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Chronological variations in handaxes: patterns detected from fluvial archives in NW Europe

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ABSTRACT: The use of handaxe morphology as a cultural and temporal marker within the Quaternary Lower–Middle Palaeolithic record has had a very chequered history, and abuses in the past have led recent generations of archaeologist to reject it out of hand. In Britain, however, advances in dating Pleistocene sediments, setting their ages within a framework of ~11 glacial–interglacial cycles over the past 1 Ma, has revealed a number of patterns in technology and morphology that must be related to changing practices and cultural preferences over time. These are not predictable, nor are they linear, but nevertheless they may aid understanding of the movements of different peoples in and out of Britain over the past 500,000 years. It is also clear that such patterns are to be expected over a much wider region of the nearby continent, although they might not be identical, or even similar, to those established for southern Britain. This paper extends from explanation of the British patterns to an exploration of the extent to which something comparable can be recognized in neighbouring areas of continental Europe: a baseline for a planned collaborative survey of data from the Acheulean of NW European river systems.

KEYWORDS: Lower Palaeolithic; Acheulean; Handaxes; Fluvial archives; NW European Pleistocene; Early human occupation

Introduction

The recognition of Lower Palaeolithic artefacts as component parts of Pleistocene fluvial sediments (predominantly river terrace deposits) was an Anglo-French collaborative achievement, thanks to the enlightened observations of Jacques Boucher de Perthes and the attention these received from British visitors to his field area in the Somme, notably Hugh Falconer, Joseph Prestwich, John Evans and John Lubbock (later Lord Avebury), all of whom played important roles in promoting interest in such things to the British scientific community (e.g., Boucher de Perthes, 1847; Prestwich, 1860, 1864; Lubbock, 1862, 1865; Evans, 1863, 1872; Grayson, 1983; Bridgland, 2014). Such pioneers, whose ranks quickly swelled, discovered that an abundance of such artefacts was a characteristic shared by the rivers of north-western France and south-eastern England, perhaps because of the prolific occurrence of flint in these areas.

Early attempts to make sense of the British Palaeolithic record within its Pleistocene context (e.g. Dawkins, 1874; Warren, 1926) were hindered by a debilitating chronological framework, now realised to be greatly simplified, and a paucity of data, although the combination of rich cave, loess (colluvially reworked) and fluvial sites gave the French a definite advantage in this enterprise (cf. Lartet, 1861; de Mortillet, 1867). Of the above-mentioned pioneers, Lubbock alone was an advocate of multiple glaciations and interglacials, but he died (in 1913) before these were fully accepted in Britain and the earliest finds were interpreted within a monoglacialist paradigm, the entirety of human prehistory being squashed into a nebulous 'Post-glacial' period. During the first half of the 20th Century, as multi-glacial schemes for classification of Pleistocene time came to the fore, Palaeolithic specialists often led the research on Pleistocene gravels and, indeed, attempted to use the patterns of artefact types from these various deposits as means of classifying and even dating the gravels (Commont, 1908, 1909; Green, 1936, 1946, 1947; King and Oakley, 1936; Calkin and Green, 1949). These were added to schemes based on multiple river-terrace levels, reflecting different glaciations of the Alps (Penck and Bruckner, 1909), on distinctive palynological signals from different interglacials (West, 1956, 1957, 1968) and on differences in mammalian faunas (e.g., Zeuner, 1959). By and large the complex divisions of the Lower Palaeolithic devised in these earlier times, generally based on relative refinement of knapping techniques and linear developments in handaxe form, are discredited, in part because they have been shown to have no chronological foundation.

The most fastidious attempt to recognize patterns within the Palaeolithic record is less easily discarded, however. It was by Derek Roe, late of the Baden-Powell Quaternary Research Centre in Oxford, who made thorough and exhaustive studies of museum collections and related them to find-spots, work that was published as a gazetteer (Roe, 1968b). Roe took the best of these sites (in terms of collection history, sample size and context) as the basis of a novel morpho-metric analysis of handaxe shape, revealing three major traditions and seven groups/sub-groups

(Table 1), which he considered likely to have a cultural and/or temporal significance (Roe, 1968a). Restricted by the condensed sequence of glacials and interglacials recognized in the mid-20th Century, Roe was unable to offer a sensible correlation of his groups, or rather their sedimentary contexts, with the Pleistocene geochronological record. That record was later revolutionized following the realisation that the fluctuations in global ice volume determined from oceanic sediments, based on the oxygen isotopic signatures of foraminifera therein, provided an improved template for Pleistocene glacial–interglacial fluctuation and, therefrom, that there had been many more climatic oscillations than previously realised (e.g., Shackleton and Opdyke,1973; Bassinot *et al.*, 1994; Lisiecki and Raymo 2005). This allowed the number of river terraces in the principal valleys to be equated approximately with the number of 100 ka climatic cycles, as had always seemed likely to those who advocated a climatic mechanism for terrace generation (cf. Zeuner, 1945, 1959; Wymer, 1968). Thus the Lower Thames sequence, arguably the most important in relation to the British Lower and Middle Palaeolithic, was reinterpreted in terms of four glacial–interglacial climatic cycles (Bridgland and Harding, 1993; Bridgland, 1994, 1998, 2006; Fig. 1), instead of the two that had been recognized within the previous palynology-based paradigm (cf. Mitchell *et al.*, 1973).

Roe's (1968b) gazetteer was subsequently updated by an English Heritage-funded project: 'The English Rivers Palaeolithic Survey' (TERPS), 1994–1997. This was initiated in 1991 in response to growing awareness that the quantity of sand and gravel being extracted for road building and construction was growing considerably and was potentially destroying Palaeolithic evidence without records being made (Wymer, 1999). TERPS began life as the 'Southern Rivers Palaeolithic Project', directed by John Wymer under the auspices of Wessex Archaeology, and aimed at providing a detailed survey of the known Palaeolithic material south of the Thames. In 1994 this work was extended to cover the whole of England, which was divided into 12 regions (including those identified as part of the predecessor project; there was an additional survey for Wales, although Scotland and Ireland were excluded, as no sites are known to exist in either country). Together these projects have provided an unparalleled database of the British Palaeolithic record that has subsequently facilitated an impressive array of new research on predominantly existing materials (e.g., Ashton and Lewis, 2002; White *et al.*, 2006; Ashton *et al.*, 2011; Bridgland *et al.*, 2014a). As a result it can probably be argued that the Palaeolithic in Britain is better understood and more satisfactorily age-constrained than in any other European country. A collaborative project is now proposed that will expand this database onto the European continent (see below).

Principal divisions of the British Lower and Middle Palaeolithic

A number of separate Palaeolithic industries are well established within the British Middle Pleistocene, whereas others have been proposed but have not withstood the test of time. An important distinction exists within the oldest assemblages between those with handaxes, collectively termed 'Acheulean', and those lacking handaxes or evidence of handaxe manufacture, which have been attributed to the 'Clactonian' Industry (Breuil 1932a; Warren 1951; White 2000). These terms are essentially synonymous with more widespread categories that have been labelled Mode 2 and Mode 1, respectively, by Clarke (1969). Although not ideal if used as a proxy for past cultural connections, Clarke's scheme can nevertheless serve as useful shorthand for technological characteristics, allowing a plethora of local names to be sidestepped.

Within the British record, Clactonian (Mode 1) assemblages occur stratigraphically below Acheulean (Mode 2) assemblages in the deposits of more than one late Middle Pleistocene glacial–interglacial cycle. The Lower Thames record has been particularly informative in this respect (Fig. 1), with a Clactonian–Acheulean succession seen in both the Boyn Hill – Orsett Heath Terrace at Swanscombe (e.g. Wymer 1968, 1999; Conway *et al.*, 1996) and the Lynch Hill – Corbets Tey Terrace on the Essex side of the river, particularly at Purfleet (Schreve *et al.*, 2002; Bridgland *et al.*, 2013), although the early Clactonian-bearing deposits in this terrace are especially well developed at Little Thurrock (Wymer, 1957, 1968, 1999; Bridgland and Harding, 1993; Fig. 2). A link between this repeated succession and glacial–interglacial climatic and sea-level fluctuation, at the Marine Isotope Stage (MIS) 12–

11 and 10–9 transitions, was suggested by White (2000) and White and Schreve (2000). They envisaged two different groups of early people sequentially colonizing Britain from areas where Mode 1 and Mode 2 traditions prevailed, these being broadly to the east and to the south, respectively, as is reflected by the distribution of handaxes in pre-MIS 9 deposits on the European continent.

