasion on the ridges between primary removals are pointers which can be of assistance in eliminating natural 'retouch'; even so, there are bound to be pieces whose status cannot be determined with confidence. Where any real uncertainty was felt about a possible tool, therefore, it has been excluded from consideration (at the risk of erring on the side of caution). This represents a slight departure from the procedure published by Bordes, in that such material might be included in his types 45-50, and thus in his 'essential' tool counts. However, the typology was designed with artefacts from terrestrial deposits in mind, and Bordes never seriously addressed the problem of those from fluviatile deposits. To take too generous a definition of types 45-50 in these circumstances merely obscures the occasional presence of probably genuine tools with very light retouch or utilisation.

At an early stage of the work described here it was realised that the stratigraphic division of the sediments by the erosion phase between layers 6 and 7 was reflected in the industrial material. The possibility that this was the case was first raised by the vertical distribution of hand-axes, and it was soon lent support by other observations (see below pp.00). The samples from individual layers were too poor for any statistical validity to attach to an analysis based on them without some form of grouping, so the finds were 'lumped' into three batches corresponding to layers 1-6, 7-14, and 15 plus unstratified (including four hand-axes thought likely to be from layer 12); these are referred to here as 'lower', 'upper', and 'unstratified' (Table 3.2). The last of these is chiefly of interest in that it extends the range of types represented.

TABLE 3.2.

*Frequencies for major artefact categories (after grouping layers).*

	Lower		Upper		Unstrat	
	n	%	n	%	n	%
Flake tools	19	16.1	4	3.9	8	9.0
Broken flake tools	0	0.0	0	0.0	1	1.1
Hand-axes	0	0.0	7	6.9	8	9.0
Hand-axe tip fragments	0	0.0	2	2.0	0	0.0
Cores	5	4.2	2	2.0	1	1.1
Tranchet accident	0	0.0	0	0.0	1	1.1
Waste flakes	94	79.7	84	82.4	68	76.4
Hammerstones	0	0.0	3	2.9	2	2.2
Total	118		102		89	

## INVESTIGATION OF THE ACHEULIAN SITE AT CUXTON

Of course, the grouping of layers into two major units begs the question as to whether there might be even more than two industries at Cuxton. But this hypothesis is rendered untestable by the limited amount of material available; for the same reason it would be pointless to describe the artefacts in detail on a layer-by-layer basis. Both for reasons of economy and because some of the most interesting pieces occur in the 'unstratified' group, the policy adopted here is to describe the most distinctive features of the totality of the 1984 collection, while presenting a stratigraphic breakdown in tabular form. The samples are too poor to permit characterisation of the contents of even the major stratigraphic groupings except in the most general terms. Their chief usefulness must be the light they throw on the interpretation of the much larger series from Tester's excavations. The statistical reliability of the observed differences is discussed below.

### *General Description*

In all, 310 objects from the 1984 excavations were studied (Table 3.1); of these, 85 were unstratified or from the topsoil (layer 15). One particular feature of the material was recognised even during excavation as constituting an important difference from that recovered by Tester. Bifacially-worked tools (hand-axes and cleavers) make up only 5.5 per cent of the total, as against 32 per cent of the earlier finds; the significance of this observation is discussed later. In other respects the new finds are very similar to Tester's – in raw material, physical condition, technology and typology.

TABLE 3.3.

### *Core typology.*

	Globular	Miscellaneous	Shapeless	Broken	Total
Upper	0	0	1	1	2
Lower	1	2	1	1	5
Unstratified	0	0	1	0	1

With a few exceptions the artefacts are made on black to mid-grey flint from the Chalk, obtained in nodular form (the colour can vary considerably over a single piece). Two possess pebble cortex, and four more are reworked from older artefacts. Most are in fairly fresh, but not in mint condition; as Tester commented,<sup>17</sup> the few artefacts which are more heavily rolled and stained cannot be separated from



the rest on typological grounds. About a third of the pieces exhibit light ochreous staining, often quite localised. This affects over 60 per cent of the lower series, but only 10 per cent of the upper and reflects the darker colouration of the lower gravels compared to the chalky upper gravels.

The debitage techniques employed were simple and essentially opportunistic. Of the cores (Table 3.3) only one, from layer 3, can be assigned to one of Bordes's formal types, being a massive globular core weighing 1490 g. (Fig. 4.2a). The one illustrated in Fig. 4.3d is much smaller (150 g.) and is a simple opposed-platform core from which transverse flakes have been removed.<sup>24</sup> None shows evidence of care in preparation of the platform; on the other hand, the sample is a small one and Tester's finds make it clear that some deliberate facetting did occur during core reduction.

Only 9.6 per cent of the flakes and flake tools entirely lack cortex (Table 3.4); the percentage for the 1962-63 finds is fairly good agreement at 12.9 per cent. This is consistent with the character of the cores, but might seem surprising in view of the presence of hand-axes. However, given the flow rate implied by the coarse sediments in which many of the artefacts were buried, thin finishing flakes are particularly likely to have been washed away by the river.

TABLE 3.4.

*Cortex (flakes and flake tools only)*

	Waste flakes				Flake tools			
	Lower		Upper		Lower		Upper	
	n	%	n	%	n	%	n	%
None	7	7.6	10	12.0	2	10.5	0	0.0
Slight	22	23.9	22	26.5	7	36.8	1	25.0
Half	40	43.5	35	42.2	7	36.8	1	25.0
Full	15	16.3	15	18.1	1	5.3	1	25.0
Along an edge	8	8.7	1	1.2	2	10.5	1	25.0
Total	92*		83		19		4	

\* Two further pieces were indeterminable

<sup>24</sup> The terms 'miscellaneous' and 'shapeless', used in Table 3.3, denote respectively pieces which do not fit into more formal categories (but have enough removals for some sort of design to be apparent) and those with a very few flakes struck from them in a casual manner.

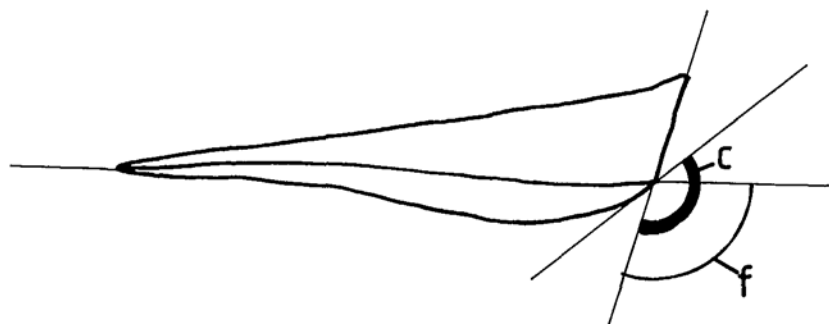


Fig. 4.1. Measuring the Cone Angle (c) and flaking Angle (f) of a Flake, along the Axis of Percussion.

The flaking and cone angles (see Fig. 4.1) are also high (averaging  $112.8 \pm 9.7^\circ$  and  $125.7 \pm 10.4^\circ$ ); this is consistent with the use of hard and rather heavy hammers on cores such as are found here, or of the early stages of handaxe manufacture, as is the low incidence of true faceted butts (Tables 3.5 and 3.6). Multiple cones of percussion are quite common, at 12.2 per cent. There are no Levallois flakes among the new finds, and five (1 per cent) present in the 1962–63 series are explicable as chance products of other knapping strategies, none being a particularly good example of the type.

