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PALAEOLITHIC ARCHAEOLOGY AND THE BRITISH QUATERNARY SEQUENCE

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Studies within the last two decades, culminating in the recent publication of the I.G.C.P. Project 24 *Quaternary Glaciations in the Northern Hemisphere* (Sibrava *et al.*, 1986) have amplified, changed or questioned much of the accepted sequence in Britain during the Middle and Late Pleistocene. This review takes the chronology of events as now seen and relates it to the evidence for the palaeolithic period, prior to that in the reach of radiocarbon dating. It would indicate that there was considerable human activity in Britain before the Hoxnian Stage and that Acheulian hand-axe industries of considerable refinement were present, and that these industries occurred before or co-existed with non-hand-axe Clactonian Industries. Only the latter can be demonstrated as having been present during the earlier part of the Hoxnian Interglacial. Acheulian Industries occur in various forms from towards the close of this interglacial and during the long period before the Ipswichian Stage. It is not possible to demonstrate a human presence during the Ipswichian Interglacial as represented by the type site, and artifacts occur very sparsely if at all in sediments attributed to other warm periods or the period between the Hoxnian and Ipswichian Stages. Levallois technique is not found as a significant element of flint industries until the latter part of this period. During the first half of the Devensian Stage flint industries with distinctive hand-axes and Levallois flakes occur, and can be described as Mousterian of Acheulian Tradition.

INTRODUCTION

The UNESCO/International Geological Correlation Programme (IGCP), Project 24 *Quaternary Glaciations in the Northern Hemisphere* (Sibrava *et al.*, 1986) exerted considerable pressure on the countries involved to clarify their own Quaternary sequences before any attempt could be made to correlate one with another. Britain was no exception and, whatever failings, inadequacies and contradictions remain, the present consensus as published in Volume 5 of *Quaternary Science Reviews* (Shotton, 1986; Bowen *et al.*, 1986) is a more reasoned and critical statement than anything hitherto. Coupled with the terminology advocated by the Geological Society of London (Mitchell *et al.*, 1973) and the numerous monographs and papers cited in the IGCP report, a framework exists with some lithostratigraphical basis (Table 1). It is now possible to relate numerous Quaternary deposits to well-defined units. Some of these units contain palaeoliths. Other deposits are demonstrably earlier or later than these units and these also may contain palaeoliths. There is a case for making a new assessment of this archaeological evidence against the British Quaternary sequence as it now appears; hence this review.

Numerous methods have been used to support or expand this sequence, although it is emphasised that lithostratigraphy should take precedence. Chronometric measurements would be superior but, at present, the methods used to attain dates beyond the maximum limits of radiocarbon dating are not reliable. Other techniques, such as the epimerization of amino acids, have great potential, especially for relative dating, as do the measurements of the loss or gain of various elements in bones through time. Less precise but still extremely useful, is the dating of deposits by the mammalian faunas contained within them. There is

ample evidence that certain species became extinct in Britain during the Middle and Late Pleistocene (Stuart, 1982; Sutcliffe, 1985), but it is not always possible to differentiate between such extinctions and the absence of particular species through migrations in response to changing environments, or just a lack of discovery. As Stuart (1982) states 'the faunal history of the Middle and Upper Pleistocene is largely restricted to an account of the faunal changes in successive interglacials'. In broad terms, it is reasonable to correlate some deposits by the presence or absence of particular species. This is especially true of some of the voles. Also, seemingly reliable indicators of particular interglacials are: *Dicerorhinus etruscus* for the Cromerian, and *Dicerorhinus hemitoechus* for the Hoxnian and Ipswichian; and no monkey or giant beaver after the Hoxnian, or mammoth in interglacials before the Ipswichian. Also, it is usually accepted that the sabre tooth, *Homotherium*, is not found after the Cromerian. Similarly, pollen profiles through interglacial sediments may be distinctive enough to be related to the Cromerian, Hoxnian or Ipswichian Stages but, as with the fauna, the reliability is limited and in both cases the information has far greater use for assessing contemporary environments. The same is true for mollusca, insects and micro-organisms. With all these various lines of evidence, unless their taphonomy is taken into account, their interpretation can be misleading or meaningless. As will be seen in the concluding section of this review, the same is true of the archaeological material.

The intention here is to relate, where possible, the Palaeolithic evidence in Britain to Stages or units on the basis of published work, avoiding the more controversial aspects of the sequence. No view is expressed of what may be implied by this in terms of archaeological interpretation except in the concluding

TABLE 1. Elements of English Middle and Late Pleistocene lithostratigraphy (modified after Bowen, McCabe, Rose and Sutherland, 1986)

Stage per Mitchell <i>et al.</i> , 1973	Stratotype	Episode	Glacial Lithostratigraphic Units	Fluvial Lithostratigraphic Units	Marine Lithostratigraphic Units	Comments
DEVENSIAN	Four Ashes	Loch Lomond Stadial		● Sproughton Gravels		● = Palaeolithic artifacts in deposits of these units or in deposits identified as correlating with them. ○ = Palaeolithic artifacts in deposits stratigraphically related to those identified as these units.
		Dimlington Stadial	Stockport Formation Skipssea and Withernsea Tills	Tattershall Gravels Chelford Sands Formation		
IPSWICHIAN	Bobbishole	Ipswichian Inter-glacial				
		LATE/MIDDLE PLEISTOCENE BOUNDARY				
WOLSTONIAN	Wolston	Glaciation in North East England	○ Welton Till / Basement Till / ?Oakwood Till	○ Stanton Harcourt Gravels		A warm period accepted between the Hoxnian and the Ipswichian Stratigraphic basis of Wolstonian till questioned. Alternatives: (i) is pre-Ipswichian but post-Hoxnian (ii) on basis of mineralogy is Anglian (iii) no glacial succession between Hoxnian and Ipswichian which are successive phases of a single glaciation
HOXNIAN	Hoxne	Hoxnian Interglacial		● Swanscombe Middle Gravels ● Swanscombe Lower Loom ● Swanscombe Lower Gravel	○ Nar Valley Beds	Status of Corton Interstadial as a climatically determined event open to question
ANGLIAN	Corton	Lowestoft Stadial Corton Interstadial Gunton Stadial	○ Lowestoft Till / Triassic Till North Sea Drift Tills Cromer Tills	● Black Park Gravels ○ Wolvercote Gravels ○ Winter Hill Gravels ○ Westmill Gravels	Swarte Bank Formation	
CROMERIAN	West Runton			Sugworth Sands		

section. The main purpose is to see if enough Palaeolithic industrial sites can be placed in a well-established order, and whether it can be determined what environment was prevailing when they were occupied. Wider archaeological issues, as discussed by Gamble (1986), are not the concern of this review, but without a firm foundation of dating and environmental conditions for the sites involved, such issues are meaningless.

D.A. Roe published a comprehensive survey of the British Lower and Middle Palaeolithic periods in 1981. His method of establishing a sequence was complementary to that used here; he declined to describe material in the order of Quaternary time, but used the well-known stratigraphical sequence in North Kent, typified by Swanscombe, as a yardstick for measuring earlier and later sites. For details of the selected sites mentioned below, the reader is recommended to his publication.

It is fortunate, perhaps not fortuitous, that the most informative areas in which to base a Quaternary sequence in Britain are East Anglia and the Thames Valley, and that these areas abound with evidence of occupation during the Palaeolithic period. This evidence is, however, limited almost entirely to discarded Lithic tools and waste products. The only human skeletal material of Middle Pleistocene date comes from Swanscombe and Pontnewydd (North Wales). This review will therefore concentrate on the Quaternary sequences in East Anglia and the Thames Valley. Many famous Palaeolithic sites are unmentioned as they cannot be related to the Quaternary sequence on present evidence. In this respect, this review unavoidably follows the same lines used by F.E. Zeuner in his classic *Dating the Past* (1952): a bias towards East Anglia and the Thames Valley and an 'insistence that they (the Palaeolithic sites) are dated by non-archaeological means'.

There is no better starting point than the major glaciation of East Anglia, and the Middle and Late Pleistocene sequence of terrace deposits in the Thames Valley. The diversion of the Thames from its former course down the Vale of St. Albans by this East Anglian ice is the familiar but secure and vital link between the two regions. The evidence for this ice is the Lowestoft Till, which covers most of Suffolk, Essex, parts of Hertfordshire and what was formerly Middlesex. Its southernmost extent is in North London at Finchley and it flanks the north side of the Lower Thames Valley at Hornchurch and Upminster. The type site is at Corton, just south of Lowestoft (Banham, 1971) where it overlies the glacio-fluvial Corton sands and the North Sea Drift. This is also the stratotype for the Anglian Stage of the British Quaternary sequence. The much thicker and more complex glacial deposits exposed along the North Norfolk Coast from Sea Palling to Sheringham are also regarded as Anglian but, as yet, it is not possible to relate them to the type site at Corton. The glacial advance which deposited Lowestoft Till in the Vale of St. Albans is interpreted as Late Anglian, mainly on the grounds that the

interglacial deposits of the following Hoxnian Stage at the Hoxne type site are above the Lowestoft Till and there is no hiatus: full glacial conditions give way to Late-glacial and Early-temperate zones with no discernible break. Hence, the Lowestoft Till can be regarded as the final expression of the actual passage of glacial ice of the Anglian Stage, at least in southern England. This gives a date for the diversion of the Thames into its present valley system. The first terrace deposit in the Thames Valley which formed in response to this diversion was the Black Park Gravel (Gibbard, 1985), and there are localities in the Middle Thames, and possibly Lower Thames, where palaeoliths have been found in these gravels. The widespread and unequivocal nature of this episode in the British Quaternary sequence make it a suitable starting point for this review.

