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**Chronology, palaeoenvironments and subsistence in the
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3 Editorial: Chronology, palaeoenvironments and subsistence in the Acheulean of
4 western Europe.

5
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7

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20 1. Introduction

21
22 The handaxe is an iconic object in European prehistory. The first discovery (a flint
23 handaxe) was in 1679 in the Grays Inn Road in central London, followed in the late
24 18th century by the pioneering work of John Frere at Hoxne (Suffolk, eastern
25 England, Fig. 1; Frere, 1800). In the next century, Jacques Boucher de Perthes
26 (1847) made important discoveries of handaxes in the gravels of the River Somme
27 around Abbeville (northern France). His work inspired a distinguished group of
28 British visitors, namely Hugh Falconer, Joseph Prestwich, John Evans and John
29 Lubbock (later Lord Avebury), whom he convinced that these artefacts were
30 manufactured by primitive humans who lived at the time when the gravels were
31 being deposited (see Bridgland and White, this issue). This established an Anglo-
32 French collaboration that continues to this day and is reflected in this Special Issue.
33 Key contributions in the 19th and 20th centuries to the study and understanding of
34 handaxes were made on both sides of the English Channel. In France, Gabriel de
35 Mortillet (1883) was the first to establish nomenclature for these characteristic
36 implements, followed by Victor Commont (1906, 1908), who established the
37 importance of St Acheul, in the Somme valley, eventually the type locality for the
38 handaxe industries. Subsequent work by François Bordes (1961) erected an
39 influential typological classification of handaxe varieties. In England (see Bridgland
40 and White, this issue), Derek Roe (1968a, 1968b) made an exhaustive study of
41 handaxe occurrences and variability, while John Wymer (1968, 1985, 1999) also
42 documented find-spots, particularly in fluvial contexts, and was responsible for his
43 own typological classification.
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47 **Figure 1 about here please**
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50 There is no doubt that handaxes remain a source of fascination for Palaeolithic
51 archaeologists and Quaternary scientists alike. They have been known by different
52 names: in France as '*limande*', '*hache*', '*coup de poing*' and '*biface*', and in England
53 as '*implement*', '*palaeolith*' (a term that must also be applied to cores and flakes) and
54 '*biface*', the last being much favoured in recent decades as a descriptive term that
55 made no reference to use and was applicable in both countries. However named,
56 they nevertheless form part of a group of tools commonly referred to as Large
57 Cutting Tools (LCTs) that are frequently (but not always) bifacially worked (Goren-
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3 Inbar and Sharon, 2006). Furthermore, handaxes can be made on a wide range of
4 raw materials, including numerous different rock types (for example, flint, quartz and
5 quartzite and volcanic products such as basalt and andesite), as well as bone. Many
6 questions remain as to the purpose of handaxes (e.g. Keeley, 1980; O'Brien, 1981),
7 the reason for their variable morphologies and possible evolution of this material
8 culture (e.g. Roe, 1968a; White, 1998; Hodgson, 2015 and references therein) and
9 the technological and cognitive capacities of their makers (Gibson and Ingold, 1993
10 and references therein; McNabb and Ashton, 1995). The long-standing and
11 generally accepted view, and one widely supported by modern experimental
12 evidence, is that handaxes were general-purpose implements for skinning and
13 butchering animal remains, as well as for cutting and shaping wood (Bordaz, 1970;
14 Oakley, 1961; Ohel, 1987).
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18 The collection of papers presented here stems from a conference organised in Paris
19 (19–21 November 2014) on “*European Acheuleans. Northern v. Southern Europe:
20 Hominins, technical behaviour, chronological and environmental contexts*”, which
21 aimed to address the key issues outlined in the title of the meeting. However, the
22 purpose of the papers in this Special Issue is not to explore the handaxe from a
23 techno-typological viewpoint (a topic to be explored in a forthcoming sister Special
24 Issue in *Quaternary International*, presenting additional papers from the conference)
25 but rather to provide a state-of-the-art view on the chronology and
26 palaeoenvironments of the earliest handaxe makers in Europe, with a view to
27 understanding key evolutionary trends in the hominin lineage, patterns of occupation
28 and aspects of behaviour. Here, by way of an introduction, we summarise the origin
29 and dispersal of the Acheulean, from its beginnings in Africa through its initial spread
30 in India and western Asia, to its eventual arrival in Europe. The ‘Movius Line’
31 dichotomy between western and eastern Europe (the former with handaxes and the
32 latter without) is still current but much debate and controversy surrounds the timing
33 of the first appearance of handaxes in the west. The current chronological
34 framework for the earliest Acheulean is then reviewed for western Europe, drawing
35 largely on multiproxy evidence from long fluvial sequences. Finally, individual
36 papers in the Special Issue are summarised with respect to the new contributions
37 that they make to our understanding of Acheulean occupation, palaeoenvironments
38 and behaviour.
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42 **2. The origin and dispersal of Acheulean industries**