The flake tools are for the most part poorly made, with localised secondary work chiefly effective in providing a short length of edge with a consistent angle of retouch, rather than in modifying the shape of the blank to any great extent. No attempt seems to have been made to select blanks of particularly high quality though, as expected, they are larger than the waste flakes; the mean lengths are 67.0 and 57.1 mm., or for the lower series only (a fairer comparison) 71.1 and 62.5 mm. The new samples are so small (Table 3.7) that detailed typological statistics would be meaningless, but it is worth noting that, for both the new and the old finds, side scrapers account for about a third of the flake tools; deliberate denticulated and notched pieces are appreciably less numerous.

Fig. 4.2c shows a convex side scraper with scalar retouch, its orientation intermediate between lateral and transverse, and with possible slight thinning near the butt. The side scraper in Fig. 4.3b, somewhat edge-damaged, has a gently concave working edge formed by semi-abrupt retouch towards the distal end of the right-hand margin, while that in Fig. 4.3a (again with semi-abrupt retouch) has three areas of secondary work, two normal and one inverse. Quina (step) retouch is entirely absent from the assemblage. The single-blow ('Clactonian') notch on the piece illustrated in Fig. 4.3c appears

# R.J. CRUSE

TABLE 3.5.

## *Butt typology (flakes and flake tools)*

	Lower			Upper		
	n	%	%	n	%	%
Cortical	16	14.2	17.8	26	29.5	39.4
Plain	49	43.4	54.4	28	31.8	42.4
Dihedral	11	9.7	12.2	3	3.4	4.5
Polyhedral	2	1.8	2.2	0	0.0	0.0
Facetted	12	10.6	13.3	8	9.1	12.1
Punctiform	0	0.0	0.0	1	1.1	1.5
Indeterminate	10	8.8	—	16	18.2	—
Removed	2	1.8	—	0	0.0	—
Missing	11	9.7	—	6	6.8	—
Total	113			88		

Polyhedral butts are defined as having facetting performed in the course of preparing the platform for an earlier removal, rather than for that of the flake in question. The definition resulted from discussions between the writer, P. Timms and F. Bordes in 1971 in Bordeaux; it was also employed by B.A. Bradley (1976) in an experimental investigation of Levallois technique.<sup>43</sup>

The second set of percentages, used in computing the facetting indices given in Table 3.7, has been calculated on the basis of only those pieces whose butt type is determinable.

TABLE 3.6.

## *Technological indices*

Index	Lower %	Upper %	Unstrat %	1984 exc. %	1962 exc. %
IF Facetting	27.8	16.7	22.6	23.0	15.5
IFs Facetting (strict)	15.6	12.1	18.9	15.3	9.1
IFss Facetting (preparatory)	13.3	12.1	17.0	13.9	6.5
IL Levallois	0.0	0.0	0.0	0.0	1.1
Ilam Blade	3.1	9.7	5.4	6.8	5.8

The index IFss (not employed by Bordes) is based on pieces with butts exhibiting facetting which is not truncated by a previous removal; IFs includes those with polyhedral butts, and IF those with dihedral butts also. IL is the percentage of Levallois blanks, and Ilam that of blades (L/B) > 2, where determinable).

# INVESTIGATION OF THE ACHEULIAN SITE AT CUXTON

TABLE 3.7.

*Tools other than hand-axes and cleavers*

Type	Lower	Upper	Unstrat	1962-3 exc.
1 Levallois flake, typical	0	0	0	3
2 Levallois flake, atypical	0	0	0	2
5 Pseudo-Levallois point	0	0	0	1
9 Straight single sidescraper	2	0	0	1
10 Convex single sidescraper	1	2	2	6
11 Concave single sidescraper	1	0	0	3
13 Straight-convex double sidescraper	0	0	0	1
21 Canted sidescraper	1	0	0	0
23 Convex transverse sidescraper	0	0	0	3
25 Sidescraper with inverse retouch	0	1	0	4
26 Sidescraper with abrupt retouch	0	0	0	2
28 Sidescraper with bifacial retouch	0	0	0	1
29 Sidescraper with alternate retouch	2	0	1	0
31 Atypical endscraper	2	0	1	2
35 Borer, atypical	0	0	0	1
37 Backed knife, atypical	0	0	0	1
38 Cortex-backed knife	0	0	0	2
39 Raclette	1	0	0	0
40 Truncated piece	0	0	0	1
42 Notched piece	5	0	1	14
43 Denticulate	1	0	1	7
45 Inverse retouch	0	0	1	2
46 Thick abrupt retouch	0	0	1	4
47 Thick alternate retouch	1	0	0	0
48 Thin abrupt retouch	0	1	0	2
51 Tayac point	0	0	0	1
54 End-notched piece	0	0	0	1
61 Chopping tool	0	0	0	1
62 Miscellaneous	2	0	0	1
Total	19	4	8	67

to be deliberate; on the other hand, the short abrupt removals along the distal end and the left-hand margin may be no more than utilisation or natural damage. A coarse denticulate on a thick flake (Fig. 4.3b) has its worked edge formed by a series of single-blow notches.

The 'heavy duty' tools are entirely in keeping with those in the much larger sample for 1962-63. There is one parallel-sided bifacial cleaver whose cutting edge is formed by a tranchet blow (Fig. 4.2d) and subsequently spoiled by a large notch. The hand-axes are pointed (though not acutely) or have linguist tips. Their centres of gravity lie