PALAEOLITHS FROM ANGLIAN STAGE DEPOSITS

There are many palaeoliths from gravels of the so-called Ancient Channel of the Thames between Caversham and Henley-on-Thames, on the southern dip-slope of the Chalk of the Chiltern Hills. This channel has a surface level of 90 m O.D. at Caversham and 75 m O.D. at Henley and is identified as belonging to the Black Park Terrace (Gibbard, 1985). It was formerly regarded as part of the Winter Hill Terrace, but it cuts through these terrace deposits, which rise to over 90 m O.D. on its north side and 92 m O.D. at Rose Hill, Emmer Green, on its south side. The latter divides this channel from the present southern detour of the Thames through Reading and Shiplake. When the material from this Ancient Channel was first published (Treacher *et al.*, 1948) it was interpreted as an interglacial deposit corresponding to the Günz-Mindel of the Alpine chronology, on the basis that it preceded the Boyn Hill Terrace which was dated to the, then, 'Great Interglacial' or Mindel-Riss. The major Palaeolithic collections from here are in the Treacher Collection in the Pitt Rivers and University Museums at Oxford, and in Reading Museum. The sites have been summarised by Wymer (1968). The vast majority of the palaeoliths found in the Treacher Collection are Acheulian hand-axes but, from 1955 to 1960 a new pit at Highland's Farm, Rotherfield Peppard, produced large numbers of crude cores and flakes characteristic of a Clactonian Industry. It also produced Acheulian hand-axes. On the basis of the differential condition of these two groups of artifacts (the Acheulian being relatively fresh, the Clactonian considerably abraded) it was considered that two separate industries were present (Wymer, 1961). The presence of ovate hand-axes exhibiting considerable technological skill and very similar to many in the upper part of the Swanscombe sequence, suggested a more recent date for the gravels in this Ancient Channel, with the possibility being added that older gravels containing the Clactonian Industry had been reworked in later 'Great

Interglacial' times causing the evolved ovate hand-axes to be incorporated. This is now seen as an unjustifiable typological mistake and would appear to be ruled out by geological considerations. There is still justification, however, for regarding the Acheulian and the Clactonian artifacts as two separate industries. It may be significant that no ovate hand-axes with twisted edges have ever been found at any of the sites in the Ancient Channel, nor is there any evidence of Levallois technique.

Elsewhere in the Thames Valley, there are no other prolific sites in the Black Park Terrace, but palaeoliths have come from the same gravels at Hillingdon near Uxbridge, where at least 20 hand-axes were found (Wymer, 1968), and at Dartford Heath, where a few hand-axes are known from the gravel beneath a primary context site of other hand-axes on top of the same gravel. However, the assignment of this Dartford Heath Gravel to the Black Park Gravel is more tentative than the sites in the Middle Thames. The same must be said for the gravels at 54 m at Richmond and Wimbledon. These gravels are the Kingston Leaf gravels of Zeuner (1959). Gibbard (1979, 1985) relates them to this same early post-diversionary phase of the Thames. At least one hand-axe comes from such gravel in Richmond Park (Wymer, 1968).

The highest terrace in the sequence of Wey terraces at Farnham [Terrace A with its Boundstone Channel cut into it (Oakley, 1939)] qualifies for inclusion with the Black Park Terrace on the sole criterion of altitude. Gibbard (1982) considers it does so; Clarke and Dixon (1981) do not. Gibbard would also include the patch of gravel at St. George's Hill, Weybridge, at 76 m O.D. Both Farnham Terrace A and St. George's Hill have produced hand-axes. Similarly, the high terrace at Fordwich, Kent, at 48 m O.D. could also be of the same age as the Black Park Terrace. It contains hand-axes and also enough cores and flakes of Clactonian type to suggest the presence of that industry. The latter are remarkably fresh compared to the hand-axes, in reverse to the situation in the Ancient Channel, but mere local circumstances could account for it. The Fordwich site is well summarised by Roe (1981), who supports the possibility of an early date for the site on the basis of the relative technological simplicity of the hand-axes.

Westward from the sites mentioned above, there are a number of hand-axes from Hampstead Marshall near Newbury, Berkshire (Wymer, 1968) in gravel of what was formerly known as the Silchester Stage (White, 1902) but now also regarded as an equivalent of the Black Park Terrace (Gibbard, 1982) and, therefore, of Late Anglian age. Other hand-axes have been found in small numbers in gravels of this great sheet of gravel containing much sarsen stone and clearly derived from the western chalklands. There is a site at Wasing (Wymer, 1968) which has produced at least two hand-axes. However, these apparently have been found on the surface ploughed up from sub-soil. The same can be said of a few others, such as one at Mortimer (Wymer,

1972) and another from Sulhamstead Abbots (Wymer, 1968). The latter of a type that one would expect to find in a Late Pleistocene industry. This highlights the problem of context. There is always the possibility that isolated palaeoliths discarded on a gravel surface in antiquity may well have become incorporated into the sub-soil or even the body of the underlying gravel during later periods of periglacial activity, through cryoturbation, frostheaving, ice wedging or similar phenomena. This question of taphonomy is discussed in the final section, but there can be no doubt about the contemporaneity of the material from Hamstead Marshall with the deposition of the gravel in question.

In East Anglia, there are many gravel deposits which may or may not belong to the Anglian Stage, some containing hand-axes or other artifacts, but there is also the unresolved problem as to whether it is the Anglian or the Wolstonian Stage which is involved. Unquestionably, much of the till which covers East Anglia once regarded as representing two separate glacial stages, the Gipping and the Lowestoft, belong to one and the same stage. Bristow and Cox (1973) and Cox (1981) would have all of the glacial tills, with the exception of those of the Devensian Stage, in East Anglia and beyond and into the Midlands, of one stage, equating it with the Saale of North Germany. Lithology of the tills (Perrin *et al.*, 1979) does not contradict this. Other viewpoints will be considered in a following section, but here it is only possible to summarise what is most convincingly Anglian, i.e. relating to a glacial stage represented by the Cromer and Lowestoft Tills. A few sites qualify: High Lodge at Mildenhall, Warren Hill nearby, Barnham and possibly patches of gravel at Eriswell and Lakenheath. Many other rich Palaeolithic sites, such as Shrub Hill, Brandon, Thetford and elsewhere are so problematical as regards their position in the Quaternary sequence that they cannot be considered.

At High Lodge, pre-Anglian deposits (see the next section) are interpreted as having been pushed as a raft over Anglian Till by ice of the same stage. Overlying these rafted deposits are gravels in position that are thought to be Anglian, as they appear to lie stratigraphically below further till which is also Anglian, but clearly of a later phase (Cook, *in prep.*). These gravels contain Acheulian hand-axes. Less than two kilometres away is the very rich Palaeolithic site of Warren Hill, which has produced more hand-axes than any other site in East Anglia (see Roe, 1981; and Wymer, 1985 for summaries). The lower gravel at Warren Hill is a chalky outwash gravel and, as such, would relate to the glacial activity at nearby High Lodge, hence its attribution to the Anglian Stage. There are two very distinct Acheulian hand-axe industries at Warren Hill: one of crudely made, generally pointed hand-axes in a very rolled condition, and another of extremely elegant ovate hand-axes in a much fresher condition. Thus, typology and condition seem reasonable indicators of two industries, but it is impossible to know whether they were stratigraphically separated, for these were

early collections made prior to any methodical recording or observations. However, there is nothing to suggest that there is any significant break in deposition between the lower chalky outwash gravels and the upper non-chalky gravels.

At Barnham, in the valley of the Little Ouse, is another extremely prolific Palaeolithic site at a height of only 6–8 m above the modern flood plain. This is Barnham Heath, not to be confused with the site at Barnham East Farm. It is the latter site which may well be of Anglian age. It is about one kilometre west of the Barnham Heath site, at 41 m O.D. and in a dry valley running broadly parallel to the Little Ouse but separated from it at this point by somewhat higher ground. This dry valley eventually runs into the Little Ouse valley but is no part of the present drainage system. There is a great thickness of gravel in this dry valley at East Farm: over 19 m on the evidence of shafts sunk by professional well-diggers during the excavations by Paterson in 1933 (Paterson, 1937). The upper part of the gravel is fluviatile and contains a prolific non-hand-axe Clactonian Industry in derived context. However, at the top of the gravel, beneath the overlying colluvial sandy silt (the brickearth of the commercial pit) there is a Clactonian Industry in primary context (Wymer, 1985). The artifacts appear to be in reworked upper levels of an Anglian glacial outwash: a gravel with much quartzite and lenses of glacial till or solifluction, locally much contorted. There is no sign of weathering at the level with the industry in primary context and the inference is that this is of Late Anglian date.

One other site which deserves mention in this section is Southacre in Norfolk, in the valley of the Nar. Thick deposits of sandy, cross-bedded gravel virtually fill the middle of this wide valley to a height of 30 m O.D. It rests on chalky till (Woodlands Farm Till) and is considered to be Anglian outwash (Ventris, 1985). It has yielded several flakes and hand-axes, all in rolled condition. How these gravels relate to the very coarse solifluction gravels at the nearby Bartholomews Hills (Sainty, 1935; Wymer, 1985) is not clear. The latter are some 18 m higher and contain not only hand-axes but also Levallois flakes and cores which the Southacre Gravels do not.

The problem of the identification of the tills of East Anglia and the Midlands as either representing two separate stages (Anglian and Wolstonian) or just one (Anglian if they are all regarded as the same stage as represented by the Lowestoft Till which is Anglian by definition) has been mentioned above. It is particularly acute in the Midlands, where Hoxnian interglacial deposits at Nechells and Quinton (Shotton *et al.*, 1977), both near Birmingham have been accepted as predating the till of the Wolstonian type site. Both sites are on interfluvial with the till in the valleys that have been cut through them. However, their attribution is disputed by Cox (1981) and Rose (1987). The latter regards this till as Anglian and the Baginton/Lillingston Gravels and the Baginton Sands beneath it as an earlier phase of the same stage. He sees this gravel as part of a major

drainage system which introduced Triassic debris into East Anglia prior to the Lowestoft Glaciation, with rivers flowing over what is now the Fens before that basin was eroded. Gravels, with much quartzite, in the Lakenheath–Eriswell area of the Breckland, are regarded as the eastern equivalent of this drainage system, which joined the ancestral Thames drainage (Kesgrave Sands and Gravels) north-east of Bury St. Edmunds. These Lakenheath–Eriswell gravels, capping higher ground at 30 m O.D. have attracted attention since the 19th century (Evans, 1897), demonstrating the existence of a drainage system totally unrelated to any present one. Alternative theories would place the gravels in the Wolstonian Stage, as part of a drainage system flowing in the opposite direction, i.e. south to north, eventually blocked by ice of that stage (Wymer, 1985). It is neither appropriate nor possible to take this matter any further here, but it is necessary to comment upon it as the Lakenheath–Eriswell gravels have produced Acheulian hand-axes. Hand-axes have also come from gravels beneath the till (equated with that of the Wolstonian type site) at Bubbenhall, Warwickshire and other places in the Midlands. Most of these hand-axes are of quartzite and in a rolled, derived condition. However, a recent discovery at the Waverley Wood Farm Pit at Bubbenhall (Shotton, *in prep.*) of a large, elegant hand-axe of andesite in mint condition associated with the tusks and teeth of a straight tusked elephant, suggests primary context sites may survive beneath or beside the gravels and organic channels beneath the same till.