The proposal that the Mode 1 – Mode 2 succession had been repeated in sequential climatic cycles in Britain challenged an earlier paradigm in which the Clactonian assemblages were regarded as more primitive and invariably older than industries with handaxes. The record in the Lower Thames had been reconciled with that paradigm by invoking down-cutting to the basal Lynch Hill terrace level part-way through the period of time represented at Swanscombe, with subsequent complex erosion giving rise to the terrace morphology as now preserved (cf. King and Oakley, 1936). This paradigm, notwithstanding its requirement for geological coincidences of clear unfeasibility, was dealt a fatal blow by the association of well-made handaxes with a pre-Anglian (MIS 13) raised-beach context at Boxgrove, West Sussex (Roberts and Partfitt, 1999), in sediments that clearly pre-date both of the Lower Thames Mode 1 occurrences.

An important difference between the two Lower Thames Clactonian–Acheulean successions is that the later one is followed, within the same Lynch Hill – Corbets Tey sequence, by the appearance of Levallois (prepared-core) technology: Mode 3 in the terminology of Clarke (1969). This tripartite Mode 1–2–3 sequence is exemplified by the record from Purfleet (Palmer, 1975; Wymer, 1985; Schreve *et al*., 2002), where its veracity was upheld recently by Bridgland *et al*. (2013). Most well-dated occurrences of classic Levallois in Britain belong to the next glacial–interglacial climate cycle (MIS 8–7–6), as represented in the Thames by the Taplow–Mucking Terrace (Fig. 1), making the Purfleet occurrence potentially the oldest in Britain. The Levallois flakes and blades recovered from Upper Gravel exposed during the 2001 Essex County Council excavations at Armor Road (Bridgland *et al*., 2013) were shown to Paul Mellars (Cambridge University), who verified their Levallois credentials. The Purfleet 'proto-Levallois' would appear to be a local phenomemon. Elsewhere in Britain handaxe manufacture probably persisted into MIS 8 (e.g., at

Cuxton and Furze Platt), ultimately disappearing during the glacial maximum of that stage, when humans were extirpated from the landscape (White, 2015). When humans recolonized at the MIS 8–7 transition, handaxes had disappeared from their technological repertoire, having been replaced by a wide variety of fully-fledged Levallois techniques (Scott, 2010). Following MIS 7, there is a hiatus in the British record, with a presumed absence of humans between MIS 6 and MIS 4 (inclusive), implied by the absence of fresh artefacts from sediments representing these stages (Sutcliffe, 1995; Wymer, 1999; White and Schreve, 2000; Bridgland, 2006; Lewis *et al*., 2011). When humans again recolonized Britain in MIS 3 they re-introduced handaxes, this time small cordiforms associated with the Mousterian of Acheulean Tradition and, thereby, the Neanderthals (White and Jacobi, 2002).

Divisions within the British Acheulean

Earlier paradigms

Long before Roe (1968a) identified his handaxe groups (Table 1), classifications of such artefacts were in widespread use, using terms such as Chellean, Abbevillian and Early, Middle and Late Acheulean. The name Acheulean was introduced in the 1873 version of Gabriel de Mortillet's artefact-based framework, initially to describe the epoch in which handaxes were the only definable tool, although Evans (1897), Dawkins (1874) and others were never fully satisfied with the scheme as a whole. The Acheulean later became a transitional industry leading to the Mousterian, with a new cultural division, the Chellean, introduced at the start of the sequence (de Mortillet, 1883; de Mortillet and de Mortillet ,1900). By the early years of the 20th Century, Commont's fieldwork in the Somme valley had shown that de Mortillet's scheme failed to describe the full range of variation, and led to subdivision of the Acheulean into Acheul I, II etc., based on characteristic types, based on an argument for increasing refinement over time (Commont, 1906, 1908).The Chellean thus became associated with older and cruder handaxes. The applicability of Comment's model to Britain was demonstrated by Smith and Dewey's (1913, 1914; Dewey and Smith, 1914) work in the Thames Valley, where a similar progressive sequence was detected. Breuil's (1932a, b, 1939) scheme introduced further complexity, recognizing Chellean, Acheulean I–V, and the Micoquian (Acheulean VI–VII) and thus expanding the handaxe industries across three evolving cultural 'phyla'. By the 1960s most of these had been superseded by less-well-defined terms such as Early, Middle and Late Acheulean, although some workers, Wymer (1968) included, were beginning to doubt whether they had any chronological validity.

The important discoveries at Boxgrove (see above) did much to dispel this schema once and for all: the well-made and advanced-looking handaxes from Boxgrove are clearly amongst the oldest from Britain. This led to the demise of 'sophistication' as a means for classifying handaxes and broadly dating the Lower Palaeolithic and led to a new axiom: that typology was no indication of age and to suggest anything meaningful based upon such evidence was folly (e.g., Wymer, 1988; Ashton and McNabb, 1994; White, 1998b). This view prevailed for the final decades of the 20th Century and into the new millennium but is currently being supplanted by the renewed recognition that, at the assemblage level, the prevalence of particular handaxe forms can indeed be meaningful and groups defined on this basis can be of assistance for dating the geological context in which they occur (White, 1998a; Wenban-Smith, 2006; Pettitt and White, 2012; Bridgland and White, 2014; White, 2015): essentially a vindication of Roe (1968a), whose groups, reinterpreted in terms of age range, form the basis for the new thinking. Critically, however, this is accompanied by the realisation that patterns are neither linear nor predictable.

Cromerian Complex handaxes

Roe's (1968a) classification (Table 1) includes two groups (V and VII) that are associated with pre-Anglian contexts. Group VII is dominated by well-made 'rounded' ovate handaxes and could not have been attributed to the pre-Anglian before the Boxgrove 'revolution' (see above), notwithstanding the fact this group (to which Boxgrove can be added) includes the assemblage from Highlands Farm Pit, near Henley (Wymer, 1968), a site in the Black Park Terrace of the Middle Thames. This terrace has long been assigned to the Anglian and regarded as coeval with glacial blockage of the Thames valley in Hertfordshire (Gibbard, 1979; Bridgland, 1994; cf. Hare, 1947), so presumably its contained archaeology must be reworked from earlier (Cromerian Complex) warmer times. The unabraded suite of handaxes from Warren Hill, Mildenhall, also belongs to this group, along with the similar but less 'fresh' assemblage from nearby High Lodge, which might be reworked from the former. These last two assemblages are associated with the Bytham River, which had a course across this part of East Anglia that was obliterated by the Anglian glaciation. That attribution has been challenged in recent years by Gibbard *et al*. (2009, 2012a, b, 2013), who have advocated a late Middle Pleistocene (MIS 6) glacial origin for these deposits, in a reversion to the much earlier interpretation by Solomon (1933), based on the coarseness and high chalk content of the gravels at Warren Hill. There are, however, distinct clast-lithological differences between the Bytham River gravels (however chalk-rich) at sites like Warren Hill and true glacial outwash gravels, which occur at other locations in the region (Bridgland and Lewis, 1991; Wymer *et al*., 1991; Bridgland *et al*., 1995). The latter have not yielded archaeology, whereas artefacts invariably occur at low-level Bytham Sand and Gravel localities, Warren Hill having the distinction of being one of Britain's richest Lower Palaeolithic sites (Hardaker, 2012). On the basis of an in-depth reappraisal of the Quaternary sequence in the wider Trent catchment, Bridgland *et al*. (2014a) have recently upheld the notion of a pre-Anglian Bytham River system draining from the West Midlands and across East Anglia.

In contrast to Group VII, Roe's Group V is characterized by 'crude' handaxes, showing minimal numbers of removals, all by hard hammer. It includes assemblages that were once classified as 'Early Acheulian' (see above), such as from Fordwich, Kent (Roe 1976a, b, 1981; Ashmore, 1980; Bridgland *et al*. 1998; Fig. 3), and Farnham, Surrey (Oakley 1939; Roe 1976a, b), both from high-level terraces of south-bank Thames tributaries. These are beyond the direct influence of the Anglian glaciation and so require correlation or dating to establish their pre-Anglian credentials. The gravel at Fordwich is part of the '125 ft Terrace' of the Great Stour (Coleman, 1952), which would appear to pre-date the Boyn Hill–Orsett Heath Terrace of the Thames, although correlation is hampered by the submergence of the

Thames–Stour confluence area beneath the modern estuary of the parent river. Nonetheless, an age of MIS 13–12 for the gravel, and thus latest Cromerian Complex for the industry, have been generally agreed (cf. Bridgland *et al*., 1998; Wenban-Smith, 2006). At Farnham the Group V handaxe assemblage comes from Terrace A of the River Wey in its upper reaches (Bury, 1913, 1916, 1935; Wade and Smith, 1934; Oakley, 1939; Clarke and Dixon, 1981; Roe, 1981), this being the highest of a series of terraces preserved above the Upper Wey. When this terrace was formed, however, the drainage hereabouts represented the upper reaches of the Blackwater (Bury, 1908), the subsequent diversion being a likely case of river capture. This post-depositional rearrangement of the drainage geometry makes height above river a less reliable guide to age than usual, but the Terrace A gravels, at ~46 m above the current valley floor, certainly have sufficient altitude to suggest antiquity comparable with those at Fordwich.