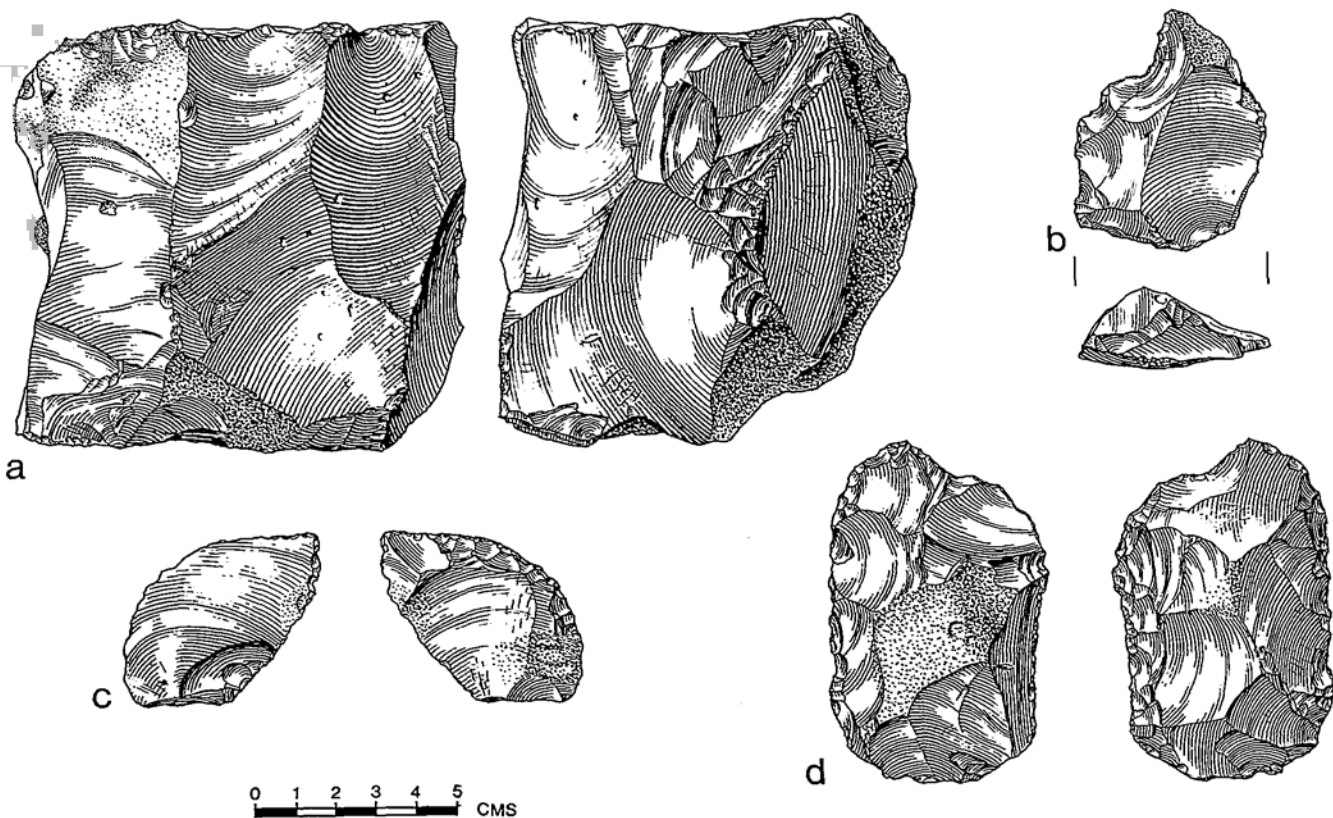


Fig. 4.2. Artefacts from the 1984 Excavations. In each case the layer is given after the type: (a) Globular core, 3; (b) denticulate, unstrat.; (c) convex side scraper, unstrat.; (d) cleaver, 15.

well towards the butt, on which with only one exception (a small amygdaloid) cortex is present to some degree – in five cases the butt is fully cortical. One piece (the small amygdaloid already mentioned) was made from a flake, but the use of nodules was the general rule. All appear to have been worked with a stone hammer only. One small crude *ficron* has been left with a thick plano-convex cross-section (the underside consisting almost entirely of a single negative scar), but the other pieces show quite extensive thinning by means of flat flakes struck from close to the edge, often with some preparatory abrasion of the platform and adjacent dorsal surface. The production of precisely regular and sharp edges cannot have been a major objective of the makers, though, and such scraper-like subparallel or scalar retouch as does occur has generally been used for the adjustment of shape or angle rather than for purposes of refinement. Two good examples of thinning flakes were found, both being unstratified (as was the by-product of an accident during tranchet removal, illustrated in Fig. 4.5c).

Many of the hand-axes are damaged; six exhibit tips with the 'tranchet effect' described by Cranshaw<sup>25</sup> out of nine for which determination is possible. One piece has had its snapped tip repaired with a straight truncation (recalling the 'basil point' in Wymer)<sup>26</sup> and there is a second less certain example. The single instance of a twisted tip affects only the extreme end of the piece and is probably no more than the result of a repair. Because so many of the bifacial tools are incomplete, statistics for size are liable to be misleading. When allowance is made for loss from reasonably complete pieces, the length ranges from 190 mm. (an estimate) to 71 mm., with a mean of 121 mm. falling to 101 mm. when only whole pieces are counted.

Three different methods of describing hand-axe shape are widely known in this country; those of Bordes<sup>22</sup> and Wymer,<sup>26</sup> which are simple typologies, and that of Roe,<sup>18</sup> which represents shape graphically by the use of ratios. All of these are employed here (Tables 3.8 and 3.9 and Fig. 4.6); for the last of them length has been estimated where appropriate.

Three pieces are sufficiently unusual to merit individual attention. Those in Fig. 4.4 and 4.5a are of Bordes's *lagéniforme* (bottle-shaped) type, with concave sides and a broad, rounded linguatate tip. Vayson de Pradenne's<sup>27</sup> term *ficron à langue de chat* is both more

<sup>25</sup> Cranshaw, *op. cit.*, 101.

<sup>26</sup> J.J. Wymer, *Lower Palaeolithic Archaeology in Britain as represented by the Thames Valley*, London, 1968, Fig. 2.3.

<sup>27</sup> A. Vayson de Pradenne, 'Les Dénominations de l'Outillage du Paléolithique Inférieur', *Revue anthropologique*, 47 (1937), 91–122.

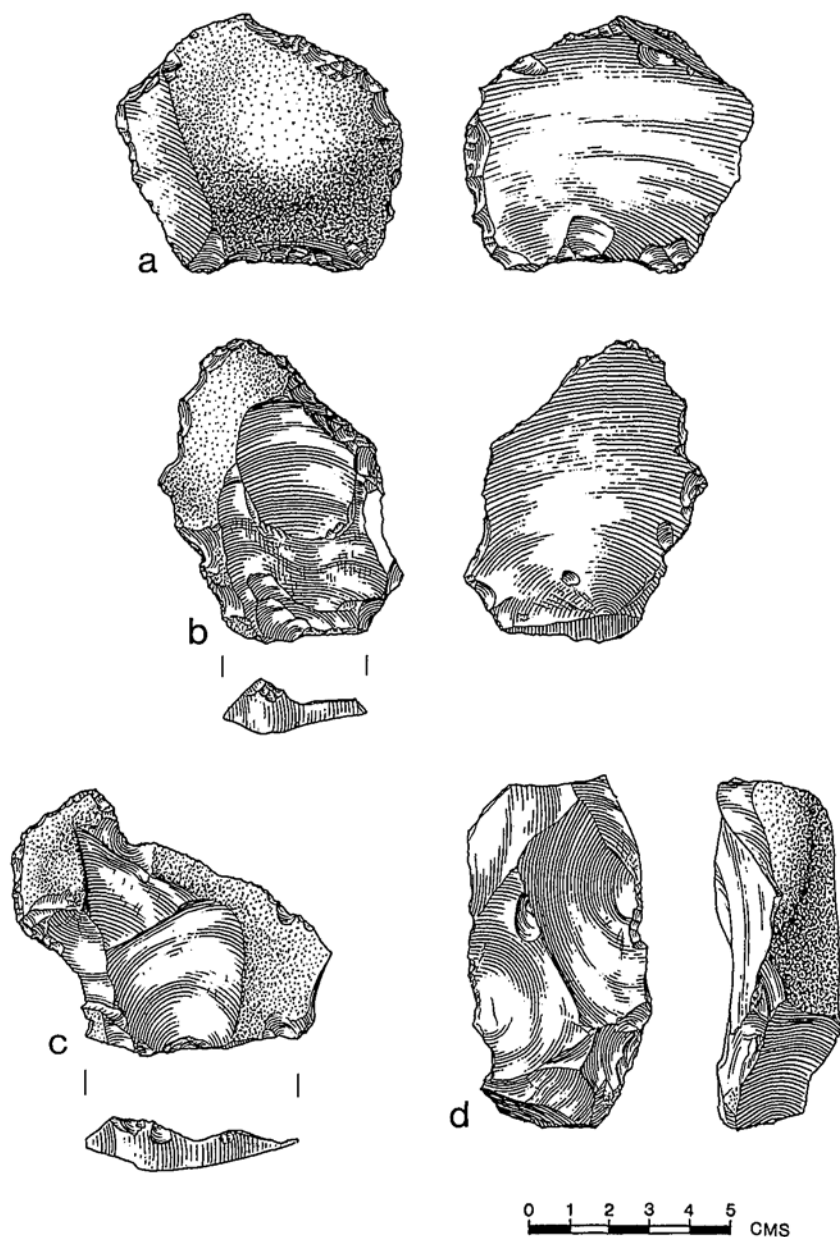


Fig. 4.3. Artefacts from the 1984 Excavations: (a) Side scraper with alternate retouch, 4; (b) concave side scraper, 4; (c) Clactonian notch, 4; (d) 'miscellaneous' core, 3.