Similar uncertainties exist with high level gravels on the Cambridge–Suffolk borders, such as at Linton and Allington (Marr, 1926; Wymer, 1985), where hand-axes have also been found. Nor can any date be assigned to the numerous palaeoliths, mainly hand-axes, which have been found in highly weathered condition on the North Downs of Kent or in the sub-soil of the Clay-with-Flints on the 180 m plateau around Banstead in Surrey (Wymer, 1968). It may be significant that the latter appear to have escaped dispersal by erosion of the coombes which now dissect the Clay-with-Flints and Chalk, but these may have formed during cold or periglacial periods at any time in the Late Quaternary.

Even farther westward there are the very rich Palaeolithic sites in the valley of the River Axe, particularly at Chard and the Broom Pits at Hawkchurch. Many hundreds, probably thousands, of Acheulian hand-axes have been recovered from the thick deposits of gravel and sand which fill this lower part of the Axe Valley, made from the local Upper Greensand chert, a very tractable rock with a pleasing honey-brown, semi-translucent aspect. The technology of manufacture is high and, although the artifacts are found in every condition, large numbers are very fresh if not in mint condition. The great majority of these artifacts have been collected during commercial quarrying (Evans, 1897; Moir, 1936) but recent excavations (Shakesby and Stephens, 1984) have demonstrated the

presence of such fresh artifacts in the lower part of the gravel deposit. Dating of this gravel aggradation is problematical (Green, 1974), but it is difficult to account for it under any other situation than a cool or periglacial climate, presumably during one of the major glacial stages. This was certainly not the Last Glaciation and it could well have been during the Anglian Stage. Again, this draws attention to the question of the context of the artifacts: were they contemporary with the cut and fill regime of a braided river course, or derived from an earlier pre-existing surface destroyed by the fluvial activity, or both? As stated, this vital matter of taphonomy will be considered more fully in the concluding part of this paper, but for the present it must be emphasised, elementary as it may be and with due caution to the question of later intrusions as mentioned above, that the artifacts cannot be younger than the deposit containing them.

If it be accepted that these various thick gravel accumulations thought to be of Anglian age were formed during cool or periglacial periods, there can be no doubt whatsoever that the massive accumulation of gravel in the chalk coombe at Knowle Farm, Savernake, Wiltshire (Froom, 1983) was a solifluction deposit by periglacial agencies. Similarly, massive accumulations of Coombe Rock cover the critical site of Boxgrove, Sussex, even farther south. As will be seen in the next section, this Coombe Rock overlies sediments of pre-Anglian age and is almost certainly of Anglian age. It contains numerous Acheulian hand-axes. Yet another large aggradation of gravels that have been related to the Anglian Stage are the Wallingford Fan Gravels (Arkell, 1945, 1947). These certainly relate to glacial activity and are regarded as outwash from glaciation of the Chiltern Hills (Horton *et al.*, 1981). They contain Acheulian hand-axes.

Claims have been made (Moir, 1923) for a hand-axe from Sidestrand found embedded in boulder clay, which would have been one of the Cromer Tills and therefore of Anglian age. Warren (Sainty and Warren, 1928) disputed the context and this may have been justified. However, a more recent discovery of a quartzite hand-axe in central Norfolk at Stibbard, may well be one transported in till from the Midlands. It comes from the upper part of boulder clay which outcrops in this area and adhering to the tool is a patch of quartzitic sand typical of sediments in the Triassic regions of the Midlands. Furthermore, the hand-axe is rolled and worn almost beyond recognition (Wymer, 1985). Many of the hand-axes or other palaeoliths in post-Anglian gravels may, of course, have been derived from erosion of the boulder clays, but this can only be speculation. It can be concluded that palaeoliths of diverse types have been found in deposits now equated with the Anglian Stage, and at many other sites where an attribution to the same stage is very probable.

PALAEOLITHS FROM PRE-ANGLIAN STAGE DEPOSITS

The many claims that were made during the first half of this century for flint artifacts in the Early Pleistocene Crag deposits in East Anglia are dismissed here on the ground that the great majority are ostensibly not artifacts and the remainder could be attributable to natural agencies. This does not remove the possibility that unequivocal artifacts, such as hand-axes, may yet be found in them, but the likelihood of human material in off-shore marine accumulations is slight, irrespective of their date. The Kesgrave Sands and Gravels, which include deposits representing various phases of the London Basin drainage system prior to the Anglian Stage have not produced any undoubted artifacts. Those in the Ipswich-Bury St. Edmunds region of East Anglia are considered to be Beestonian in age and represent an ancestral Thames (Rose and Allen, 1977). A rubefaction of their surface is regarded as the product of weathering during the Cromerian Stage and, as typified at Barham near Ipswich, are overlain by outwash gravels beneath Lowestoft Till of the Anglian.

The identification of deposits of the Cromerian Stage is complicated by the oscillations of climate that are indicated by flora and fauna. In their absence, a stratigraphical relationship beneath Anglian Stage deposits may only indicate that they are inter-Anglian. However, there is a very distinct mammalian fauna with numerous species that are not found in post-Anglian deposits (Stuart, 1982), and the presence of these species is regarded here as an indicator of pre-Anglian age. They include the Southern Elephant, *Elephas meridionalis*, the sabre tooth, *Homotherium*, *Dicerorhinus etruscus* and distinctive micro-mammals such as *Sorex savini*, *Miomys savini* and *Pliomys episcopalis*. Palaeolithic artifacts have been found in definite association with such fauna at three sites in Britain: Westbury-sub-Mendip, Boxgrove and High Lodge. There is also a very likely association at Kent's Cavern. These sites are briefly summarised below.

Westbury-sub-Mendip was the first site in Britain where artifacts were recorded in association with a Cromerian fauna (Bishop, 1975). The deposits in question are a complex accumulation of cave sediments within carboniferous limestone of the Mendips, much truncated by later erosion. The small numbers of flint artifacts are mainly restricted to the upper Rodent Earth Series of a tripartite sequence (Bishop, 1982) and the position of the whole complex is described as post-Cromerian-pre-Hoxnian, begging the question of its relation to the Anglian. On the basis of its fauna it is accepted here as at least preceding the major glacial advance of the Anglian, even if it is more recent than the Cromerian as represented by the Cromer Forest Bed. It would be misleading to refer to the Westbury-sub-Mendip flints as an industry, as the technology was

clearly influenced by the dearth of suitable knapping material. Only very small and somewhat unsuitable pieces of raw material appears to have been available, whether it was collected locally or brought some distance, and this is reflected in the small size of the flakes and rarity of cores. There are no hand-axes, although one core (Bishop, 1975) may have been a small, broken hand-axe, nor any specialised tools. The products can be described as simple flakes removed in whatever way the shape of the raw material would allow, with virtually no retouch. An interesting aspect of the site is the marked decomposition of many of the flints, presumably on account of their presence in a highly calcareous environment over a very long period of time. So-called patination has reduced many broken flint surfaces to a white, rough state, obliterating any features which may have distinguished artificial working (Bishop, 1982). The fact that this has happened since the time when the flints were incorporated in the cave deposits is demonstrated by some of the struck flints having escaped this extreme patination process, whereas others are still partly recognisable as artifacts. Many of the more 'rotted' pieces of flint have undergone such transformation that it is impossible to know whether they were artifacts or just natural fractures. It must be this unusual feature which has made some archaeologists register doubts about the artificial nature of all the flints (Cook, Jill, *pers. commun.*). Certainly there must be doubts about many of the pieces that have become severely patinated, but the presence of undoubted flakes makes the total dismissal of the assemblages as artificial unjustified. It is clear evidence of Palaeolithic activity associated with a pre-Anglian fauna, in a non-flint area of south-west England. Geographically, this is surprising, as so much of the evidence for the Palaeolithic period in Britain is in south-east England. However, the possible pre-Anglian site of Kent's Cavern, Torquay, Devon, is also in the West Country.

At Kent's Cavern there are cave sediments which contain a sabre tooth (Campbell and Sampson, 1971) which is unknown from deposits younger than those of the Cromerian Stage. There are also some hand-axes. Unfortunately, the records from the early excavations which produced them are not sufficiently detailed to allow it to be concluded with confidence that the remains of this animal and the hand-axes were in the same deposit and thus contemporary. However, it can be stated in support of their contemporaneity that the hand-axes would be very much out of place in any of the other archaeological contexts in the cave. The site is summarised by Roe (1981).

The best evidence for pre-Anglian (in the sense stated above) archaeological material is the site at Boxgrove, Sussex, currently being excavated, for this is the only Palaeolithic site in Britain so far discovered where the material is in primary context and in association with a pre-Hoxnian fauna. The material lies on and in the upper part of the Slindon Sands which rest on the 45 m raised beach which can be traced for

several kilometres east and west of the site (Roberts, 1986). It is close to the actual chalk cliff, now much degraded, from which flint was being exploited. Rough-outs from this source were taken away a short distance and worked into elegant hand-axes. This surface and the cliff itself were eventually overwhelmed by a massive accumulation of soliflucted chalk and flint gravels (Coombe Rock) containing numerous hand-axes derived from destroyed surfaces at a higher level. One horizon of silt within this Coombe Rock, containing hand-axes which may have been in primary context, may indicate an interval in the period of solifluction. This is unlikely to have formed in anything but a periglacial climate. There is no dating evidence for this Coombe Rock, but in the absence of any obvious hiatus it was presumably Anglian.

The site of High Lodge, Mildenhall has already been mentioned in the preceding section, as all the deposits there except the fluvial gravels are considered to be the result of glacial activity during the Anglian Stage. However, as stated, the lacustrine muds (brickearth) are interpreted as having been thrust bodily as a raft into their present position by ice movement. As they contain pollen and fauna indicative of a warm period, they must predate the glacial phase represented by the boulder clays which lie below and above them. Proof of this remarkable transportation of the mass of these muds and the distortion of the bedding, is demonstrated by the conjoining of flakes found in the lower 'red brickearth', with those in the upper 'black brickearth', (N. Ashton, *pers. commun.*). The sparse fauna contained in these lacustrine muds includes *Dicerorhinus etruscus* and some voles, all unknown from Hoxnian or later stages. The inference is that the transported mass was originally deposited in a lake prior to glaciation of the area. This can be described as Cromerian or perhaps, as with Westbury-sub-Mendip, post-Cromerian-pre-Hoxnian.