Roe's Group V also includes an assemblage of abraded handaxes from Warren Hill, which share the 'primitive' characteristics of those from Fordwich and Farnham (Roe, 1968a, 1981), and another, added formally by White (2015), from cave breccia in Kent's Cavern, Torquay, Devon (cf. Roe, 1981). Recent dating of this deposit, using the ^{10}Be method, points to an age in MIS 12 (Lundberg and McFarlane 2007), implying once again that the handaxes it contains were derived from a previous warm episode, probably MIS 13.

Twisted ovate handaxes

In contrast to the types attributed above to the late Cromerian Complex, which are almost invariably straight edged, artefact assemblages from the first interglacial following the Anglian often include handaxes with 'twisted' edges. Experimentation has shown that the 'twist' has been caused by differential working of the diagonal edges during the final phase of flake removal. Specimens of this sort are generally ovate or cordate in shape, with the twist taking the form of a 'Z' in the majority of cases (White and Plunkett, 2004; Fig. 4). Discussion about whether the twisted edge was deliberate or accidental can be traced back to Evans (1897) and Layard (1904), although the identification of this type as particularly characteristic of one of Roe's (1968a) handaxe groups (Group VI) suggests that its occurrence is not random but must instead be reflective of cultural tradition. White (1998a) upheld the pattern established by Roe and concluded that British assemblages with high proportions of twisted ovates are potentially temporally distinctive, since those for which a date could be established occurred in latest Hoxnian (MIS 11) sediments or in contexts representative of the MIS 11–10 transition.

As with the establishment of a meaningful chronology for the British Lower and Middle Palaeolithic, and indeed in the identification of four post-Anglian glacial–interglacial climate cycles in Britain, evidence from the Lower Thames is of prime importance in attributing assemblages with a significant twisted-ovate component to MIS 11–10. Such assemblages occur in the uppermost sediments of the Boyn Hill–Orsett Heath terrace, notably the Swanscombe Upper Loam (cf. Wymer, 1968; Bridgland, 1994; Conway *et al.*, 1996; Wenban-Smith and Bridgland, 2001) and the Wansunt Loam at Dartford Heath (Smith and Dewey, 1913; Tester, 1951, 1976), probably a direct lateral equivalent (Wenban-Smith and Bridgland, 2001; Bridgland *et al.*, 2014b). At Swanscombe the occurrence of twisted ovates is well constrained at the principal locality: Barnfield Pit, now the Swanscombe Skull Site National Nature Reserve. Here, Smith and Dewey noted white-patinated and twisted handaxes as early as 1913. Fifty years later Roe was only able to attribute a small number (19) to this pit with certainty, but others were marked as coming from the Upper Loam at Milton Street (virtually synonymous with Barnfield) and other pits. As well as occurring in the Upper Loam they are recorded, in weathered form, from the overlying Upper Gravel, although thought in this case to have been reworked from the subjacent loam. They are also known from the upper loams at Rickson's Pit (Derek Roe, unpublished records) and Dierden's Pit (Ingress Vale), from decalcified 'stony loam' deposits, stratigraphically higher than the famous shell bed at that locality (Newton, 1901; White *et al.*, 2013). The most stringently located of these various finds point to the latter part of MIS 11, possibly from the later of two warm substages: MIS 11a (cf. White and Schreve, 2000; Pettitt and White, 2012).

Other British localities that have yielded significant numbers of twisted ovate handaxes are more difficult to constrain in terms of age, although MIS 11–10 is a perfectly feasible correlation for all of them and has been established with confidence for Elveden (Ashton *et al*., 2005), Foxhall Road, Ipswich (White and Plunkett, 2004), and Hitchin (Boreham and Gibbard, 1995). A further example is Limpsfield, Surrey, on an interfluve between the catchments of the Medway, to the south, and the Darent, to the north (Field *et al*., 1999; Bridgland, 2003). The Limpsfield outlier is at ~150 m OD and, given that it incorporates bedded fluvial gravel containing semi-durable Hastings beds clasts, has been attributed to the Darent (Gossling, 1937, 1940; Bridgland, 1999), probably representing the final floodplain of a larger version of that river that drained from the central Weald but was soon to lose its headwaters to capture by the Medway (Wooldridge & Linton, 1939, 1955; Worssam, 1973).

Perhaps the first use of the new ideas about handaxe forms as age indicators was in the application of uplift modelling as a means of obtaining an improved age model for the terraces of the erstwhile Solent River, by Westaway *et al*. (2006). They took the occurrence of twisted ovates from the Old Milton Gravel at Barton on Sea (Evans, 1897, p. 558; Roe, 1968a) as a pinning point for their modelling, which also made use, as stratigraphical markers, of the earliest appearances of artefacts and of Levallois technique, as well as the rare preservation of interglacial deposits (MIS 5e) within the sequence. Comparison with better-dated records, particularly the Thames, was used for calibrating these markers, taking the Old Milton Gravel to date from MIS 11–10. Concurrent work on the Solent by an independent group produced optically stimulated luminescence (OSL) dates (Briant *et al*., 2006) that agree well with the uplift modelling results (Westaway *et al*. 2006, note added in proof). It can be added that the Barton assemblage was reviewed by Roe (1968a) but included by him in his 'intermediate' (between pointed and ovate) Group IV, rather than Group VI, to which the Swanscombe Upper Loam and Wansunt Loam assemblages were allocated. Roe acknowledged that the Barton artefacts were somewhat problematic, many of them having been badly abraded on the modern beach before discovery (see also the concerns of Briant *et al*. (2009) about the integrity of this assemblage).

Ficrons and Cleavers

The term 'ficron' is used to describe narrow pointed handaxes with distinct concavity of their sides (Fig. 5). In Britain the term is applied to any handaxe that matches this description, many of them well made (cf. Fig. 5A). In France, where it originates, the term is reserved for quite crudely made examples with this form (or even 'lanceolate' forms), often with flat faces unworked, better-made versions being termed 'Micoquien' instead (Bordes, 1961). Whichever usage is favoured, these finely pointed handaxes could hardly be more different from cleavers, which are flat-ended handaxes that have had any point removed by 'tranchet' flake detachment (Fig. 6); this was emphasized by Wenban-Smith (2006), who noted the co-occurrence of these types in a relatively thin but highly artefact-rich gravel at Cuxton, in the Medway. White (2006) suggested that cleavers *sensu stricto* (a technologically driven form widespread in Africa, India and the Near East) do not occur in Britain, where cleavers *sensu lato* are the end-result of a widespread resharpening practice rather than a deliberate form. Wenban-Smith (2006) was loath to believe that the common occurrence at Cuxton both of extreme forms of ficron and of cleavers could be accidental. The distinctiveness of this association had already been noticed by Roe (1968a), who had placed Cuxton in his Handaxe Group I, along with Stoke Newington and sites on the Lynch Hill Terrace of the Middle Thames, notably Furze Platt, also known for the occurrence of ficrons (Wymer, 1968; cf. Harding *et al*., 1991; Fig 5B). In the Middle Thames the Lynch Hill Terrace is difficult to date but its continuation in the Lower Thames, the Corbets Tey Formation, incorporates interglacial deposits that have been attributed to MIS 9, at sites like Purfleet, Grays and, indeed, Stoke Newington (Bridgland, 1994, 2006; Schreve, 2001; Schreve *et al*. 2002; Green *et al*., 2004, 2006; see Fig. 1B).

The correlation of Cuxton has proved problematic, since identifiable fossils are lacking from what is a small erosional remnant within a narrow confined reach of the Medway through the Chalk; the scarcity of terraces in this part of the valley makes long-profile projection difficult (Bridgland, 2003). Tester (1965), who first excavated the Palaeolithic site, suggested equivalence with the Boyn Hill Terrace at

Swanscombe, on the basis of typological arguments that have been roundly rejected (cf. Wenban-Smith, 2006). Bridgland (in Cruse, 1989) regarded the Binney Gravel as the most likely correlative for the Cuxton remnant amongst the better preserved terraces of the Lower Medway, below Rochester. At that time the Binney Gravel was ascribed to the Devensian, but revision of the correlation of the lowest terraces within the Thames sequence downstream of Tilbury (Bridgland *et al*., 1993) led to its reassignment to the MIS 8–7–6 climate cycle, it being regarded as correlative with the Taplow–Mucking Terrace of the Lower Thames. Assistance with deciphering the problematic stratigraphy and downstream correlation of the Medway terraces was subsequently provided by AW Skempton (personal communication in Bridgland, 1996; cf. Skempton and Weeks, 1976), leading to the conclusion that the Cuxton deposit could represent either the Binney Gravel or the older Stoke Gravel of the Medway. Further consideration of the archaeological evidence led Bridgland (2003) to interpret the Cuxton outlier as a degraded remnant of the Stoke Gravel, which is equivalent to the Lynch Hill – Corbets Tey Terrace of the Thames, although the archaeology that swayed him was the occurrence of Levallois artefacts in the uppermost deposits at Cuxton (Tester, 1965), in close correspondence with the appearance of that industry at Purfleet in the Thames (see above). This revision was overlooked by Wenban-Smith (2006), who nonetheless tentatively advocated an age of ~MIS 8 for the Cuxton assemblage.