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TABLE 3.8.

*Hand-axes and cleavers* (classification after Bordes 1961)

Type	Upper	Unstrat.	Total
Lanceolate	0	3 <sup>1,2</sup>	3
Ficron	3 <sup>1,3</sup>	0	3
Amygdaloid	1	3 <sup>1</sup>	4
Biface-cleaver	0	1	1
<i>Lagéniforme</i> (bottle-shaped)	2	0	2
Miscellaneous	0	1	1
Broken amygdaloid(?)	1 <sup>1</sup>	0	1
Tip only (lanceolate/ficron)	1	0	1
Tip only (roughout)	1	0	1

Key to superscripts: (1) tip missing; (2) tip broken, then retouched?; (3) tip crushed.

TABLE 3.9.

*Hand-axes and cleavers* (classification after Wymer 1968)

Type	Upper	Unstrat.	Total
Da Pointed; natural butt	1	0	1
DFa Pointed; natural butt	0	1	1
Ea/i Pointed; natural butt	1	0	1
Fa/iv Pointed; natural butt	0	1	1
FGa Pointed/sub-cordate; natural butt	0	1	1
FGa/i Pointed/sub-cordate; natural butt	0	1	1
FLa/i Pointed/segmental chopping-tool; natural butt	0	1	1
FMa/i Pointed/ficron; natural butt	2	0	2
FMb/i Pointed/ficron; natural butt	0	1	1
Ga Sub-cordate; natural butt	1	1	2
Gb Sub-cordate; trimmed butt	1	0	1
Hb/vi Cleaver; trimmed butt	0	1	1
Ma Ficron; natural butt	1	0	1
- Tip of type F or M	1	0	1
- Tip of roughout	1	0	1

descriptive and more suggestive of the continuum which may exist between them and the more classic British 'ficrons' (Wymer's type M). The third (Fig. 4.5b) is a *biface à dos* on which cortex extends along three-quarters of one edge, almost certainly as a grip for the hand, while opposite it is a knife-like cutting edge. In this respect, it recalls the 'segmental chopping tool' defined by Wymer,<sup>28</sup> but in plan it remains a pointed or lanceolate handaxe.

<sup>28</sup> Wymer, *op. cit.*, 53.



*The Upper and Lower Series compared*

Nine hand-axes are present in the upper (if two tip fragments are included), and none in the lower. Two questions thus require an answer – could this be an accident of sampling, and are there other differences between the two groups of material? In dealing with the first of these, a simple  $2 \times 2$  contingency table was constructed, for hand-axes vs. non-hand-axes; Fisher's exact test indicated that sampling alone would explain the result only one time in a thousand. However, this overlooks the possibility that sorting by the river was responsible. Using an arbitrary cut-off of 100 g., all the lighter pieces were therefore excluded from analysis, leaving 15 in the upper series and 30 in the lower – the difference between the percentages, 18.3 and 29.4, is *not* statistically significant. Repetition of the contingency test for hand-axes (tips have to be excluded) then gave a probability of 1 in 10,000. Adopting another approach, we may ask the likelihood of a zero count in the 'heavy' sample for the lower series, if the percentage in the *population* were the same as the minimum estimate (allowing for sampling error) for the upper series, i.e. 21 per cent. The binomial theorem shows that this too is negligible. This difference between the two series is a real one, therefore. In fact, even supposing that the zero count were the result of sampling error from a industry possessing hand-axes, these are likely to be less than a quarter as common as in the upper industry.

If the relative frequency of heavy artefacts does not differ significantly between the two series, this cannot be said of the overall size distribution of *flakes* (retouched or not), however this is measured. Means and standard deviations are given in Table 3.10, together with the significance of the means, based on Student's *t* after log-transformation (to reduce skewness of the curves). The differences between the mean for length/breadth, breadth/thickness and other ratios are not significantly different, though Fig. 4.7 demonstrates that the modal length is greater for the lower series than the upper; no less important is that the former is very poor in flakes shorter than about 30 mm. This could be a function of river transport, or as well reflect technological differences – hand-axe manufacture, or debitage from simple cores. Unfortunately, the number of cores is too small for this last to be tested directly (though it will be recalled that no entirely convincing examples occur in the upper series). Of the flaking and cone angles, only the latter gives a significant difference; of course this need imply no more than the use of heavy blows to detach large flakes!

Flake tools are far more numerous relative to waste flakes in the lower series than in the upper, giving a chi-square of 6.2 ( $P = 0.013$ ).

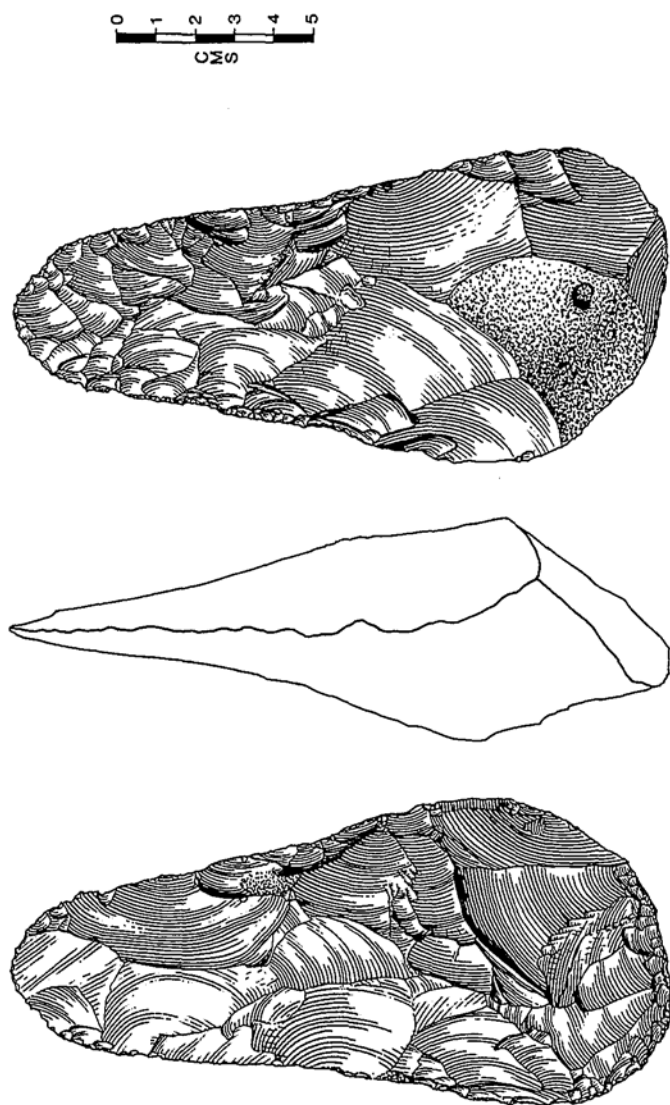


Fig. 4.4. *Lagéniforme* Hand-axe from the 1984 Excavations, 9.