The industry from High Lodge is one of the production of large and small flakes somewhat haphazardly from cores of fine quality flint, many of which were retouched with skill and symmetry into so-called scrapers of various forms (Coulson, *in prep.*). The refinement of the industry and resemblance to the products of much later industries such as the Mousterian is seemingly at variance with this very early date, but the implications are discussed in the latter part of this paper.

No other sites in Britain can as yet be attributed to this stage of the Quaternary, even with a low degree of probability. There is also the negative evidence of the Cromer Forest Bed, frequently exposed and examined by geologists and palaeontologists, apart from archaeologists. Not a single humanly struck flake has ever been found indisputably within these interglacial deposits which are of the Cromerian Stage by definition. An industry from the foreshore near Cromer of large, mainly cortical flakes, thought to have been eroded from the Cromer Forest Bed, are regarded as the result of storm activity on the present beach.

PALAEOLITHS FROM HOXNIAN STAGE DEPOSITS

On the basis of a distinctive pollen profile and a stratigraphical relationship above till identified as of the Anglian Stage, a few lakes or freshwater sediments in Britain can be related confidently with the type site itself at Hoxne in North Suffolk (West, 1956). Only at Marks Tey in Essex is there a complete sedimentary record of the entire interglacial from Anglian Late-glacial, through four pollen chronozones to an Early-glacial which, in the absence of a hiatus and definition, is the Wolstonian Stage (Turner, 1970). The other main sites where Hoxnian interglacial deposits have been recognised are, apart from the type site:

Rivenhall End-Copford, Essex (Turner, 1970)
St. Michael South Elmham, Suffolk (West, 1956)
Sicklesmere, Suffolk (West, 1981)
Athelington (West, 1956)
Nechells (Shotton *et al.*, 1977)
Quinton (Shotton *et al.*, 1977)
Clacton-on-Sea, Essex (Pike and Godwin, 1953)
Slade Oak Lane (Gibbard, 1985)

A few hand-axes have come from Marks Tey and Sicklesmere but their exact provenance is not known. No palaeoliths have ever been recorded from St. Michael South Elmham, Athelington, Rivenhall-Copford, Slade Oak Lane, Nechells or Quinton. Only at Clacton and Hoxne are there Palaeolithic industries with mammalian faunal remains in primary context which can be related to the pollen-dated interglacial sediments, and only at Clacton can it be demonstrated that the industry is in the Early-temperate chronozone. The evidence is not entirely satisfactory, for the borehole which was sunk through the Clacton channel deposits in 1951 cannot be directly linked with the archaeological levels described by Warren (1955). However, Turner and Kerney (1971) were able to extend the profile downwards into the freshwater deposits which contained archaeological material at various levels, probably in a slightly derived condition, and interpret them as belonging to the Early-temperate zone Ho. IIb. Later work on the golf course, in the same channels about a kilometre to the west (Singer *et al.*, 1973) revealed a Clactonian Industry in primary context on a thin bed of gravel, covered by marly silt which was contemporary with the occupation. Pollen in this marl examined by Mullenders (Wymer, 1974) suggested an earlier phase with pine and birch woodland. Turner (1985) disputes the validity of this interpretation because of contamination from other sediments and also oxidation producing differential preservation of the pollen of particular species. Notwithstanding this, it can be accepted that the industry at Clacton-on-Sea, found in primary context or in the Freshwater Beds of Warren represents human activity during the early part of the Hoxnian Stage. Whether the rolled material in the underlying gravel is earlier is irrelevant to this section. Recent exposures of the

Clacton Channel in deep drainage trenches between the golf course and the type site in the cliff near the borehole of 1951, have revealed a consistent marly silt up to 3–4 m thick above a thin lag gravel containing Clactonian artifacts and bone fragments (Bridgland and Wymer, *in prep.*). This seems consistent with the gradual aggradation of a river in response to a slowly rising sea level as might be expected during the early part of an interglacial. There was no sign of gravels and sands typical of the cut and fill of braided river courses.

At Hoxne it has been shown that the Lower and Upper Acheulian Industries are within reworked lacustrine or fluvial deposits which postdate the Late-temperate zone Ho. III. These must span the Post-temperate zone Ho. IV and the Early-glacial zone of the succeeding Wolstonian Stage. Both industries are mainly in primary context and there can be no question of derivation from earlier deposits. It is possible that a small number of flakes and hand-axes found in the lacustrine clay-muds of the Early-temperate zone Ho. IIc, some actually corresponding with the deforestation zone (West, 1956), may indicate lakeside occupation at this period, but the similarity of their condition and type to the Lower Industry above makes it seem more likely that they are intrusive from this level.

There are a few other sites where palaeoliths have been found in lacustrine or fine fluvial sediments, some probably in primary context, in positions which suggest they may well be broadly contemporary with the Hoxne upper sequence, such as Foxhall Road, Ipswich and Elveden, Suffolk, and also Hitchin. However, none of these sites have been dated by pollen analysis or any other method.

On the basis of its faunal assemblage, the sandy silts at Grays have been attributed to the Hoxnian Interglacial (West, 1969) but there is a total absence of palaeoliths from this deposit which, from its nature and the mammalian species found in it, must be of full interglacial date.

It is unfortunate that the dating of the most famous Palaeolithic site in Britain, Barnfield Pit at Swanscombe, is not supported by a satisfactory pollen profile. The full sequence, as described by Conway (1972) covers a number of episodes. The Lower and Middle Gravels, with the intervening Lower Loam, are considered Hoxnian on the basis of their altitude (22–30 m O.D.) and the contained mammalian fauna (horse, giant ox, straight tusked elephant, red, roe and fallow deer, monkey, pig, wolf, lion, bear, rhinoceros and *Homo*, apart from numerous smaller mammals). Not all the mammalian fauna is derived and all these deposits are interglacial, although the presence of lemming in the Upper Middle Gravel and certain mollusca (Kerney, 1971) suggest the onset of cooler conditions at this part of the sequence. It is also certain that they are post-Anglian in view of the erratic rocks they contain derived from tills and outwash of that stage. Cold climate deposits rest on the Upper Middle

PALAEOLITHS IN DEPOSITS BETWEEN THE HOXNIAN STAGE AND THE IPSWICHIAN STAGE

This period of time is referred to as the Wolstonian Stage in the scheme proposed by the Geological Society of London (Mitchell *et al.*, 1973), but in view of the controversy already mentioned in the preceding sections concerning the age of the till at the type site, objections or misunderstandings could arise from its continued use. However, there is no question of the Ipswichian Stage as represented by the interglacial deposits at the type site of Bobbitshole. Hence, if the Wolstonian should be equated with the Anglian, it makes no difference to the time period represented by the title of this section. An alternative stage name would be desirable but this review is no place to consider one.

The most incontrovertible evidence for a long series of climatic episodes between Hoxnian and Ipswichian Stages is in the Middle Thames Valley, for a whole flight of terraces including the Boyn Hill Gravel, the Lynch Hill Gravel, the Taplow Gravel and the Spring Gardens Gravel have to be placed in this position. This will be the starting point for this section. Certainly, there is no indication of any actual glaciation in or very close to the Thames Valley during this stage, but periglacial features might relate to glacial episodes in the Midlands or East Anglia, whatever their relation to the Wolstonian type site might be. Hence, it is unwise at present to ignore the possible glaciation of parts of East Anglia and the Midlands at various times between the Anglian and Devensian Stages. The Marly Drift of Norfolk has been claimed to fit in here (Straw, 1979; Straw and Clayton, 1979) mainly on the basis of its distinctive suite of erratics. Similarly, others (Baden-Powell, 1948; Gladfelter, 1975) have stressed the presence of these erratics in the post-Hoxnian gravels and superficial deposits of East Anglia. Only at one site in Lincolnshire does a thick till overlie a gravel with some hand-axes and elephant remains (Wymer and Straw, 1977), but there is no way of demonstrating whether the gravel is Late Hoxnian, or earlier, or even later. However, there must have been climatic changes of some sort in view of the Thames Valley sequence if nothing else. The ironical aspect is that the majority of the Palaeolithic evidence in Britain appears to belong to this part of the Quaternary sequence, yet it is virtually all in a derived condition, and interpretation of the contemporary environments is very limited.

The recently published work of Gibbard on the Middle Thames (Gibbard, 1985) allows the palaeoliths in the terrace gravels to be placed into the Quaternary sequence with considerable confidence. His discovery of Hoxnian Stage deposits, dated on the basis of pollen analysis, at Slade Oak Lane near Denham, Buckinghamshire, places the gravels of the Boyn Hill Terrace stratigraphically after this stage. The gravel accumu-

Gravel and are, in turn, covered by the Upper Loam which is considered to have formed under temperate conditions as it contains the pollen of a mixed oak forest (Hubbard, 1972). Whether this is valid or not (Turner, 1985) the Upper Loam must represent a stage that is younger than that of the Lower and Middle Gravels. This lower part is generally considered to be of the Hoxnian Stage and it would be difficult to see it as otherwise. Monkey is not known, rare as it is, from any deposits considered younger than Hoxnian and the whole mammalian assemblage is more similar to that at Clacton and Hoxne itself than any of the later Ipswichian sites. Further refinements of dating for this complex site can only be based on somewhat circumstantial evidence, i.e. the coincidence of the presence of Clactonian Industries during the earlier part of the interglacial represented (as at Clacton) and the rich Acheulian Industries in the Middle Gravels which are thought to span the closing stages of the same interglacial (as at Hoxne). On this interpretation, the later Acheulian Industry in the Upper Loam would be Wolstonian or Ipswichian.

The simplicity of this interpretation may be misleading as, for instance, nothing is known of the duration of the hiatus that occurred after the deposition of the Lower Loam, other than there was enough time for a soil to form on its surface (Bridgland *et al.*, 1985). Also, if the deposits at Grays with their rich mammalian fauna are to be equated with those at Swanscombe, there is a difference in altitude of over 10 m. Similarly, only a few kilometres to the east in the valley of the Medway at Cuxton, an identical flint industry to that of the Swanscombe Middle Gravels, in fresh condition, is found in gravel also at a considerably lower altitude. This perhaps highlights the difficulties of correlating fluvial deposits in the lower reaches of rivers subject to the effects of changing sea levels or isostatic movements.