As noted by Bridgland and White (2014), both ficrons and cleavers occur throughout the British Lower Palaeolithic; both occur as minor components of the large (MIS 11) assemblage from Barnfield Pit, Swanscombe, for example, albeit in different divisions (Cotton, 1964; Wymer, 1968). However, they are particularly prevalent in assemblages within Roe's (1968a) Group I, which can now be associated with contexts of probable MIS 10–9–8 age and which, in the Thames, correspond with the Lynch Hill – Corbets Tey Terrace. Bridgland and White also noted that, in addition to the assemblages identified above, there have been numerous isolated finds of ficrons and cleavers from Lynch Hill outcrops, including several from Greater London, where that formation is well developed.

Middle Palaeolithic *bout coupé* handaxes

Handaxes largely disappeared with the transition to Levallois knapping techniques, but the re-occupation of Britain later in the Middle Palaeolithic, during MIS 4–3, saw handaxe making reappear, as encountered in assemblages that have been termed 'Mousterian of Acheulean tradition'. Roe (1968a) included two such assemblages within his Group VI, noting that they stood apart within that group; these were Great Pan Farm, Shide, Isle of Wight (Poole, 1925; Shackley, 1973), and Oldbury Rock Shelter, Kent (Harrison, 1933), which he separated out as the two members of 'Sub-Group D' within Group VI. These assemblages are characterized by well-made handaxes and, more importantly, contain a further distinctive typological form that has long been regarded as a temporal indicator for the early part of the last glacial: the flat-butted cordate or '*bout coupé*' (Roe, 1968a; Tyldesley, 1987; White and Jacobi, 2002; White and Pettitt, 2011; Fig. 7). To Roe's two Group VID assemblages can be added those from Little Paxton, Cambridgeshire (Tebbutt *et al.*, 1927; Paterson and Tebbutt, 1947; Fig. 7A), the cave earth at Kent's cavern (MacEnery and Vivian, 1859) and the more recently discovered material from Lynford, Norfolk (White, 2012; Fig. 7B). In addition there are numerous *bout coupé* find-spots; White and Pettitt (2011) tabulated >140, not including those mentioned above.

The occurrence of *bout coupé* handaxes in the low terraces of the Solent system was another chronological pinning point used by Westaway *et al.* (2006) in their modelling (see above), taken to indicate MIS 3. Indeed, the temporal significance of this handaxe type is acknowledged beyond Britain, it being a characteristic (if rather uncommon) form amongst the Neanderthal-associated Mousterian assemblages from the Paris Basin (Roe, 1968a; White and Pettitt, 2011; see below). This somewhat pre-empts the foregoing discussion, which will explore whether the chronological validity of the various patterns of occurrence discussed above might extend to the nearby continent.

Extending the occurrence patterns of handaxe types to the near Continent

Before attempting to explore the above ideas further, and assess the potential for similar findings on the European continent, it is important to emphasize that the chronological patterns described here have been constructed on biostratigraphical and lithstratigraphical frameworks, sometimes with reinforcement from geochronology, not from the Palaeolithic artefact assemblages. In the past, the sophistication and shapes of tools might have been allowed to influence the dating of a site, but this is no longer the case. The patterns revealed could not, in any case, be predicted on the basis of evolutionary frameworks of increased technological refinement, or on one shape being more highly developed than another. Human actions are creative and capricious and while a particular form may be common in one period it will almost certainly occur in others. For example, the elongated pointed–ovate (limande) handaxes found at Boxgrove and High Lodge dominate Group VII sites, most of which are pre-Anglian, but examples of this form can be found almost anywhere. Individual handaxe forms are notoriously untrustworthy, but if the patterns detected here endure future scrutiny they may permit assessment of the age of a site based on its total artefact profile. Furthermore, Palaeolithic archaeologists are not only interested in dates of artefact clusters but also in the insights these give into human dispersals and cultural transmission. That people who were linked in time and space shared a common tool-making repertoire is probably no great surprise, but establishing the social mechanisms for such linkages is an entirely different issue and a source of research questions for the future.

A broad agreement already exists about the age of the principal divisions within the Lower and Middle Palaeolithic across Europe, although the earliest occupation by tool-making hominins was clearly much earlier in Africa and in regions on the northward pathway along which migration therefrom would have occurred, such as the Middle east and the Caucasus, as well as southern Europe (Mgeladze *et al*., 2010; Moncel, 2010; Kahlke *et al*., 2011). The established tenet that hominin activity in northern Europe was restricted to more recent parts of the Pleistocene has been challenged since the turn of the Millennium by the discoveries on the Norfolk coast at Pakefield (Parfitt *et al*., 2005) and Happisburgh 3 (Parfitt *et al*., 2010), although the early Cromerian Complex and Early Pleistocene respective ages claimed for these assemblages have in turn been challenged by Westaway, who has attributed Pakefield to MIS 15e (Westaway, 2009a, b) and Happisburgh 3 to MIS 15c (Westaway, 2011). These sites have sparse assemblages (34 and 78 artefacts, respectively) that, such as they are, lack any indication of handaxe making. However, if the Westaway ages are correct, they may be little if any older than some of the undated British handaxe assemblages attributed to the Cromerian Complex and the small number of pieces cannot in either case be regarded as excluding handaxe making (cf. McNabb, 2007). On the European continent, strong claims for human occupation 1.6–1.0 million years ago have been made in the Mediterranean region and as far North as the Loire (Bridgland *et al*., 2006; Despriée *et al*., 2010), with the first claims for Acheulean occupation at Solana del Zamborino (~750–770 ka) and Estrecho del Quípar (–900 ka) in Spain (Scott and Gibert, 2009), although some doubt has been expressed over the provenance of these handaxes and their relation to the dated levels (Robin Dennell, pers. comm.). Claims for Acheulean occurrences >700,000 years old at La Noira, Central France (Moncel et al 2013), and Barranc de la Boella, la Canonja, Spain (Vallverdú et al 2014), may prove more robust. For NW Europe the record in the Somme points to earliest occupation in MIS 15 (Tuffreau and Antoine, 1995; Locht and Antoine, 2001; Antoine *et al*., 2003, 2014), a conclusion that applies over a wider area as far as handaxe making is concerned, based on fluvial and cave sites in France (Barsky and de Lumley, 2005; Bridgland *et al*., 2006; Voinchet *et al*., 2010; Despriée *et al*., 2011) and from Atapuerca in Spain (Raposo and Santonja, 1995; Pérez-González *et al*., 1999). The first use of Levallois technique (Mode 3) is also thought to have an essentially uniform age across wide tracts of Europe, including Britain (White and Ashton, 2003; White *et al*., 2011).

The cyclical nature of occupation and abandonment of northern Europe, with recolonization having potentially taken place from one (or more) of several southern refugia, as well as the periodic isolation of Britain from Europe, means that there are no *a priori* reasons, empirical or theoretical, for expecting the patterns detected in Britain to be repeated elsewhere. They might at best have only local significance, although even that would mean that patterns on the nearest parts of the continent, adjoining a British Peninsula for the majority of Pleistocene time (even after the Strait of Dover was first formed), might well be similar. Furthermore, contiguous areas of Europe might also show greater similarities since, if it is assumed that technology moved with people as they dispersed from glacial refugia, founder populations might well have left familiar signatures wherever they or their daughter populations settled. Despite 150 years of study these basic issues remain to be fully explored.

The most obvious starting point for comparison is therefore France, which has a Lower Palaeolithic record comparable with that found in Britain in terms of quantity and quality, arguably surpassing it in terms of internationally important sites, including those from which industries are named. However, Antoine *et al*. (2010) have expressed reservations about the veracity of primary-context Palaeolithic material from Middle Pleistocene fluvial sediments in the Somme, since no new finds of this sort have been made during the recent programme of research (15 years). Indeed, much of the archaeological record from the Somme comes from loess-derived colluvial material ('overburden') and past records are often unclear as to whether artefacts came from fluvial or slope deposits at a site. Important new work has been conducted at one of the most important sites: the type locality of the erstwhile 'Abbevillian' (see above), the Carpentier Quarry at Abbeville. This new study has used ESR dating and palaeontological analyses, as well as reassessment of artefact collections, to confirm a late Cromerian Complex age for Palaeolithic assemblages that can be matched with both Group V and Group VII of Roe (1968a); indeed, calcareous interglacial sediments within the Renancourt Formation at Abbeville have been dated to MIS 15, although the artefacts, which represent the earliest Acheulean in NW France, are attributed to MIS 14, as they have not been demonstrated to occur within the fluvial part of the sequence (Antoine *et al*., 2014).