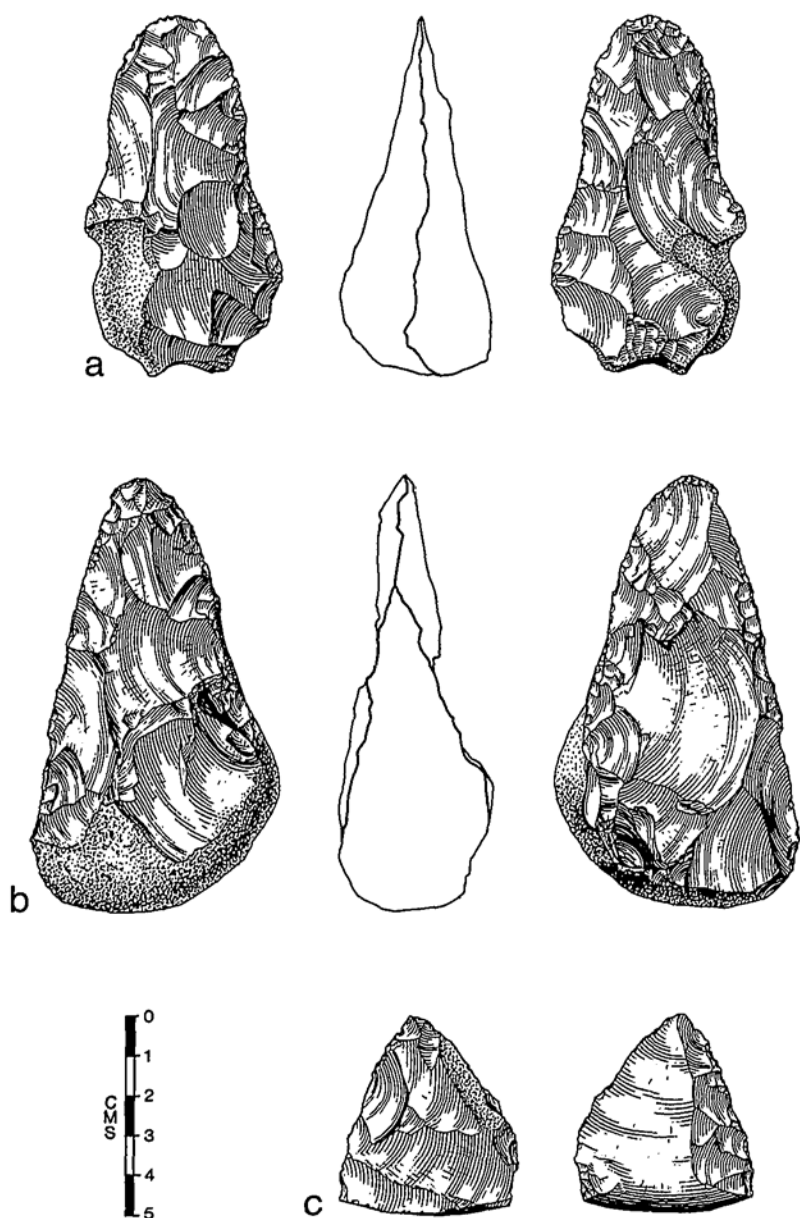


Fig. 4.5. Artefacts from the 1984 Excavations: (a) *Lagéniforme* hand-axe with linguete tip, 9; (b) hand-axe with 'natural' back opposed to a cutting edge (*biface à dos*), 12?; failed hand-axe tranchet flake with negative bulb of percussion, 15.

TABLE 3.10.

Measurements and ratios for flake and flake tools in the upper and lower series (the units are mm and degrees). Statistically significant differences between the means are indicated with an asterisk

	Original measurements				Log-transformed				Probability
	Lower		Upper		Lower		Upper		
	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.	
Length	64.0	21.2	49.3	17.4	1.78	0.15	1.66	0.16	(0.001 *
Breadth	55.5	20.4	39.7	17.4	1.71	0.17	1.56	0.18	(0.001 *
Thickness	18.5	8.0	12.8	7.2	1.23	0.20	1.05	0.22	(0.001 *
Weight	81.8	86.5	33.3	53.4	1.69	0.48	1.22	0.51	(0.001 *
Length/breadth	1.33	0.43	1.22	0.44	0.102	0.143	0.065	0.136	0.087
Breadth/thickness	3.45	1.47	3.20	0.95	0.507	0.163	0.487	0.126	0.381
Butt breadth	40.6	18.7	23.0	12.8	1.40	0.29	1.28	0.29	0.028 *
Butt thickness	12.4	6.7	8.6	4.6	1.02	0.26	0.87	0.26	0.002 *
Flaking angle	110.9	11.4	114.4	8.3	2.043	0.046	2.057	0.032	0.055
Cone angle	127.3	10.1	122.3	11.2	2.102	0.036	2.086	0.041	0.024 *

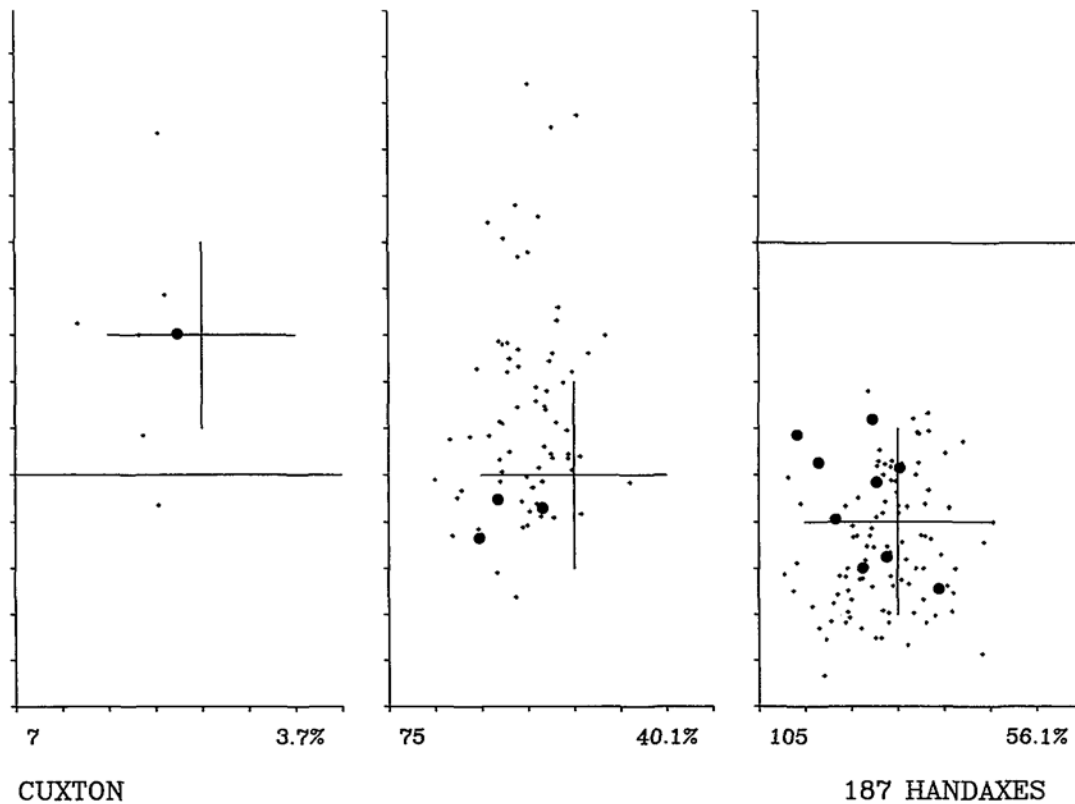


Fig. 4.6. Scatter Diagram of Hand-axe and Cleaver Shape for Cuxton (for a key see Roe 1968, fig. 4, or 1981, fig. 5:15). The 1984 finds are marked with larger dots. The others have been plotted from Roe's own measurements, but with a larger total because all of Tester's Cuxton finds have been included.

Although the contrasting size distribution and uncertainty over correct identification of retouch may be contributory factors, there is a good case for regarding retouched flakes as more characteristic of the earlier material.