In conclusion, it has to be seen that there are very few actual occurrences of Palaeolithic material in Britain which can be directly associated with firmly dated Hoxnian Stage deposits. The implications as to whether this is the result of geological conditions which were not conducive to the preservation of contemporary sites, or the deposits which may have formed were particularly vulnerable to later erosion and destruction, or there was a dearth of human activity especially in the middle of the Hoxnian Stage, will be discussed in the final section of this paper. However, the available evidence for the Hoxnian Stage indicates the presence of a non-hand-axe industry in the early part of the interglacial, in a temperate well-wooded environment, and Acheulian hand-axe industries of varying traditions during the latter part when more open conditions prevailed. This occupation continued, probably intermittently, into the succeeding cold period of the Wolstonian Stage.

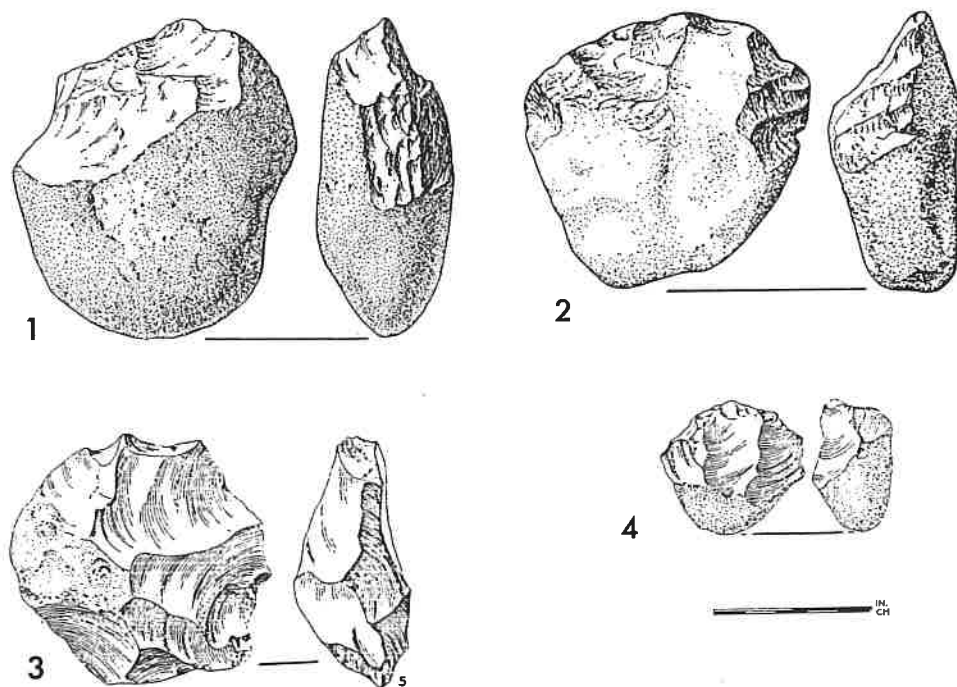


FIG. 1. Primitive Technology. These four chopper-cores illustrate the use of very simple flaking technology at different times, in Africa and in Britain. It can occur at any time during the Palaeolithic period, or even later, and it is only when large assemblages are found without any addition of more advanced technology that it may have some industrial or temporal significance. (1) Olduvai Gorge, Tanzania. Upper part of Bed 1. ca. 1600 ka BP (Leakey, 1971). Volcanic rock. (2) Woodley and Sandford, Berkshire. Thames Valley, Lynch Hill Gravel. Post-Hoxnian-pre-Ipswichian (Wymer, 1968). Quartzite. (3)-(4) Jaywick Sands, Clacton-on-Sea, Essex. Basal gravels of the Clacton Channels. Late-Anglian-Early-Hoxnian (Oakley and Leakey, 1937). Flint.

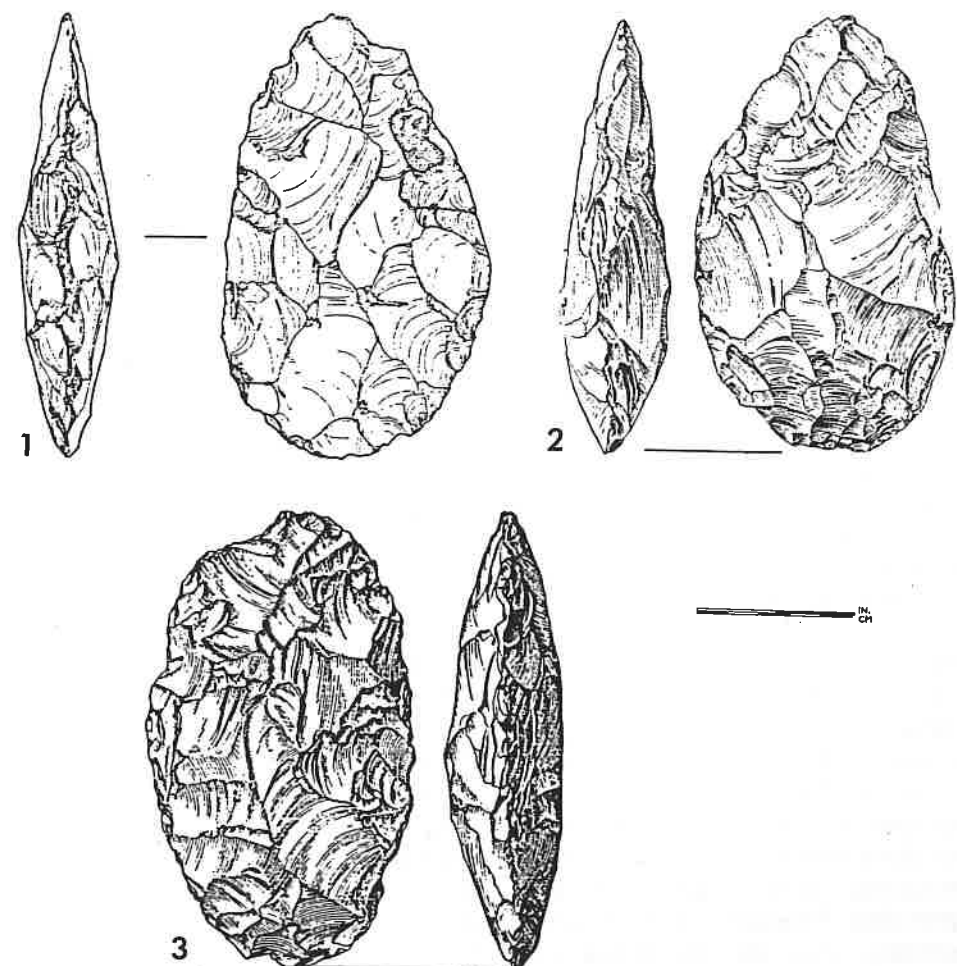


FIG. 2. Typology. In very few cases can hand-axes be used as temporal indicators, as may be seen from these three ovates from different stages of the British Quaternary. All are made by a similar refined technique and shape preference. In each case one side of the cutting edge has been produced by the skilful removal of a 'tranchet' flake from near the tip. (1) Boxgrove, Sussex. *In situ*, Upper Slindon Sands, Unit 4c. Pre-Anglian (Roberts, 1986). (2) Swanscombe, Rickson's Pit. Post-Hoxnian. (Waechter, 1973). (3) Sonning Common, Kennylands Pit, Oxfordshire. Black Park Gravel of Middle Thames Valley. Late-Anglian. (Treacher *et al.*, 1948).

lations of this terrace and those of the progressively lower terraces (Lynch Hill and Taplow Terraces) are interpreted as the products of braided river courses during cool or periglacial episodes. Lithological analyses are given in support of each of the gravels on these terraces as representing individual phases in the evolution of the valley, with each lower terrace being a younger phase than the one above it. There are thus three major series of terrace gravels which are post-Hoxnian and pre-Ipswichian of The Upper Flood Plain Terrace at Trafalgar Square, London. The correlation of the latter with the Bobbitshole type-site, by pollen analysis and the faunal assemblage, seems secure. No evidence can be seen in the middle Thames for any other interglacial or even interstadial period between the Boyn Hill Gravels and Trafalgar Square.

Palaeoliths occur, in a derived condition, in all of these terrace gravels: Boyn Hill, Lynch Hill and Taplow, but mainly in the Lynch Hill.

Boyn Hill Gravels

Those around the area of the type site at Maidenhead have been described by Lacaille (1961). It is apparent that there are no sites in this area that have produced any large numbers of hand-axes or other artifacts and that those which have been found are invariably in a very rolled condition. Much of the gravel was deposited under high energy conditions and the state of the artifacts accords with them having been derived some distances from their original place of manufacture or use. The early literature frequently gives the impression that the Boyn Hill Gravels are rich in Palaeolithic material, but this is because the Geological Survey (Dewey and Bromehead, 1915) did not distinguish between the Boyn Hill and Lynch Hill terraces, and the prolific sites in the latter gravels were attributed to the former. The most prolific sites in gravel regarded as Boyn Hill Gravel are at Caversham, especially Toot's Farm. Less dispersed, richer Palaeolithic sites in the Boyn Hill Gravels have been found at Burnham, Stoke Poges and Farnham Royal (Lacaille, 1939; Wymer, 1968; Roe, 1981). Little more can be said about the hand-axes other than that they tend to be of ovate or cordate types. No Clactonian Industries can be identified, or any specific use of Levallois technique.

Lynch Hill Gravels

These gravels constitute the most prolific source of Palaeolithic artifacts in the Thames Valley, from Cookham to north-east London. The largest collections come from Furze Platt, Maidenhead and various pits in Burnham and Iver (Wymer, 1968). At Furze Platt and Lent Rise, Burnham (Lacaille, 1940) much of the material is in sharp if not mint condition, with little or no edge damage. It cannot have travelled far and, coupled with the concentration of finished hand-axes and the primary and finishing flakes resulting from their manufacture, it can be accepted that they have not been derived from any higher, earlier terrace gravels, such as the Boyn Hill Gravels. It is reasonable to

assume that the majority of this Lithic material had been made, used and discarded on the edge of one of the braided river channels and became incorporated in the gravels which eventually filled it as other channels were eroded. If this and the interpretation of the gravels as really being those of braided river courses formed during cool or periglacial climate is correct, it is strong evidence for the human activity being contemporary.