Notwithstanding advances of this sort, France currently lacks an easily accessible national conspectus from which to draw regional comparisons, these relying therefore on harvesting information from individual sites and/or publications and rare technological syntheses that utilize a suitable methodology. One such study is that by Paul Callow, who applied a method combining elements of Roe's (1968a) and Bordes' (1961) classifications to 27 French assemblages, mostly from the north of that country (Callow, 1976, 1986). This provides a basis for comparison, but omits subtle variations such as ficrons. In an analysis of breadth/width using Euclidian distance, most of the French sites cluster together and are separate from the British assemblages. Interestingly, this index succeeded in separating Roe's Groups I, II, and V, with VI and VII tending to merge into one another.

Four French assemblages fall into a cluster containing most of Roe's Group II sites. These are Vermand, a small 'workshop' assemblage from loessic silt, possibly fluvially re-deposited, in the Omignon valley (tributary of the Somme); Mare-aux-Clercs A5, from a plateaux loess site in the lowest Seine valley near Le Havre (Ohel and Lechevallier, 1979); Le Tillet (Seine), from the 'base of older loess'; and La Micoque 6. The last will serve as an example and salutary lesson. The handaxes from Level 6 at La Micoque (Dordogne) are not in primary context and are thought to have been derived from older deposits on the plateaux above the locality. Ironically the upper levels at the site, which has been considered to be the type series for the Middle Palaeolithic Micoquian Industry, have been dated by ESR and U-series on teeth to 350–300 ka (MIS 10), probably a minimum age (Falguères *et al*., 1997). This is only slightly younger than the Roe's Group II (MIS 11), which suggests conformity with the British situation, but there is a caveat. Although these handaxes cluster with the Group II sites on the basis of breadth/width, typologically they are similar to those from Wolvercote (dated by the Upper Thames terrace stratigraphy to MIS 9: Bridgland, 1994; Bridgland and Schreve, 2009; cf. Fig. 8) and would fit more comfortably in Group III, an observation made previously (Roe 1968a, 1981). Notwithstanding that this apparent mismatch highlights the dangers of using a single metric rather than a combination of metrics and typological attributes, there remains the possibility that the French assemblage from MIS 10 is transitional (a refugium perhaps) between the two British groupings from the interglacials before and after that cold stage. Wolvercote-type handaxes were noted in a number of other assemblages: Bihorel and Mare-aux-Clercs (B9, B4 and Mathi 4), from the Argille Rouge of the Seine valley, and Daours, from the basal cailloutis of the Younger Loess in the Somme, although it is unclear whether these are of comparable age.

Happily, Callow also provided a typological assessment of the French and British sites, from which a more nuanced examination may proceed. Two sites were dominated by thick limande handaxes, the rolled series from Cagny and Montières, both situated on the 30 m terrace of the Somme, the river-gravel component of which is formed by the MIS 12 Garenne Formation. The assemblages from these sites, along with those of the 'type Abbevillian' (synonymous with early and poorly refined handaxes), are the closest approximation to Roe's Group V.

As will be apparent from the above, many of the northern French assemblages are from 'overburden' sequences rather than fluvially deposited sediments (and, as noted already, in some cases there is uncertainty about precise provenances in one or the other). Such overburden, much of it loessic (originally wind-blown), generally constitutes slope deposits that have accumulated during periglacial episodes, with stabilization and soil formation during interglacials, providing an important additional avenue for stratigraphical dating (e.g., Antoine *et al*., 2007, 2010) that is completely unknown in Britain. Artefact assemblages from such contexts need careful interpretation, with due consideration of condition and taphonomy, as well as assemblage integrity. At one extreme they might represent valley-side living and/or knapping locations, whereas at the other there is the potential for earlier material to have accumulated within a coarser 'slopewash' layer (which is the likely interpretation of many if not most 'cailloutis': pebble stringers in silty 'overburden' deposits). Indeed, Jean-Luc Locht (pers. comm.) has emphasized the difficulty in determining the ages of French assemblages from such contexts.

A valuable approach might involve concentration on the best-dated assemblages, such as those from the various sub-aerial tufa bodies in the Somme and Seine systems, all of them datable by multi-proxy means, with reference to palaeontology and geochronology (Lautridou *et al*., 1974; Lhomme *et al*., 2003, 2004; Antoine *et al*., 2006; Limondin-Lozouet *et al*., 2006, 2010, this issue; cf. Fig. 2). These assemblages are generally rather sparse, however, although there is some similarity between the range of forms recorded from the MIS 9 Soucy terrace deposits (Lhomme *et al*., 2004) and the characteristics of Roe's Group I (see above).

Looking forward: a proposed survey of the Rivers of Palaeolithic Europe

By way of a conclusion to this paper, the authors propose to follow up the findings presented here with a collaborative survey of the Palaeolithic record from fluvial contexts in Europe, building on the work presented throughout this special issue, with the aim of creating an accessible database comparable with that already existing for Britain. While this will be valuable for many different purposes, a particular aim will be the teasing out of patterns, such as those determined within the British Acheulean by Roe (1968a), and further developed here.

The survey would be based on that undertaken in Britain under the leadership of the late John Wymer (see above) but would be driven not by concern about the finite nature of the sedimentary contexts, as with TERPS, but by the conviction that fluvial sequences provide important long-timescale stratigraphical frameworks upon which comparison with wider Quaternary data can be based, making them ideal for exploring and establishing patterns of variation and evolution within the Lower and Middle Palaeolithic. The brief will not exclude the most important assemblages from other environmental contexts; these can be placed within the fluvially-based stratigraphical framework by multi-proxy means of correlation, further building up the database.

Determination of meaningful patterns of occurrence like those now recognized in Britain requires that entire assemblages are appraised and catalogued in terms of tool form, as was undertaken by Roe, as well as by Wymer (1968, 1999) and, to a lesser extent, by Callow (1976, 1986). This will require access to and painstaking assessment of existing collections, although modern technology should streamline the process.

Suggested protocols, based on those of TERPS, are as follows (modified from Wymer 1999):

- To identify, as accurately as possible, the findspots of Lower and Middle Palaeolithic artefacts and the deposits containing them, in order to demonstrate fully the distribution of known Palaeolithic occurrences. If time and resources are limited, emphasis can be given to the most important assemblages, e.g., in terms of size, integrity and age constraint.
- To confirm, where necessary, the validity of previous identifications of artefacts
- To chart the extent of relevant Quaternary deposits
- To determine and document the condition of artefacts (of potential importance in understanding taphonomy and for establishing, in the case of abraded material, that surface finds have been derived from fluvial contexts (this is additional to TERPS)
- To assess the varying relative importance of discoveries and the potential for future finds throughout the study area in order to develop predictive models.
- To assist planning authorities across Europe in making informed decisions about the potential for Palaeolithic archaeology in relation to particular localities and/or aggregate reserves.

Such a programme is needed to provide a database of European earlier Palaeolithic sites that will enable future researchers to interrogate and correlate all suitable find-spots, rather than just the best-known ‘flagship' sites. The intention would be to extend beyond artefact style and chronology, aiming towards a better understanding of the cultural geography of Lower–Middle Palaeolithic Europe.

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Tables:

Table 1 Core (most securely dated) members of Roe's (1968a) British handaxe groups, with inferred ages after White (2015). Additions by White are in parentheses.

Figures:

Figure 1 Palaeolithic of the Thames: A. Middle Thames terrace sequence; B. The Lower Thames terrace sequence. Modified from Bridgland (2006, 2010). Handaxe assemblages that can be assigned to Roe's (1968a) groups are indicated.

Fig. 2 – Location of sites from British and French fluvial sites mentioned in the paper. Tufa sites are indicated by (T).

Fig. 3 – Handaxes once interpreted as 'Early Acheulean' from Fordwich, Kent (from Ashmore, 1980); they are from the assemblage belonging to Roe's (1968a) Group V (Table 1). Scale graduated in cm.

Fig. 4 – Twisted ovate handaxes from the Upper Loam at Barnfield Pit, Swanscombe (from Waechter, 1973). Scale graduated in cm.

Fig. 5 – Examples of 'ficron' handaxes, from assemblages belonging to Roe's (1968a) Group I (Table 1). A. Cuxton, Kent (photo courtesy of Francis Wenban-Smith). B. Furze Platt (from Lacaille, 1940). Scale graduated in cm.