### *Comment*

It has been shown that there are important differences between the finds from above and below the erosion surface at the layer 6/7 interface. The former include hand-axes similar to those found by Tester, while the latter *may* represent an industry from which hand-axes are entirely or almost entirely lacking. Other contrasts may be taken as supporting the case for a lower (and earlier) industry based more heavily on flake tools (mainly scrapers) and using simple debitage techniques; this should not be confused with the Clactonian. On the other hand, it is conceivable that at times the river eroded different parts of a site possessing more or less distinct functional areas. If the dichotomy really does reflect the former existence of two types of assemblage (particularly if the contrast is cultural rather than functional in origin), it raises questions about the 1962-63 finds.

The hand-axes, especially, provide a strong archaeological connection between the rectory gravel and layers 7-14 at no. 15 Rochester Road, but in the former they are much more abundant relative to the waste flakes (as sieving was practised in both excavations, it seems unlikely that this is purely due to the recovery techniques). On present evidence, it is simply not possible to make a categorical statement as to what extent the differences between the rectory finds and those from the other side of the road arise because of (a) localised and contrasted human activity, (b) difference in the régime

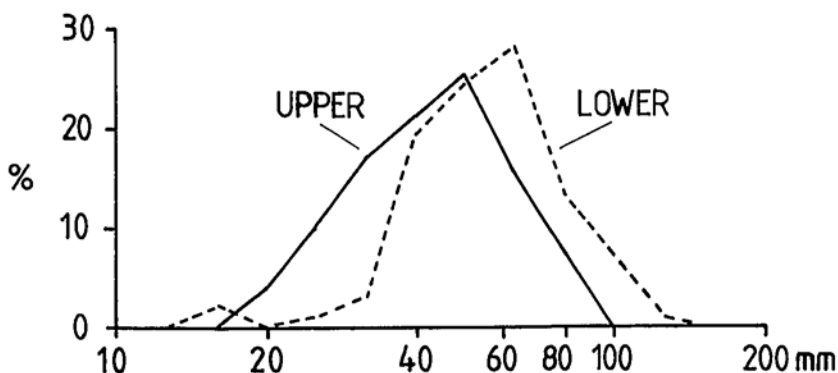


Fig. 4.7. Frequency Distribution of Length for Flakes and Flake Tools (upper and lower Series), using a logarithmic scale of the x-axis.

of the river and (c) geological mixing of more than one kind of assemblage within the same unit – whether the shallow rectory gravel or our layers 7–14 in which a small amount of derived material may have been incorporated. It would, therefore, be unwise to treat Tester's finds as a totally unmixed assemblage without further excavation on that side of the road. As is so often the case, the new work has probably raised more uncertainties than it has resolved.

#### 4.5 Mammal Remains

(A.P. Currant)

Given the restricted area of the excavations, bone fragments were quite common at some horizons. The overall state of preservation was exceedingly poor and identifiable material very scarce. Layers 3–7 and 9 in Trench 2 were sampled for small mammal remains, but none were found. The identifiable large mammal bones are given in Table 4.

TABLE 4

#### Mammal Remains

Trench	Layer	m. O.D.	Description
1	9	15.8	Small fragment of the shaft of a large limb bone, which from its size must be elephantid.
2	6	15.2	Broken left lower third molar, <i>Equus</i> sp
1	3	14.6	Fragments of the left calcaneum, <i>Bos</i> or <i>Bison</i> sp.
1	3	14.4	Fragments of a horn core <i>Bos</i> or <i>Bison</i> sp

This large mammal fauna is environmentally and biostratigraphically undiagnostic. As such, it gives no clues as to the time range of the Cuxton deposits, or to the presence or absence of major breaks in the sequence. However, the mere presence of animal remains in a recognisable condition is an advance on the 'few small fragments of decomposed bones' recovered in the 1962–63 excavations.<sup>16</sup>

#### 5. GENERAL DISCUSSION

(R.J. Cruse)

It is now clear that the Cuxton gravel terrace was laid down by the mainstream of the River Medway in a more complex manner than was apparent from the excavations in 1962–63. On both stratigraphic

## INVESTIGATION OF THE ACHEULIAN SITE AT CUXTON

and typological grounds, we now know that there were two different occasions when flint implements were incorporated into the gravel deposits. However, although the chronological separation between these phases is unknown, it is unlikely to be substantial.

Alteration of the artefact surfaces by abrasion, staining and patination precluded use wear analysis. However, as Tester has noted,<sup>29</sup> some of the artefacts have clearly not travelled far. Interestingly, the same can be said about the chalk component in the hand-axe-rich upper gravel. In seeking a local source for chalky debris, it may be appropriate to recall Wymer's observation<sup>30</sup> that chalk cliffs adjacent to the nearby Palaeolithic site at Frindsbury were probably quarried for flint.

In his original interpretation of the position of the Cuxton gravel in the Lower Medway terrace sequence, Dr Bridgland saw the site as an extension of the Stoke Gravel.<sup>31</sup> However, after further reflection, he now sees the terrace as an extension of the lower (and thus younger) Binney Gravel, which he tentatively links with the Kempton Park Gravel of the Middle Thames Valley.<sup>32</sup> Using the link with the Kempton Park Gravels as a working hypothesis, the Cuxton gravels would, therefore, have been laid down in a mid-Devensian cold period around 45,000 years bp.<sup>33</sup> At this point it should be noted that the detailed story of the development of the Lower Thames and Medway terraces has yet to be fully worked out. As the interpretation of the complex changes in sea level in this period becomes better understood,<sup>34</sup> a clearer picture of the sequence and dating of terrace formation should emerge. Until then, the mid-Devensian attribution to the Cuxton gravel will remain tentative and be liable to later reinterpretation.

The redeposited sandy loam which overlies the gravel deposits at Cuxton has been TL-dated to a minimum of 100,000 years bp. This first indication of the absolute date of the site is clearly very welcome. Although the precise mechanism for the formation of these redeposited loams is not fully understood, it is becoming apparent that they originated by slope wash or alluvial processes combining loess with

<sup>29</sup> Tester, *op. cit.* in n. 2, 41.

<sup>30</sup> J.J. Wymer, 'The Palaeolithic Period in Kent' in (Ed.) P.E. Leach, *Archaeology in Kent to AD 1500*, CBA Research Report no. 48, 9.

<sup>31</sup> Bridgland and Harding, *op. cit.*, 52.

<sup>32</sup> The correlation with Taplow gravel in the interim site report was a proof reading error (*Current Archaeology*; 105, (1987), 315-7).

<sup>33</sup> Gibbard, *op. cit.*, 139.

<sup>34</sup> (Eds.) P. Callow and J.M. Cornford, *La Cotte de St. Brelade 1961-1978*, Norwich, 1986, 52.



other water laid deposits.<sup>15</sup> It is, therefore, improbable that the artefacts in the loam are in a primary context and far more likely that they have been reworked from the surface of the underlying gravels.

It is now necessary to review the factors which may have contributed to the gravel deposit being apparently younger than the TL date of the overlying 'loam'. Two possible explanations can be considered. In the first, attention can be drawn to the TL sample preparation procedure, which selects fine particles measuring less than 10  $\mu\text{m}$ . As a result the TL date is largely specific to the loess component within the sample. Recent work on the 'brickearth' overlying the gravel terraces of the Middle Thames has suggested that this 'brickearth' was laid down comparatively recently in late-Devensian or Flandrian times, but that there were instances where it was built up from aeolian sands and loess which were reworked from earlier deposits.<sup>15</sup> Such reworking of older loess within the loam deposits could account for the observed TL date at Cuxton.