Hand-axes of many types are found in the Lynch Hill Gravels but at Furze Platt and Lent Rise, Burnham, it would seem that one industrial tradition is represented, with an emphasis on hand-axes of pointed shape, identified metrically as Group 1 by Roe (1968) in his classification of hand-axe types into seven groups. This would also seem to be the case with most of the hand-axes found in the Lynch Hill Gravels. As with Boyn Hill Gravels, there is no evidence for the use of Levallois technique, in the sense of the elaborate and skilful preparation of cores for the removal of flakes of predetermined shape and size, to the virtual exclusion of hand-axes. However a few such flakes and cores have come from Lynch Hill Gravels [cf. Butt's Hill, Woodley and West Drayton (Wymer, 1968)] and are tentatively referred to as proto-Levalloisian. This is discussed in more detail in the final section.

It is possible that a Clactonian Industry of crude chopper-cores and flakes, without hand-axes, is present in the Lynch Hill Gravels, as several such artifacts came from this gravel at Deep Lane, Burnham. However, there are also hand-axes in the same gravel and, in the absence of very large numbers or isolation of them in a primary context, it must remain doubtful. This is especially so now that it can be seen that similar cores were sometimes a part of some Acheulian hand-axe industries, such as the Hoxne Upper Industry (Wymer, 1983).

Taplow Gravels

The gravels which underlie the Taplow Terrace form very extensive spreads in the Middle Thames, downstream from Taplow itself, through Slough and across to the great expanse of Heathrow airport. They continue through Hounslow towards Ealing, all within the wide, south meander loop of the present river. Beyond this, eastward, through central London the Taplow Gravels are less preserved and there are difficulties in defining the junctions between them and the Lynch Hill Gravels, so only the former area can be considered here.

The section at the type site would suggest different conditions prevailing at the time of its formation to those of the Lynch Hill Gravels, at least in its initial stages. This possibility is based mainly on the records of faunal remains including musk ox at the base of the gravel where, as expressed by Prestwich (1856): 'it becomes mixed with chalk rubble, or on top of the chalk itself'. This apparent solifluction deposit with faunal remains has not been seen in any of the numerous other exposures observed more recently,

either at the type site or elsewhere, but there is no reason to doubt its localised occurrence, or its support for the aggradation of the Taplow Gravels being preceded by a cold or periglacial climate.

A few dozen hand-axes are recorded as coming from the Taplow Gravels in this area of the Middle Thames, mainly from the gravel of the type site. Those in the Treacher Collection at the Oxford University Museum are, with one exception, in rolled to very rolled condition and, in view of the proximity of the highly implementiferous Lynch Hill Gravels, it seems most likely that these hand-axes have been derived from them as the river cut its lower bench level. The occurrence of a few unequivocal Levallois flakes may be significant, for although they are also in rolled condition, such very rarely occur in the Lynch Hill Gravels. However, in support of the majority of the artifacts in these Taplow Gravels being derived from earlier terrace gravels, they have rarely been found in the great spreads of them at greater distances from the bluff of the remaining Lynch Hill Gravels, for example at London airport, Hanworth, Heston and Hounslow. This could suggest a greater dispersal of them in proportion to the distance from their source of origin.

How these terrace gravels in the Thames Valley and in all the other major drainage systems in southern England relate to climatic changes during this part of the Pleistocene is unknown. If it is accepted that the majority were deposited by the cut and fill regime of braided rivers during cold phases, and that the terracing has been caused by the lowering of sea level relative to the land, then this would have been during times of glaciation in the northern hemisphere. Conceivably, the vertical intervals between such terraces could represent periods of interstadial or interglacial climate. However, it has already been seen that as far as the Middle Thames Valley is concerned only one interglacial site has been found that is earlier than the Ipswichian, stratigraphically between the Black Park and Boyn Hill Gravels and dated as Hoxnian. It would thus seem that the chances of fine, organic interglacial sediments surviving in a major river valley are very slender. Any archaeological evidence has presumably been destroyed with them, the artifacts dispersed from their primary contexts and washed into the later terrace gravels. However, there is in the Middle Thames downstream of Marlow, the so-called brickearth that mantles both bed-rock and the surfaces of the Lynch Hill and Taplow Terraces and also the Ipswichian deposits at Trafalgar Square. It is described by Gibbard (1985) as the Langley Silt Complex and it has produced Palaeolithic artifacts of Levallois and Mousterian types, rarely found in the underlying gravels. Its loessic component and indications of slope wash, as well as occasional ice wedge casts, imply accumulation in periglacial conditions. As Gibbard emphasises, there is a wide range of sediment types and it must cover a series of depositional events. The cold environment for its deposition is well demonstrated by soil analyses of the silts at the level of a Mousterian type hand-axe

found at Sipson Lane, Hillingdon (Cotton, 1984; Macphail, *pers. commun.*). The hand-axe was found on an eroded surface covered by clay apparently under very cold conditions. The upper surface of the hand-axe showed 'pocking' from thermal fractures, whereas the lower, protected surface did not. Gibbard's conclusion is that the majority of the Langley Silt Complex is of Devensian Age, but some is probably pre-Ipswichian. Iver is cited as a possible locality where two periods are represented, for there is an Upper Grey 'brickearth' and a lower Red 'brickearth'. However, both contain similar Levallois flakes, but the only two recorded hand-axes came from the lower red 'brickearth' (Lacaille and Oakley, 1936; Lacaille, 1959). It is also significant that Levallois flakes have also been found occasionally in rolled conditions in this part of the Thames Valley, in the Lynch Hill Terrace. Presumably, because of their condition they have actually come from the gravels, but they are not common and it is very probable that they were incorporated in the upper part of the gravel by later solifluction or reworking over its surface. However, an industry of Levallois flake cores in primary context comes from beneath the Langley Silt Complex at West Drayton, occurring at the interface with the gravel according to the early accounts (Brown, 1896). It must remain unproven whether some or all of such artifacts are pre-Ipswichian or Devensian, but at least this does place Levallois flakes and Mousterian type hand-axes firmly within this span. The likelihood is that most of the material within the Langley Silt Complex is of Devensian Age, although perhaps not the industry from West Drayton. The Levallois industry from West Drayton is very similar to that from the famous and very prolific site of Baker's Hole, Northfleet. Typological correlations are inappropriate in this part of this review, but the same Levallois industry is found at West Thurrock beneath an accumulation of fluviatile, sandy sediments 12 m thick, rising to 14 m O.D. (Carreck, 1976; D. Bridgland, *pers. commun.*). On the basis of altitude alone, these sediments are unlikely to equate with the Ipswichian of Trafalgar Square and therefore could be earlier.

Upstream of the Middle Thames, large numbers of palaeoliths have come from the Twyford-Sonning-Reading-Caversham area (Wymer, 1968). The majority come from the terraces mapped as Boyn Hill and Lynch Hill by Gibbard (1985). There are rich Acheulian hand-axe industries in the Boyn Hill Gravels at Caversham. Similar industries are in the Lynch Hill Terrace, particularly at Grovelands (Wymer, 1968) where there is also an industry of Clactonian-like cores and large, finely-made scrapers, similar to the Hoxne Upper Industry. The same terrace, at Denton's Pit, has yielded what may be a Clactonian Industry and, surprisingly, at least two Levallois flakes in rolled condition. The Reading Town Gravel, considered Devensian by Gibbard (1985), has only produced a few rolled hand-axes. Apart from the latter, all these palaeoliths must have been incorporated within these

terrace gravels after the Anglian Stage and before the Ipswichian Stage.

The Upper Thames Valley, i.e. above the Goring Gap, has yielded palaeoliths from gravels of the Summertown-Radley and Lower Flood Plain Terraces, an infilled channel within the Wolvercote Terrace, and one hand-axe from the higher Hanborough Terrace. It is not possible to substantiate the few hand-axes reported to have come from the Wolvercote Terrace Gravel itself. This area has received considerable attention recently, from archaeologists and Quaternary specialists (MacRae, 1985; Roe, 1986; Briggs *et al.*, 1985; Tyldesley, 1986; Shotton *et al.*, 1980). The richest Palaeolithic locality in the Upper Thames at Berinsfield has been investigated by MacRae (1982) and organic channels have been found at Sugworth and Stanton Harcourt. Unfortunately, at present, correlations with the Middle Thames or the British Quaternary sequence are not reliable, apart from the question of derivation of the palaeoliths from older surfaces or gravels in which they are found. Roe (1986) favours a Late Pleistocene, probably Ipswichian, age for the Wolvercote Channel, but solely on typological grounds. Some of these palaeoliths in the Upper Thames will have been incorporated into deposits of the age being considered in this section, but there are too many problems to warrant discussing them further in this review.

A channel with organic sediments at Stanton Harcourt mentioned above, introduces the subject of interglacial periods between the Hoxnian and Ipswichian. This particular channel is unequivocally stratified beneath deposits which correlate with the Ipswichian Stage sediments at Magdalen College, Oxford (Sandford, 1924; Briggs *et al.*, 1985). Insufficient pollen was preserved for analysis and a Hoxnian date cannot be disproved, but the presence of mammoth argues against it. Several other sites in Britain exist where, as stated in the Final Report of I.G.C.P. Project 24, 'older (i.e. than the Ipswichian of the type site) deposits with at least a temperate biota and demonstrably post-Hoxnian occur' (Shotton, 1986). Sites listed are: Marsworth, Stanton Harcourt, No 5 Terrace of the Warwickshire-Worcestershire Avon, a series of sites near Ipswich (Stoke Tunnel, Maidenhall, Stutton, Harkstead), Brundon and the inner beach at Minchin Hole. Aveley, Ilford and several other sites could be added, with varying degrees of confidence. The surprising archaeological fact is that very little Palaeolithic material has ever been found at any of these sites! There is nothing at Marsworth (Green *et al.*, 1984), Minchin Hole or Aveley, in spite of rich mammalian faunal assemblages; one small, discoidal core and a few flakes come from Stoke Tunnel, one broken blade from Maidenhall; Levallois flakes and cores and some hand-axes from Brundon, but probably from gravel deposits on top of the interglacial deposits; a few flakes including Levallois from Harkstead and Stutton. The most surprising aspect is that, as there is at least definite evidence for a human presence and

associated mammals, no prolific sites have ever been found. However, the use of Levallois technique at this time is adequately demonstrated.