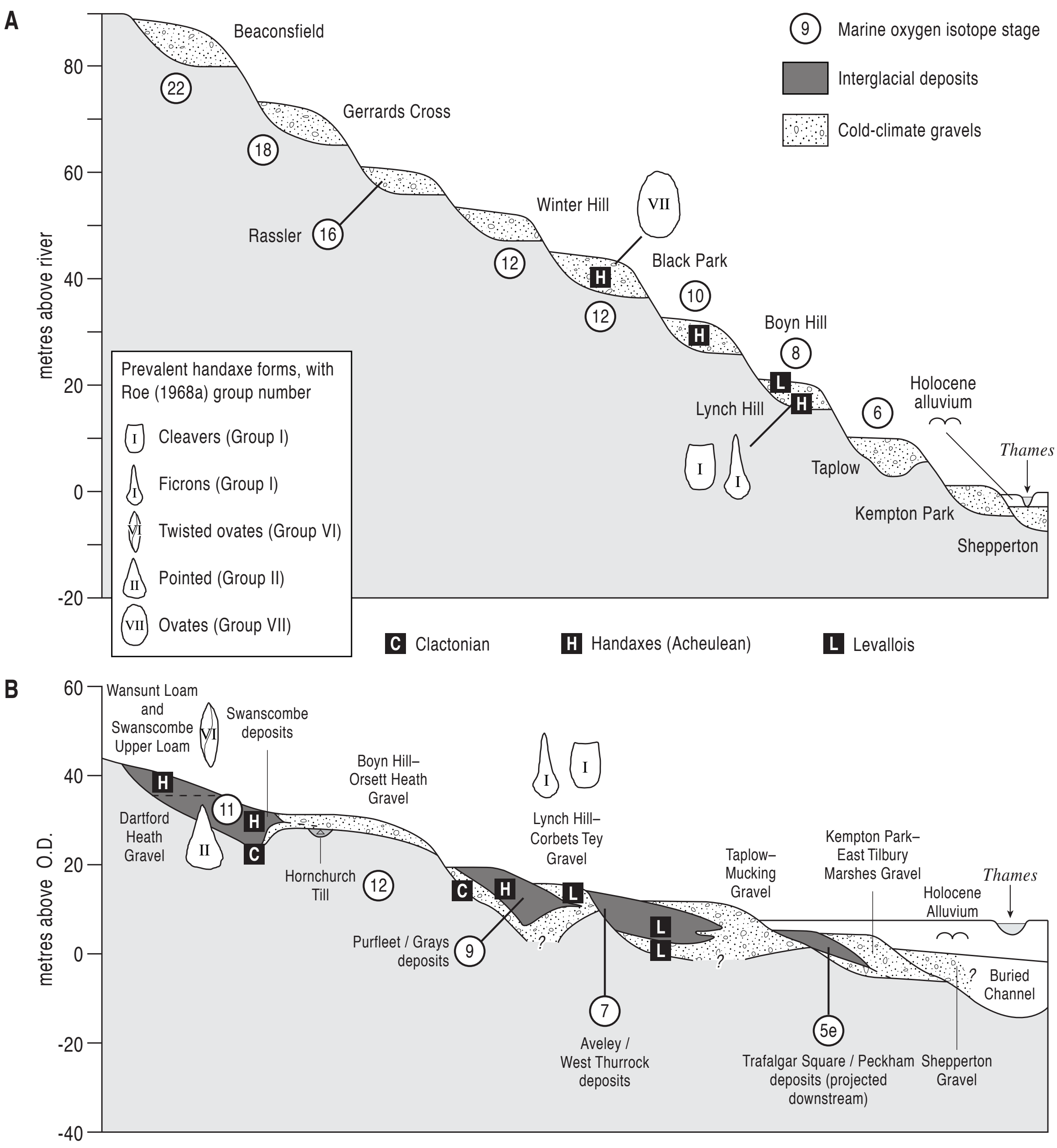
Fig. 6 – Examples of cleavers, from assemblages belonging to Roe's (1968a) Group I (Table 1). A. Furze Platt (from Lacaille, 1940). B. South Woodford, London Borough of Redbridge (from Pettitt and White, 2012). Scales graduated in cm.

Fig. 7 – Examples of *bout coupé* handaxes, considered indicative of MIS 3. A. Little Paxton, near St Neots, Cambridgeshire (from Paterson and Tebbutt, 1947). B. Lynford, Norfolk (Photo MJW). Scale graduated in cm.

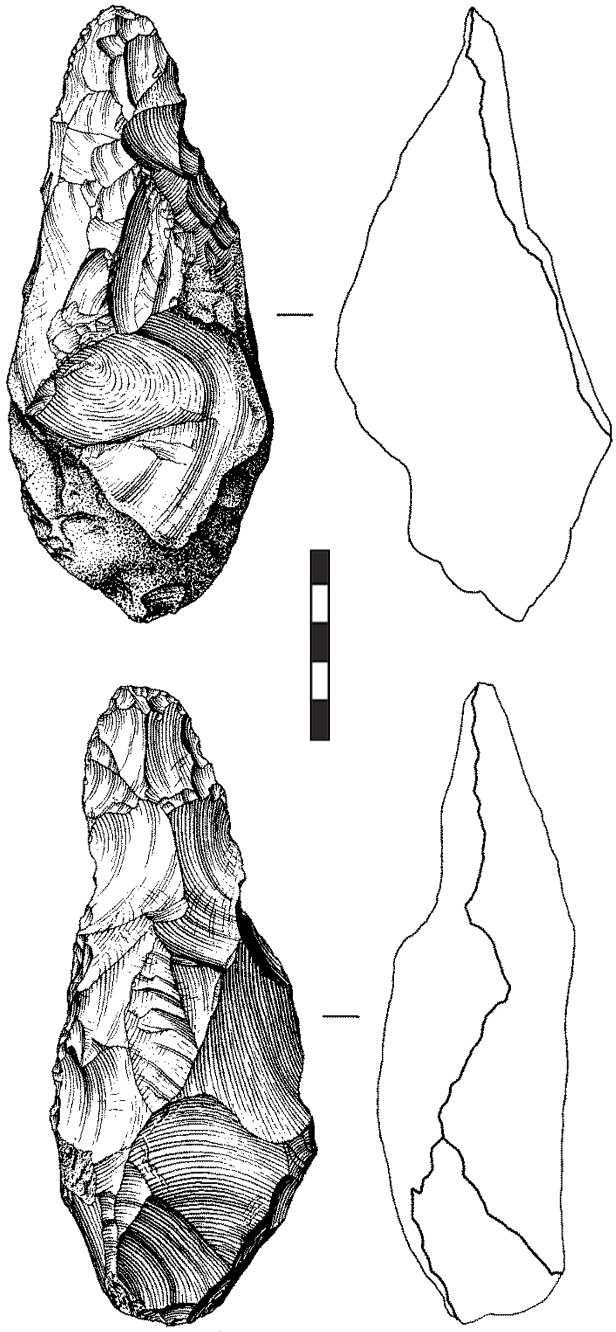
Fig. 8 – Typical plano-convex handaxe from Wolvercote. The assemblage from the Wolvercote brickpit, near Oxford (Wymer, 1968; Bridgland, 1994), is the sole member of Roe's (1968a) Group III (Table 1). Length 22 cm.

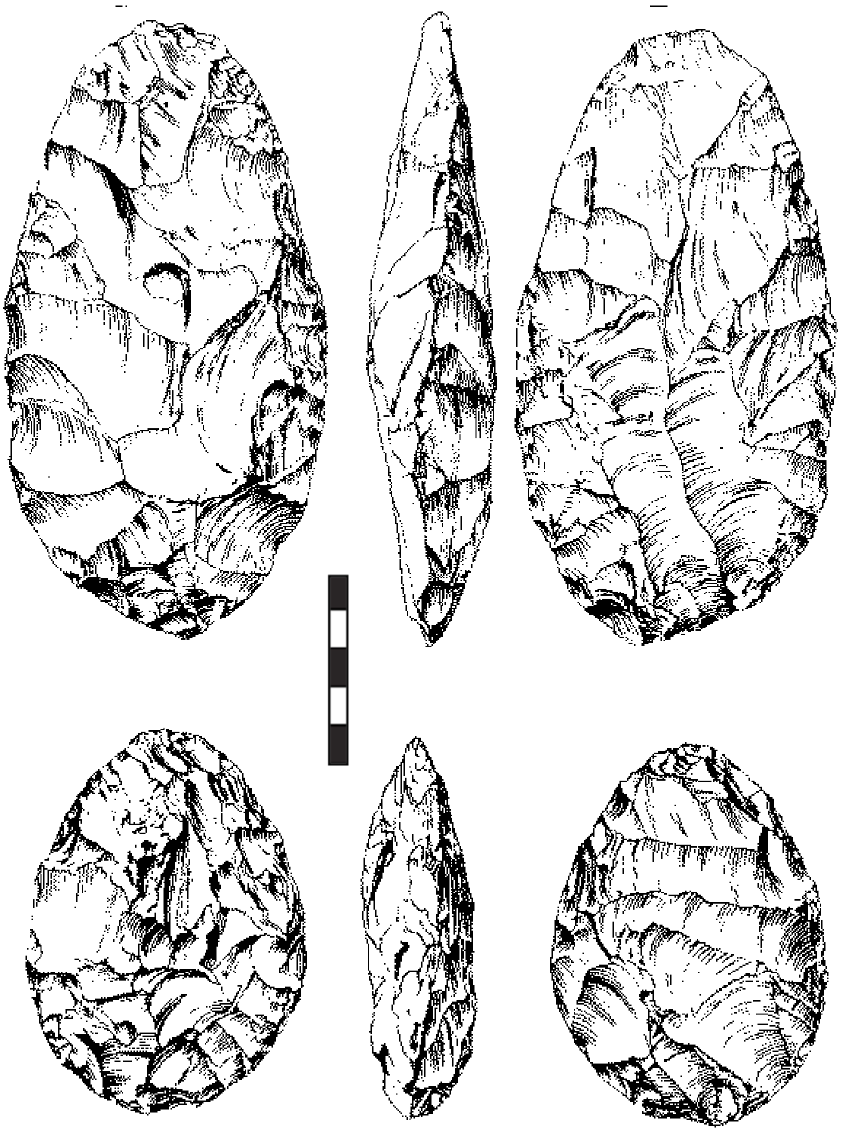
← Pointed tradition →			← Ovate tradition →		
Group I (with cleavers)	Group II (with ovates)	Group III (plano-convex)	Group V (crude, narrow)	Group VI (more pointed)	Group VII (less pointed)
<u>MIS 9–8</u>	<u>MIS 11</u>	<u>MIS 9</u>	<u>MIS 15–13</u>	<u>MIS 11</u>	<u>MIS 13</u>
Furze Platt	Swanscombe MG	Wolvercote	Fordwich	Elveden	High Lodge
Bakers Farm	Chadwell St Mary		Farnham terrace A	Bowman's Lodge	Warren Hill fresh
Cuxton	(Hoxne UI)		Warren Hill worn	Swanscombe UL	Highlands Farm
Stoke Newington	Dovercourt		(Kents Cavern Breccia)	(Wansunt)	Corfe Mullen
	Hitchin			(Foxhall Road Grey Clay)	(Boxgrove)
	(Foxhall Road Red Gravel)			(Hoxne LI)	
				<u>MIS 13–12</u>	
				Caversham	
				<u>Middle Palaeolithic</u>	
				Shide, Pan Farm	
				Oldbury	