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44 Handaxes appeared during the Early Pleistocene in Africa as early as ~1.75–2 Ma
45 (Semaw *et al.*, 2009; Beyene *et al.*, 2013). This is a topic that is beyond the brief of
46 both the conference in Paris and this Special Issue, although of course it remains
47 one of enormous interest and is the subject of continued intense research.
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49
50 There are also records of ‘Early Acheulean’ artefacts from Peninsular India,
51 contrasting with later handaxe industries that are associated with low-level fluvial
52 deposits and had long been regarded as of late Quaternary age (Mishra *et al.*, 2007).
53 The recent recognition that areas of cratonic crust such as the Indian subcontinent
54 have not experienced the progressive uplift experienced by younger continental crust
55 elsewhere (cf. Westaway *et al.*, 2003; Bridgland and Westaway, 2014), means that
56 fluvial incision has been minimal and low-level deposits can date back to the Middle
57 or Early Pleistocene. There have been few opportunities to bring geochronological
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3 techniques to bear on the Indian record, but application of Th/U dating of a number
4 of 'Early Acheulean' localities in India showed that all were beyond the range of the
5 technique (>400 ka) (Mishra, 1992; Mishra *et al.*, 2007). Paddaya *et al.* (2002) dated
6 bones associated with Early Acheulean artefacts at Isampur, Karnataka, and
7 obtained Electron Spin Resonance (ESR) ages >1.2 Ma. The same technique was
8 used to obtain a date of > 800 ka for calcretes in the Thar Desert of Rajasthan
9 (Kailath *et al.*, 2001), from which 'Late Acheulean' artefacts have been obtained.
10 Palaeomagnetic studies have suggested that the Acheulean contexts at Bori,
11 Morgaon and Nevasa are of Matuyama age (Sangode *et al.*, 2007). Such data led
12 Mishra *et al.* (2007) to conclude that the Indian 'Early Acheulean' probably dates from
13 the Early Pleistocene. However, this remains a topic of debate, as indeed does the
14 veracity of pre-Middle Pleistocene hominin occupation of the Indian subcontinent (cf.
15 Dennell, 2007; Chauhan, 2009, 2010; Patnaik *et al.*, 2009; Dennell *et al.*, 2010;
16 Gaillard *et al.*, 2010; Mishra *et al.*, 2010; Chauhan and Patnaik, 2012).
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20 Handaxes appear at the gates of Europe, in the Levant and southern Turkey, in
21 Early Pleistocene contexts at Ubeidiya in the Jordan valley in Israel (e.g., Bar-Yosef
22 and Goren-Inbar, 1993; Belmaker *et al.*, 2002), at Latamneh in the valley of the
23 Orontes in Syria (Bar-Yosef and Belmaker, 2010; Bridgland *et al.*, 2012) and from
24 Euphrates gravels both north and south of the border between Syria and Turkey
25 (Demir *et al.*, 2007, 2008). Although these occurrences might be imagined to mark
26 the spread of handaxe makers from Africa, this technology was apparently not
27 shared by the earliest inhabitants of Europe, for example at the site of Dmanisi in the
28 Lesser Caucasus Mountains of Georgia (Gabunia and Vekua, 1995; Gabunia *et al.*,
29 2000; de Lumley *et al.*, 2002). Hominin remains in fluvial and volcanogenic deposits
30 at Dmanisi have been dated to 1.8 Ma by Argon-Argon, applied to underlying and
31 overlying basalt flows. This date, which is supported by the normal polarity of the
32 deposits, indicative of the Olduvai subchron, is apparently older than the spread of
33 handaxe industries through the Levant and pre-dates the supposed ages of the
34 Acheulean industries at Ubeidiya (~1.4 Ma: Tchernov, 1987, 1999) and Latamneh
35 (1.2–1.0 Ma: Bar-Yosef and Belmaker, 2010). The Levantine corridor is therefore of
36 great potential significance as the pathway for hominin migration and population
37 exchange between SW Asia and Europe, as well as from Africa (cf. Dennell *et al.*,
38 2010).
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42 Twenty years ago, the appearance of handaxes on the European continent was
43 widely viewed as delayed until the Middle Pleistocene (the "short chronology" of
44 Roebroeks and van Kolfschoten, 1994), with a series of stringent criteria to be met
45 by sites put forward for early occupation; even then, the Acheulean was widely
46 thought to be restricted to western and southern Europe. Many sites "failed" these
47 criteria on various grounds but in recent years, there has been a resurgence in
48 claims for pre-Middle Pleistocene Acheulean occupation at Solana del Zamborino
49 and at Estrecho del Quípar, in Spain, at ~900 ka (Scott and Gibert, 2009; see,
50 however, Jiménez-Arenas *et al.*, 2011, and Bridgland and White, this volume), at
51 Barranc de la Boella, also in Spain, around 1 Ma (Vallverdú *et al.*, 2014; Mosquera *et al.*,
52 this volume) and >700ka at La Noira, central France (Despriée *et al.*, 2010, 2011;
53 Moncel *et al.*, 2013). Although controversial in some cases, if the dates of these
54 oldest sites can be verified, then handaxe making in southern Europe might not be
55 so very much later than in areas further to the south.
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3 The question remains as to how the Acheulean dispersed. Several scenarios may
4 be envisaged, for example either (1) rapid and ancient dispersal throughout Western
5 Europe of one (or several) new hominins, (2) separate dispersals of new technical
6 habits through a Levantine corridor or across the Gibraltar Strait from Morocco (cf.
7 Bridgland *et al.*, 2006), where the earliest Acheulean assemblages around
8 Casablanca have been dated by magnetostratigraphy to the latest part of the
9 Matuyama chron (~850 ka, or MIS 21: Raynal and Texier, 1989; Raynal *et al.*, 1995,
10 2002), or (3) a local origination in some areas due to an increase in skills of
11 established populations.
12