As already stressed, the majority of evidence for the Palaeolithic period in Britain comes from gravels which are demonstrably post-Anglian and pre-Ipswichian, but only in the Thames Valley does the succession of terraces allow an interpretation to be made of their sequence in relation to each other over a long distance. Elsewhere, the preservation of such features has been more piecemeal or the deposits have not been studied in sufficient detail. Sequences are certainly forthcoming from such areas as the Wey Terraces at Farnham, the Kentish Stour, the Hampshire Avon and several other places, all of which contain palaeoliths (almost entirely hand-axes) in varying numbers, from isolated artifacts to prolific concentrations. The same is true in East Anglia, with some of the richest Palaeolithic sites in Britain (e.g. the Mildenhall area, Icklingham, Brandon, Keswick, Whitlingham, etc.), although any succession of terraces appear to represent far more complicated depositional agencies than the Middle Thames. Similarly, in the Midlands, Terraces 1 to 4 of the Warwickshire-Worcestershire Avon are dated to the Devensian although the gravels below the surface of Terrace 3 are Ipswichian, and underlie those below Terrace 4 with Acheulian hand-axes (Shotton, 1953, 1968). At present, these regions can do little to assist with clarifying the archaeological sequence.

To summarise, prolific concentrations of hand-axes in the Lynch Hill and to a lesser extent the Boyn Hill Terrace Gravels of the Middle Thames, both post-Hoxnian, testify to considerable intensity of Palaeolithic occupation, much of which appears to have been contemporary with the deposition of the gravels themselves. This would imply occupation during periods of cool climate. Levallois artifacts seem restricted to later deposits, occurring sparsely in an interglacial episode that is pre-Ipswichian and post-Hoxnian. Such artifacts may have been present earlier, as a few have come from Lynch Hill Gravels.

PALAEOLITHS FROM IPSWICHIAN STAGE DEPOSITS

The identification of deposits of this stage has been by pollen analysis, mammalian faunal assemblage and altitude. In view of the proven existence of another interglacial between the Ipswichian of the type site and the Hoxnian Stage, possibly with similar pollen profiles and at no great altitudinal difference, differentiation relies considerably on the mammals. The whole matter is made more difficult by the type site at Bobbitshole, Ipswich, not yielding mammalian remains. However, the type site is correlated with the Trafalgar Square Complex (Gibbard, 1985) at which site there is hippopotamus, straight tusked elephant, mammoth and no horse. Other interglacial sites identified as Ipswichian with no hippopotamus, no straight tusked

elephant but much mammoth and horse, are considered by some as earlier (Sutcliffe, 1985). Others see these faunal assemblages as belonging to the same interglacial but related to different habitats or chronozones (Stuart, 1982). The danger of using the presence of hippopotamus as a temporal indicator has been emphasised wisely by Sparks and West (1972). Amino acid geochronology is already doing much to solve this problem (Bowen *et al.*, 1985) but for the purpose of this review, the archaeology of only those sites with hippopotamus and generally accepted as Ipswichian Stage (*sensu stricto*) will be considered. These are listed by Shotton (1986) as:

Bobbitshole (the stratotype)
Trafalgar Square
Uppermost beds of the Summertown-Radley Terrace at Oxford
Terrace 3 of the Warwickshire Avon
Hippopotamus layer at Victoria Cave, Settle (with U/Th date of ca. 125 ka BP)

to which could be added:

Barrington, Cambridgeshire
Basal layer of Hyaena Den, Wookey

The archaeological evidence from these sites is very sparse and, in the case of the Summertown-Radley Terrace gravels (the Eynsham Gravel of Briggs *et al.*, 1985) and Terrace 3 of the Warwickshire Avon, too unreliable on account of the strong possibility of the palaeoliths being derived from older deposits. There are no palaeoliths known from Bobbitshole or Trafalgar Square. One rolled flake from Barrington can be dismissed as intrusive. There is a hand-axe from Victoria Cave, Settle (Roe, 1968) but its relation to the dated Ipswichian level is not known. The evidence from the Rhine Hole, Wookey, where four flakes and a Mousterian type hand-axe come from the basal layer, must be discounted, as the identification of associated hippopotamus is incorrect (Currant, *pers. commun.*).

Levallois flakes and Mousterian type hand-axes have also come from a few sites in the Sussex 6-8 m Raised Beach, or river deposits equated with it such as Great Pan Farm on the Isle of Wight (Shackley, 1973) which may be Ipswichian Stage (*sensu stricto*).

Unless much of the Palaeolithic material found in some Devensian gravels, as mentioned in the next section, has been derived from land surfaces of this stage, it is difficult to prove there was any occupation at all of Britain during the Ipswichian.

PALAEOLITHS FROM DEPOSITS OF THE DEVENSIAN STAGE

It is generally assumed that most of the low-lying or Flood Plain gravels of the major river systems in southern England, usually yielding remains of mammoth, woolly rhinoceros and reindeer were deposited during the mainly cold Devensian Stage. This may be true for the majority but not necessarily for all of them.

This is especially so in East Anglia where gravels at levels close to the modern flood plain are frequently not so (e.g. Shrub Hill, the March Gravels and Nar Valley Beds). Thus, in the absence of detailed studies of specific localities, only those sites mentioned in the Geological Society report of 1973 will be considered, apart from some caves. In any case, palaeoliths are generally absent in most of these flood plain gravels, even very rolled artifacts that probably derive from earlier deposits. This is particularly true of the Thames Valley. There is virtually nothing from the Devensian Kempton Park Gravel (Gibbard, 1985) except for a Mousterian type hand-axe in sharp condition at a depth of 4 m at Berrymead Priory, Acton. This is an early find, recorded by Brown (1889) and, if the provenance is correct would, by its condition, presumably date to the time of the gravel. Similar Mousterian type hand-axes come from the dredgings of the Thames at Tilbury, apparently from the buried channel.

The stratotype for the Devensian is Four Ashes, Staffordshire. It contains organic layers within the reach of radiocarbon dating. Interstadial sediments within Devensian gravels at Kempton Park, Isleworth, South Kensington and Upton Warren have also been radiocarbon dated to around 40 ka. An earlier interstadial has been identified at Chelford. Not one of these sites has produced any palaeoliths, although any that might have been forthcoming from the later interstadial would be presumably Upper Palaeolithic and beyond the scope of this review.

More satisfactory is the attribution of the Christchurch Gravels in Hampshire, and the Ouse Gravels at Earith and St. Neots to the Devensian, for both have produced Mousterian type hand-axes and Levallois flakes (Calkin and Green, 1949 and Paterson and Tebutt, 1947 respectively). There is at least one Mousterian type hand-axe from the gravels of the low terrace of the River Gipping at Sproughton, near Ipswich. Nearby, at Bramford Road, in perhaps a slightly earlier terrace, is the richest assemblage of Mousterian and other types of hand-axes with Levallois flakes in the country (Wymer, 1985). Yet, elsewhere in East Anglia, carefully recorded localities such as Wretton have produced nothing.

The Langley Silt Complex has already been mentioned in the pre-Ipswichian section and it was noted that, although of composite formation and age, much of it formed during the Devensian. Such would seem to be the age of the industry of Levallois flakes and blades at Creffield Road, Acton (Brown, 1886; Smith, 1931).

Mousterian type artifacts have also been recorded from a few cave sites where, although the stratigraphical evidence from the early excavation is not always reliable, are very unlikely to be earlier than the Devensian Stage. Such have come from Creswell Crage (Pin Hole and Robin Hood's Cave) and the Rhino Hole and Hyaena Den at Wookey (Roe, 1981; Tratman *et al.*, 1971).

It can be concluded that industries with hand-axes, including Mousterian types, and Levallois flakes were

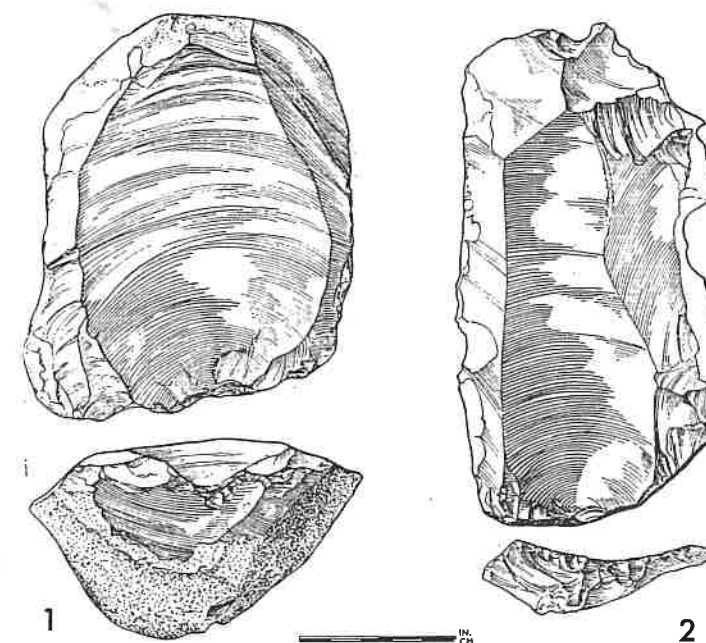


FIG. 3. Levallois Technique. The removal of flakes of preconceived shape by elaborate core preparation does not appear to have been practised as an important element of flint industries in Britain until some time in the later part of the 'Wolstonian'. It was used extensively in Early Devensian industries. (1-2) Levallois core and large flake. Brundon, Suffolk. Stour gravels. Late-'Wolstonian'-Devensian. (Wymer, 1985).

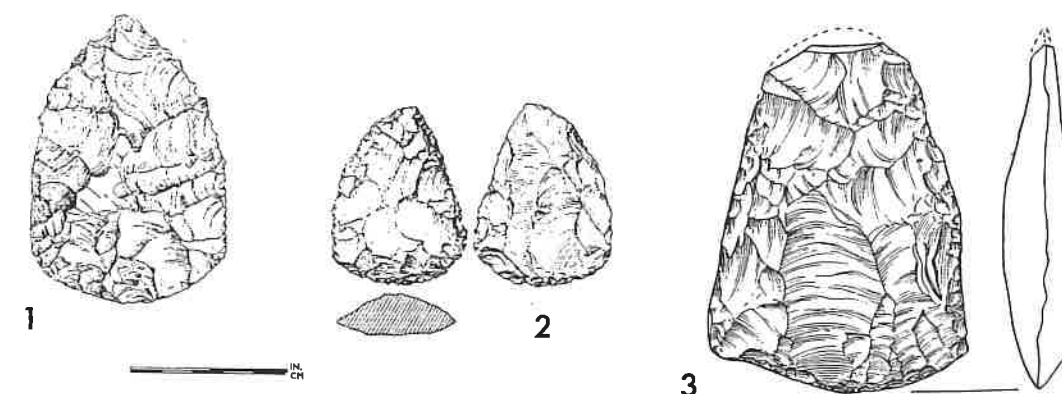


FIG. 4. Industries of Mousterian and of Acheulian tradition. During the earlier part of the Devensian Stage, flint industries are found which include Levallois flakes and a distinctive form of cordate hand-axe, referred to as a *Bout coupé* hand-axe (Roe, 1981). Three are illustrated, all from deposits of Devensian age. However, as with all typology, such distinctive hand-axes grade into less distinctive forms, and caution is needed in assigning individual discoveries to this particular stage of the Quaternary sequence (Coulson, 1986). (1) St. Neots, Huntingdonshire. Pit at Little Paxton in Lower Terrace of Ouse Gravels. Devensian. (Paterson and Tebutt, 1947). (2) Wookey Hole, Somerset, Hyaena Den. Devensian. (Tratman *et al.*, 1971). (3) Acton, West London. Near Berrymead Priory. Thames Valley Kempton Park Gravel. Devensian. (Wymer, 1968).