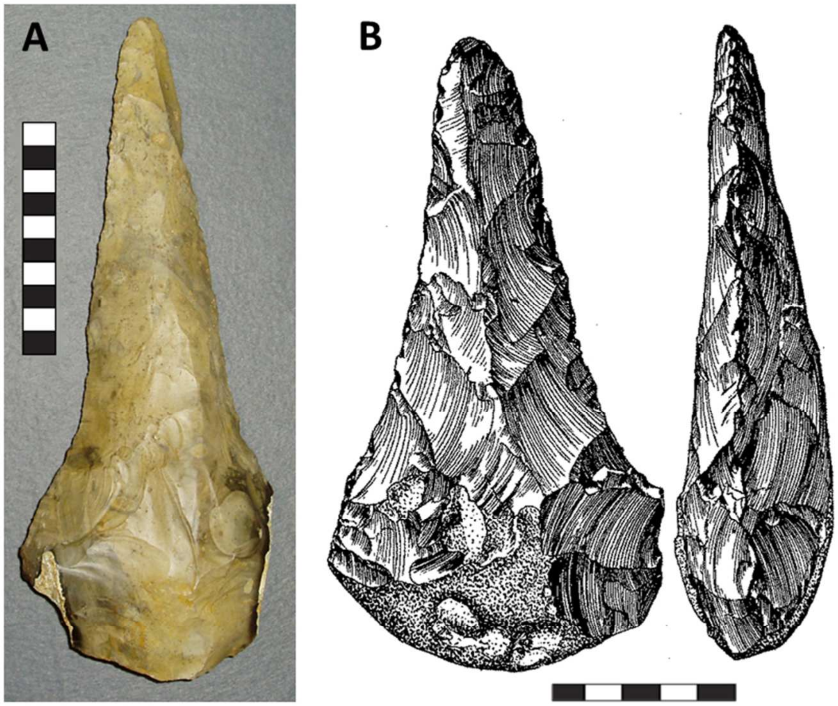
Table 1. Core (most securely dated) members of Roe's (1968a) British handaxe groups, with inferred ages after White (2015). Additions by White are in parentheses.


A
Beaconsfield
Gerrards Cross
Rassler
Winter Hill
Black Park
Boyn Hill
Lynch Hill
Taplow
Holocene alluvium
Thames
Kempton Park
Shepperton
metres above river
80
60
40
20
0
-20
22
18
16
12
12
10
8
6
VII
I
I
9
Marine oxygen isotope stage
Interglacial deposits
Cold-climate gravels
Prevalent handaxe forms, with Roe (1968a) group number
Cleavers (Group I)
Ficrons (Group I)
Twisted ovates (Group VI)
Pointed (Group II)
Ovates (Group VII)
C Clactonian
H Handaxes (Acheulean)
L Levallois
B
Wansunt Loam and Swanscombe Upper Loam
Swanscombe deposits
VI
Boyn Hill–Orsett Heath Gravel
Dartford Heath Gravel
II
11
Hornchurch Till
12
Lynch Hill–Corbets Tey Gravel
Purfleet / Grays deposits
9
Taplow–Mucking Gravel
Kempton Park–East Tilbury Marshes Gravel
Holocene Alluvium
Thames
Buried Channel
7
Aveley / West Thurrock deposits
5e
Trafalgar Square / Peckham deposits (projected downstream)
Shepperton Gravel
metres above O.D.
60
40
20
0
-20
-40