An alternative approach would be to accept that the TL date provides a relative indication of the antiquity of the loam, but to defer any assessment of the age of the gravel until the correlations between the Cuxton and the Thames valley terrace profiles can be made with greater confidence. (It is salutary to remember that viewing the Cuxton gravel as an extension of the Stoke Gravel would move the correlation with the Thames Valley to the Taplow Gravels and thus cause the Cuxton gravels to be dated some 100,000 years earlier).

The presence of bone fragments and pollen in the Cuxton gravel, despite their poor state of preservation, provides new forms of evidence about the contemporary environment. Whilst the mammals identified are not associated with a particular period of environment, there is clearly potential for future archaeological investigations on the site to reveal such information.

The initial examination of the pollen (Appendix 2) shows that this is another promising source of data. However, Hubbard's interpretation that the residual pollen is from a post-Cromerian interglacial environment is unfortunately at variance with other evidence that the gravels were laid down under colder periglacial conditions. With the above evidence that the gravel is likely to have incorporated redeposited flint artefacts and that the loam also contained reworked material, the final pollen report will clearly have to consider the extent to which the surviving pollen has also been reworked.

The characteristics of the flint assemblage have been comprehensively dealt with by Dr Callow. The recognition of differences between the assemblages from the upper and lower gravels is a significant advance, but further excavation will be needed to clarify

whether this variation is due to natural or human factors. He has also noted the use of hard hammer technique and the absence of unambiguous Levallois working from the Cuxton material.

Wymer has commented that some of the East Anglian and Thames Valley sites yielding comparable axes from Roe's Group 1 would 'fit comfortably into a Wolstonian 2 Stage gravel', i.e. from a date range 297,000 – 240,000 years bp.<sup>35</sup> With this in mind, the 1984 evidence could, therefore, indicate that the Cuxton terrace was laid down considerably later than the date when the flint artefacts were manufactured. This conclusion would have important implications, as despite their well-preserved condition, the Cuxton artefacts would then be seen to be reworked from significantly earlier deposits. Previous interpretations, which deduced from the condition of the hand-axes that they were virtually in a primary context, would need to be reviewed.

In seeking the source of these hypothetical earlier deposits, the conventional explanation would be that the Acheulian material was eroded by the river Medway from deposits in the immediate vicinity. Although this is quite feasible, the possibility that the artefacts were derived from deposits at a higher location should not be ignored. Debris flow down steep slopes has been recognised as a mechanism by which 'fragile objects or undisturbed blocks of sediment may be carried down without damage, in the central zone of the flow'.<sup>36</sup> Such a mechanism could also account for the presence of artefacts which were typologically identical to the rest of the assemblage. It is also worth noting that a sequence of debris flows can effectively reverse an original stratigraphy.

If it could be established that the Cuxton material was not originally deposited at its current altitude but was derived from a terrace, (perhaps 15 – 20 m. higher up the valley side) which had been subsequently transported down slope by debris flow, it would then become possible to integrate the site more securely with other sites from higher terrace deposits which have yielded comparable assemblages, such as the Middle Gravels at Swanscombe.<sup>37</sup>

As Dr Callow noted earlier, the 1984 excavations have identified more problem areas than they have resolved. More optimistically, they have also emphasised that future large-scale excavations on the Cuxton terrace have the potential to provide some of the answers.

<sup>35</sup> J.J. Wymer, *Palaeolithic Sites of E. Anglia*, Norwich, 1985, 353, 372.

<sup>36</sup> S.N. Collcutt, *The Palaeolithic of Britain and its nearest Neighbours – recent Trends*, University of Sheffield, Sheffield, 1986.

<sup>37</sup> D. Collins, *Palaeolithic Europe*, Tiverton, 1986, Fig. 72.

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I should like to thank Mr C. Cogger for his permission to excavate and for his interest and co-operation during the excavation. In addition to the advice of the above specialists, I am also grateful to all the people who provided valuable assistance with the interpretation of the site and in particular to John Wymer, Jill Cook and Peter Tester. The drawings of the flint implements were drawn by Meredydd Moore of the British Museum. All other drawings are by the writer, who also appreciated the encouragement of the excavation being nominated for the Pitt Rivers Award in the 1986 British Archaeological Awards. The assistance of Mrs. L. Michie in typing the manuscript is gratefully acknowledged.

Mr C. Cogger has kindly donated all the finds from the excavation to the British Museum, where they have joined the finds from 1962-63 and where the site archive is also lodged.

## APPENDIX 1

*Thermoluminescence Measurement*

(N.C. Debenham and  
S.G.E. Bowman)

The basic assumption behind this form of thermoluminescence (TL) dating is that exposure of the sediment to sunlight during river transport and deposition will significantly reduce, or 'bleach', the TL intensities in the sediment and set their initial states. Following deposition, the sediment's exposure to natural radiation levels causes

a gradual increase of the signal intensities and this provides the basis of the TL dating method. In this work, the radiation dose received during burial has been evaluated by the technique of TL regeneration. This method involves bleaching several samples of the sediment and then regenerating their TL by giving them various radiation doses. The regenerated emissions are then compared with the TL intensity found in the untreated 'natural' sediment. The increase in TL when the natural samples are exposed to additional radiation doses is also measured and compared with the rate of growth of the regenerated TL. This is necessary to show whether any change in the TL sensitivity of the signal has been caused by the action of bleaching. Measurements were carried out on both the feldspar UV emissions and the quartz 350°C signal. Of the two signals measured, that of the feldspars is more easily bleached than that of the quartz fraction and is, therefore, generally more reliable for dating purposes. The procedures used for each of the two signals are now described.

(i) *Feldspars Component*

Twenty discs were prepared using the method described by Debenham.<sup>38</sup> Following normalisation by the zero-glow method,<sup>39</sup> twelve of the discs were bleached by a 60 minutes exposure to an unfiltered medium pressure 100 W mercury lamp (type UVS100, Hanovia, Slough, Bucks.) and used to determine the regeneration growth curve up to a maximum dose of 1.9 kGy. The remaining eight were used to measure the natural TL intensity and the slope of the first glow growth curve. All TL measurements were carried out with a quartz-windowed EMI 9635 photomultiplier tube fitted with a Schott UG11 UV transmitting filter.

(ii) *Quartz component*

Sediment fine grains were stirred in fluorosilicic acid for three days in order to digest the feldspars. Disc preparation then proceeded as for the feldspars samples. However, the TL procedures were altered in two respects. First, discs were bleached by exposure to May daylight for two days, because the

<sup>38</sup> N.C. Debenham, 'Use of UV Emissions in TL Dating of Sediments', *Nuclear Tracts*, 10 (1985), 717-24.

<sup>39</sup> M.J. Aitken, G.D. Russell and H.S.T. Driver, 'Zero-glow Monitoring', *Ancient Thermoluminescence*, 9 (1979), 13-15.

quartz signal, being less readily bleached than the feldspar signal, requires an illumination that is more closely matched to the original exposure. Second, a Corning 7-59 blue transmitting filter was substituted for the Schott UG11 filter.