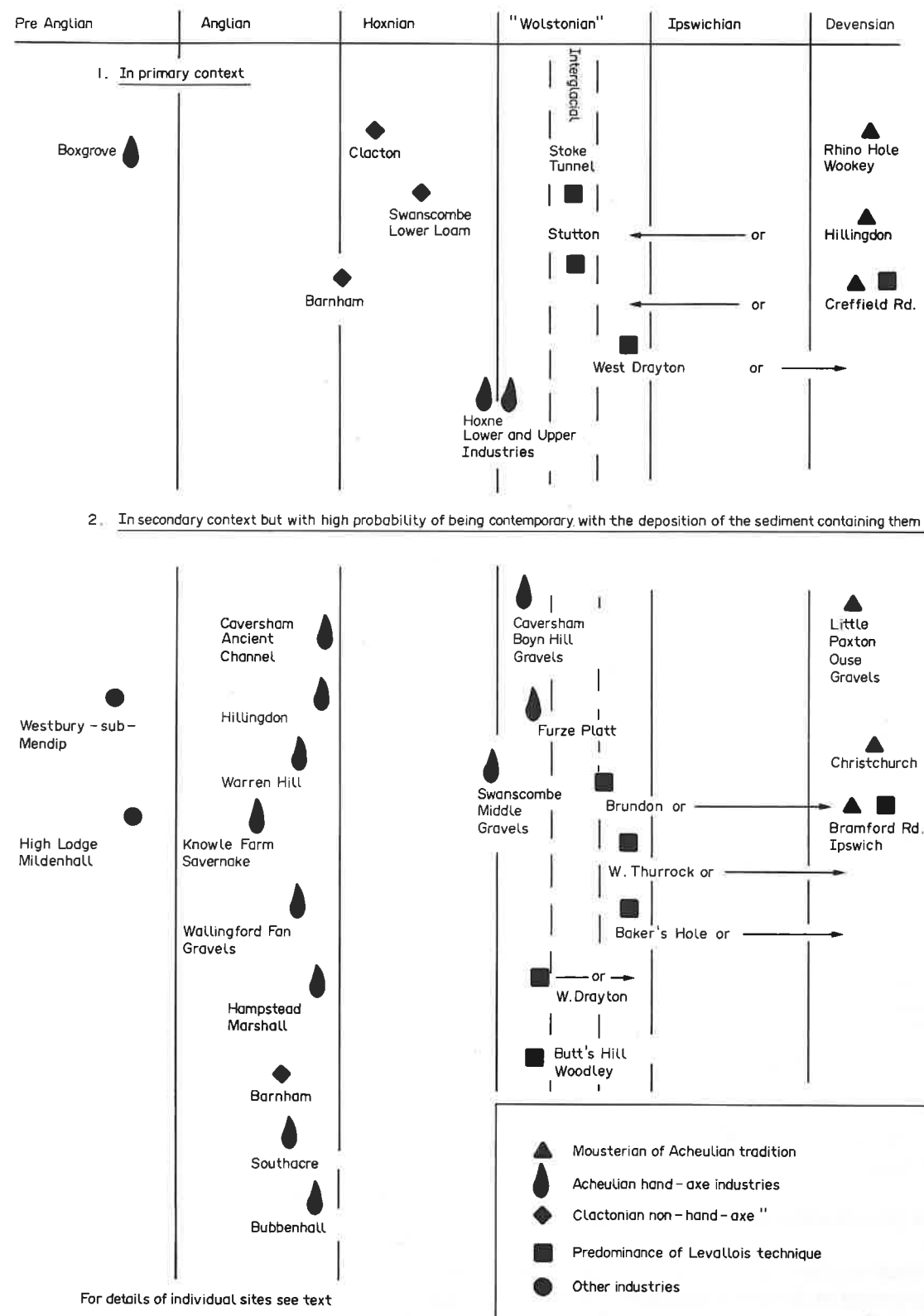
present in Britain during the earlier part of the Devensian Stage.

ARCHAEOLOGICAL IMPLICATIONS

In this final section the evidence for the Lower Palaeolithic period in Britain is considered against the Quaternary sequence as currently accepted and summarised in the preceding sections. Of special concern is the earliest date for a human presence, how this sequence affects the generally accepted temporal position of various Palaeolithic industries, whether lithic typology presents any uniform pattern, and with what

environments our predecessors were coping. Before doing so, the question of the taphonomy of the Lithic evidence needs examination, especially in regard to gravel deposits in which the great majority of palaeoliths have been found. There has been much misinterpretation in the past through a blind acceptance of palaeoliths and faunal remains being contemporary with the deposition of the sediments containing them. In coarse gravel deposits it is clear that palaeoliths are in a secondary context and the only thing that is definitely true as regards their age is that they obviously cannot be younger than the age of the deposit in which they have been found. They are thus 'derived fossils',

TABLE 2. The position of Palaeolithic Flint Industries within stages of the British Quaternary



but they need not accordingly be dismissed as useless for dating purposes apart from having minimum age. The taphonomy of material in fine sediments is quite different, but in gravels which were deposited by rivers with a high energy regime capable of moving clasts as heavy or large as flakes or hand-axes, these become just normal constituents of the gravel and just happen to be artifacts. However, the following situations exist in descending order of probability:

(i) Hand-axes found in large numbers (say >1 per 2-3 m²) together with flakes, the majority in a sharp or only slightly rolled condition (e.g. such sites as Furze Platt or the Swanscombe Middle Gravels) are likely to be contemporary with the deposition of the gravel containing them. This assumes a concentration of Lithic material discarded on the edge of a channel of a braided river which has become incorporated by normal cut and fill processes.

(ii) Hand-axes found in fair numbers (say >1 per 4-15 m²) in more rolled conditions and associated with less flakes than in situation (i) above (e.g. sites such as West Drayton and Yiewsley, Lynch Hill Gravels at Ealing and many others in the same terrace) are still likely to have been contemporary with the deposition of the gravel containing them, but dispersed by further reworking by the river.

(iii) Individual finds of palaeoliths in gravels may record constant reworking of the deposit before the river cuts down to a lower level, or the erosion of one terrace deposit by the formation of a lower one, thus incorporating palaeoliths from the earlier one. The latter process may be repeated several times until the palaeoliths which may be involved are reduced by abrasion to virtually unrecognisable pebbles. Two factors are thus involved: quantity and condition. Little more can be done to assess the span of time between the production of a palaeolith and its final resting point where discovered other than to consider these two factors: e.g. an isolated find of an extremely rolled hand-axe found in Flood Plain Gravels in areas where such artifacts are common in higher terraces has probably been derived from them. Obviously, such artifacts have very limited use for dating purposes.

The number of sites in Britain where Palaeolithic industries have been recovered from undoubtedly primary contexts (i.e. lying unmoved from where they were discarded) is very few: Boxgrove, Clacton, Barnham (East Farm), Hoxne and Swanscombe Lower Loam are the only ones with sufficient numbers of artifacts adequately excavated and recorded to allow an industrial status to be given to them, and which can also be assigned with confidence to the Quaternary sequence. Unfortunately, several of the later Levallois or Mousterian sites in primary context (e.g. Creefield Road, West Drayton, Baker's Hole) date to a cool phase or phases after the Ipswichian Stage interglacial (*sensu stricto*) or the one represented by Marsworth. It is the former sites, few as they are, which must form the basis of the Palaeolithic sequence in the British Quaternary. The first of the following two tables

summarises the present position and can be accepted with confidence. The second table indicates the positions of certain Palaeolithic industries found in derived contexts and is obviously controversial. However, the sites on this second table have been selected on the criteria as outlined above and are thus thought to be contemporary with the deposits in which they are found. What is certain is that, assuming the provenances are correct, they cannot be more recent than the date in the Quaternary sequence that has been assigned to them. If these tables are combined, it would seem to be the most reliable assessment that can be made of the British Palaeolithic sequence in relation to the present state of knowledge of the Quaternary one.

The following points are apparent:

(1) There was a human presence in Britain prior to the Anglian Stage, either in the Cromerian Stage or some post-Cromerian-pre-Anglian Stage not yet identified. Flint industries present were a refined Acheulian one (Boxgrove) and one represented by elegant scrapers (High Lodge, Mildenhall).
 (2) Acheulian and Clactonian Industries were produced during the Anglian Stage. Both are present in the Late Anglian Black Park Gravel of the Thames Valley (Highlands Farm, Rotherfield Peppard), some are probably earlier.

It is inferred that one or more non-glacial, possibly interstadial phases existed during the Anglian Stage not yet seen in the geological record.

(3) Only Clactonian Industries can be shown to have been present in the Hoxnian Stage before the Late-temperate biozone.

(4) Acheulian Industries abound from very late Hoxnian Stage and through the 'Wolstonian' Stage. Levallois technique appears only as a significant element of flint industries towards the end of this latter stage, possibly earlier, but not at the beginning.

(5) The 'Marsworth' interglacial has sparse material from industries using Levallois technique. No hand-axes are certainly known to date to this stage.

(6) There is no certain evidence for a human presence during the Ipswichian Stage (*sensu stricto*).

(7) Industries of advanced Levallois technique with or without hand-axes including those of *bout coupé* form occur in the Devensian Stage, presumably the earlier part of it.

(8) The typology of hand-axes cannot be used as an indication of age although the *bout coupé* hand-axes of Mousterian type certainly predominate in the Devensian Stage, even if not entirely restricted to it.

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