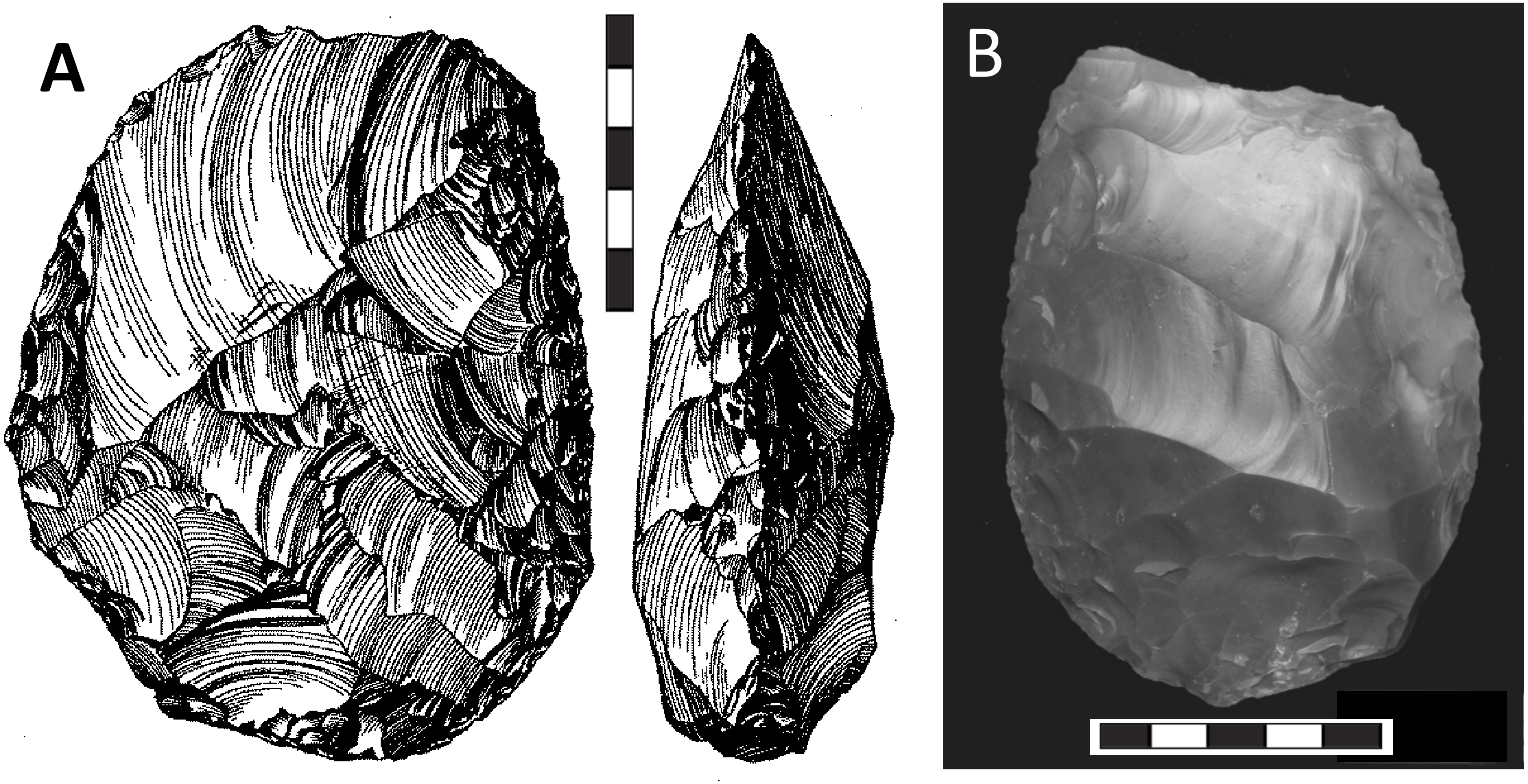

Furze Platt
Stoke Newington
South Woodford
Marylebone
Chadwell St Mary
Ealing Common
Purfleet
Grays
Dartford
Swanscombe
Creswell Crags
N
Witham
Happisburgh
Nar
Bure
Yare
Tame
Saltley
Severn
Rea
Elveden
Lynford
High Lodge
Beeches Pit (T)
Pakefield
Little Paxton
Warren Hill
Waveney
Nene
Ouse
Cam
Avon
Stour
Ipswich
GREAT BRITAIN
Ely
Evenlode
Hitchin
Clacton
Usk
Wolvercote
Thames
Highlands Farm
Avon
Blackwater
Darent
Cuxton
Kennet
Wey
Fordwich
Wookey
Test
Mole
Limpsfield
Medway
Stour
Farnham
BELGIUM
Parrett
Beedings
Exe
Avon
Otter
Axe
Corfe Mullen
Barton-on-Sea
Boxgrove
Frome
Kent's Cavern
Abbeville
Caours (T)
Mareuil
St. Acheul (T)
Vermand
Montières
Daours
Cagny
Somme
Mare-aux-Clercs
Bihorel
Oissel
Saint-Pierre-lès-Elbeuf (T)
Vernon (T)
Seine
Le Tillet
Chelles
PARIS
FRANCE
La Celle (T)
Soucy (T)
Yonne
0 kilometres 100

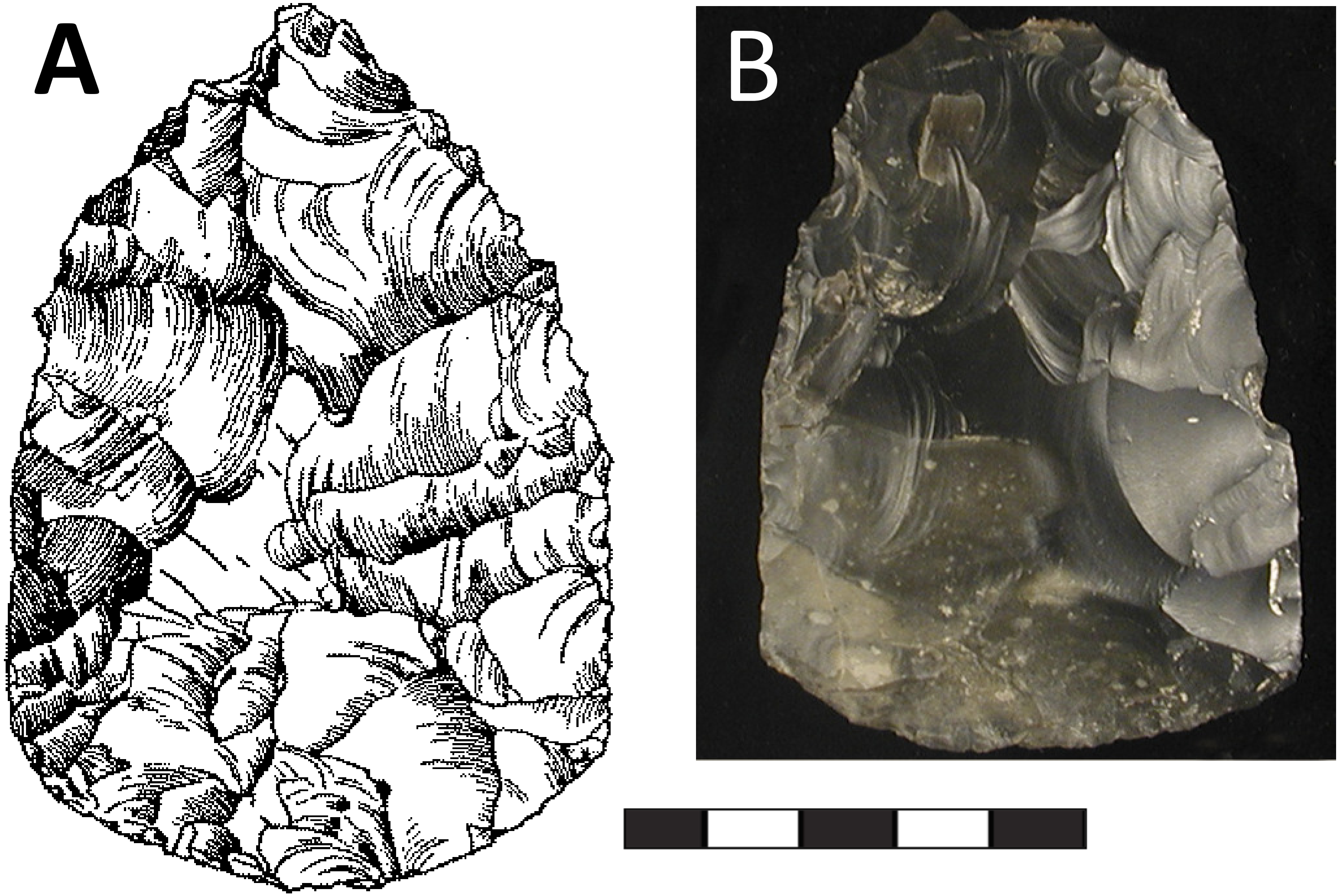


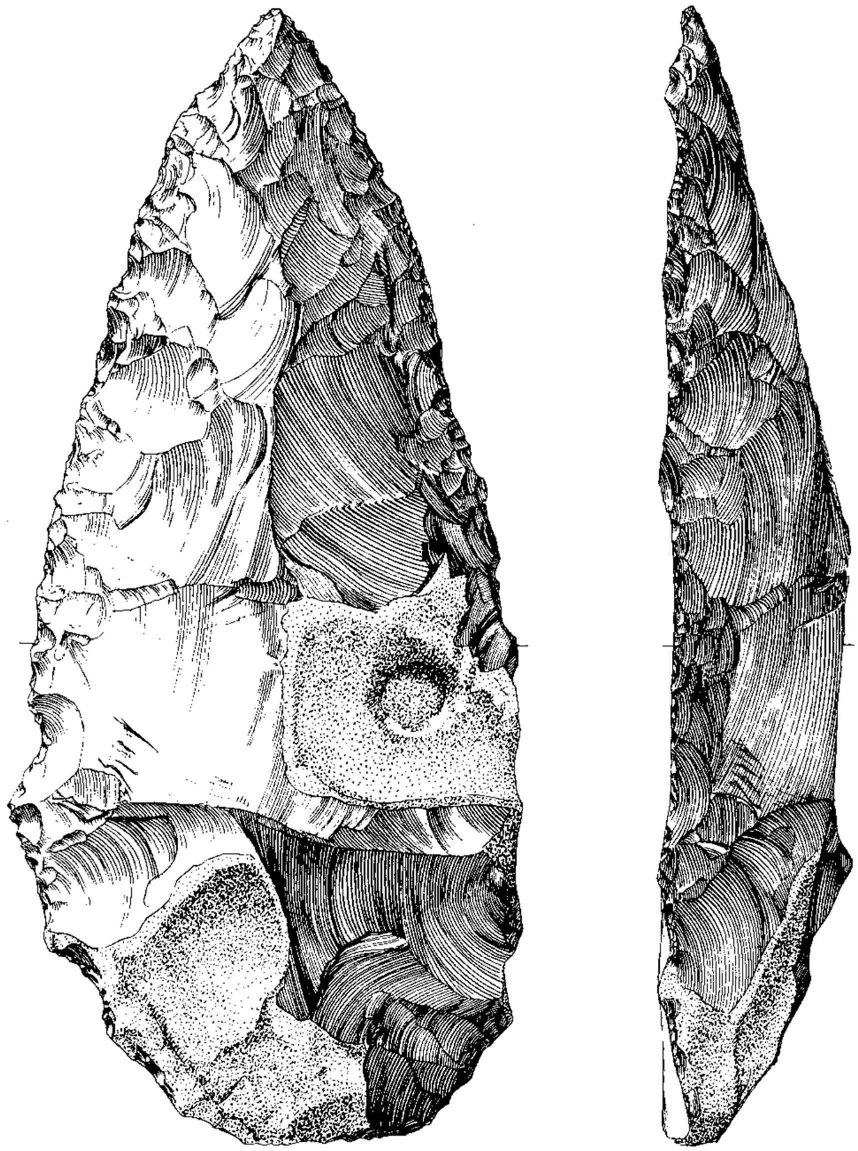




254x190mm (96 x 96 DPI)


A
B


A
B



90x115mm (299 x 299 DPI)