### *Results*

Radioactivity of the sediment was evaluated by sealed alpha counting and potassium analysis. The former yielded a count rate of  $6.61 \pm 0.23 \text{ Ms}^{-1} \text{ mm}^{-2}$ , which is a typical value for sediments. The potassium oxide content, measured as 2.22 per cent, was slightly higher than is commonly found. For alpha sensitivity, a b-value of  $1.3 \text{ Gy } \mu\text{m}^2$  was assumed, and the mean water content of the sediment during its history was taken to lie in the range 16 per cent to 40 per cent. The feldspar measurements yielded a good plateau in calculated age stretching from 270°C to 400°C. Its mean value was  $105 \pm 20 \text{ ka}$ . However, it has been noted<sup>38</sup> that use of the feldspars signal yields TL ages close to 100 ka for all north-west European sediments earlier than the Weichselian, irrespective of their true age. The measured date should, therefore, be regarded only as the minimum age of the sediment's deposition.

No plateau in calculated age was given by the quartz data except in the short temperature range 260–310°C where the feldspars signal is dominant. The varying ratio between the quartz and feldspars signals as a function of temperature would be sufficient to account for this behaviour. While these data do not contradict the conclusions of the feldspars measurements, no extra information can be deduced from them.

### *Conclusion*

The deposition date of the sandy loam is too early to allow TL dating by current techniques. However, the TL measurements set a lower limit to the age of the deposit of 100 ka.

## APPENDIX 2

### *Preliminary Results of Pollen Analyses* (R.N.L.B. Hubbard)

Well-sorted water-laid gravel deposits, like those at Cuxton, are avoided by conventional pollen-analysis and with good reason, for they normally contain very little pollen, and when they do yield substantial quantities the spectra tend not to be readily comparable with the standard pollen-diagrams. The reasons for this are simple: in

water-laid deposits about 90 per cent of the pollen is derived by erosion from exposed land surfaces,<sup>40</sup> and, therefore, is deposited in accordance with the same hydrodynamic laws as the rest of the sediment carried in the water.

A relationship between pollen concentration and sedimentology is consequently to be expected. Although largely uninvestigated, the relationship between the logarithm scale appears to be linear. Thus, in the clayey lake deposits favoured by many palynologists, the pollen concentrations are in the region of 100,000 pollen grains per gram of sediment, while in sands and gravels it is in the order of 100 to one tenth of a grain per gram.

The reasons why pollen spectra from deposits like those at Cuxton are not readily comparable with regional reference pollen diagrams are not so simple. Deposits formed in the edges of streams, rivers, and estuaries are liable to be aggraded, exposed as dry land, then eroded and re-aggraded once more. Peats and lake deposits usually experience much less complicated sedimentary regimes. It has long been known that a land surface collects pollen from the plants growing on it, and from plants growing within a hundred metres or so. Plants from further afield contribute very little to the pollen catchment. (This is a natural consequence of the ways in which plants distribute their pollen). A land surface, even an ephemeral one, therefore is likely to contain quite large quantities of pollen, and, in a fluviatile environment liable to frequent disturbance, this is likely to be dominated by annual herbs. The pollen content of moving water (and, therefore, the deposits laid down by it) is related, in a far-from-simple way, to both the sedimentary environment and to the prevailing terrestrial ecology.<sup>41</sup> Pollen spectra from rapidly aggraded river and stream deposits consequently tend to have all the continuity and informativeness of a piece of music by John Cage.

There is a third good reason why most pollen analysts steer clear of non-waterlogged calcareous sediments: poor pollen preservation. Pollen exines are famous for their resistance to chemical decay – the science of palynology is, in no small way, a consequence of this property, but one thing that does affect them is oxidation.

Terrestrial and semi-terrestrial calcareous and near-neutral matrices tend to be well-drained, and pollen is often partly or completely destroyed by oxidation under these conditions. To the extent that the

<sup>40</sup> R. Peck, 'Pollen Budget Studies in a small Yorkshire Catchment', in (Eds.) H.J.B. Birks and R.G. West, *Quaternary Plant Geology*, Oxford, 1973, 43–60.

<sup>41</sup> A.A. Crowder and D.G. Cuddy, 'Pollen in a small River Basin, Wilton Creek, Ontario', in Birks and West, *op. cit.*, 61–77.

partial degradation of pollen can give rise to distorted pollen spectra in which some types are unnaturally rare, this is obviously undesirable; but on the other hand, the shortened mean lifetime of pollen caused by its rapid degradation means that there is less 'old' pollen available for reworking, and the associated problems seem, in practice, to be reduced.

Since the Cuxton pollen analyses are at present very incomplete (as a result of the unavailability of essential equipment) it is necessary to discuss the result by analogy with other analyses. The pollen analyses from Swanscombe are near ideal for this purpose, since the site is nearby, covers a long archaeological span and the analyses are supported by a wide range of other palaeoecological evidence.

The various complications described above can be seen in different parts of the pollen analyses from Swanscombe, of which a summary was published by me in 1982.<sup>42</sup> Differential destruction affects the lower part of the A3/B3 Lower Loam pollen diagram; the Lower Gravel spectra show a lack of continuity that can be attributed to the mixing of transient land surface and water-transported pollen spectra; and the influence of sedimentology is most spectacularly displayed in the Lower Loam, where the coarse sand lenses have almost identical pollen spectra to contiguous silty samples in which the pollen concentration is two orders of magnitude higher.

The initial examination of a first series of preparations of pollen samples from Cuxton, unfortunately, shows that the majority of the samples display, to a greater or lesser extent, many of the undesirable characteristics outlined above. The pollen concentrations are low: as has already been explained, this is only to be expected in water-laid sediments whose textures range from medium sands to fairly coarse gravels. Not enough work has yet been done to see whether or not they display the lack of continuity to be seen in the spectra from the Lower Gravels at Swanscombe.<sup>42</sup> All of the pollen preparations examined so far appear to show the effects of differential destruction of pollen, with pine, birch, alder, and herbaceous pollen well-represented, but little or no oak or elm. Such pollen spectra might arise in an interstadial environment analogous to those that occurred in the early stages of the last glaciation; but the appearance of the specimens suggests that the spectra are, in fact, differentially-destroyed interglacial Zone II ones. With four major post-Cromerian

<sup>42</sup> R.N.L.B. Hubbard, 'The environmental Evidence from Swanscombe and its Implications for Palaeolithic Archaeology', in Leach, *op. cit.*, n. 30, 3-7.

<sup>43</sup> B.A. Bradley, 'Experimental Lithic Technology with special Reference to the Middle Palaeolithic', unpublished Ph.D. thesis, University of Cambridge, 1977.

interglacials to distinguish between, dating of the Cuxton deposits by pollen-analysis is not feasible at present (and may not be possible at all), especially as it is only the late-temperate (Zone III) stages of interglacial periods that tend to have sufficiently gross vegetational differences to be recognisable under these conditions. At present, any hope of real clarification of the age of the Cuxton deposits depends on whether any rare pollen types of some diagnostic value may be discovered in the preparations – and this is purely a matter of chance.

At Cuxton, the palynological evidence will have to stand by itself, as shells have not survived in the deposits; and the animal bones that have survived and can be identified are equally compatible with a semi-glacial environment and with a fully interglacial one. This is another area where comparison with Swanscombe is helpful, as the sedimentology of Cuxton has been interpreted as indicating a 'cold' environment, which conflicts with the picture given by the initial palynological results. Fluvatile sedimentology is directly informative about water-flow, and only indirectly suggests climatic conditions; while pollen (in principle) reflects vegetation, which is closely related to climate. At Swanscombe, there is close agreement between pollen, molluscs, and animal bones about the prevailing environment conditions, within a range of sedimentary environments apparently wider than those from Cuxton. With this qualification, one can have no hesitation in applying Occam's Razor (*'Entia non sunt multiplicanda praeter neccessitatem'*) and accepting the palynological evidence at more-or-less face value.