14 **3. The current chronological framework for Acheulean occupation in western** 15 **Europe**

17 In western Europe (as indeed in other regions), the record from river terrace
18 'staircases' has provided some of the best-preserved evidence for understanding the
19 timing of the appearance of the Acheulean (Bridgland, 1994; Bridgland *et al.*, 2006;
20 Westaway *et al.*, 2006; Mishra *et al.*, 2007). Within a number of long fluvial
21 sequences, the earliest occurrence of the Acheulean has been consistently
22 estimated at around 500 ka, within the latter part of the early Middle Pleistocene.
23 This is equally the case between Britain and northern France, although given the
24 peninsular status of Britain in the early Middle Pleistocene, this is to be expected.
25 Nevertheless, absolute age estimates for this period have been few from fluvial
26 sequences (e.g. Voinchet *et al.*, 2010; Hérisson *et al.*, 2012; Antoine *et al.*, 2015)
27 and the preponderance of dating information comes from other techniques, such as
28 the relative position of the deposits within the river terrace succession (e.g. Bridgland
29 1994; Antoine, 1994; Antoine *et al.*, 2007, 2010, 2015), from mammalian and
30 molluscan biostratigraphy (Keen, 1990, 2001; Preece, 1995, 2001; Schreve, 2001;
31 Bridgland and Schreve, 2004; Schreve *et al.*, 2007) and from aminostratigraphy
32 (Penkman *et al.*, 2013).
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36 The majority of Acheulean sites from northern France have been recovered from the
37 terraces of the Somme (Antoine, 1994; Antoine *et al.*, 2000), with the oldest known
38 from the vicinity of Abbeville, from the quarries of Carpentier and Champ de Mars
39 (Tuffreau *et al.*, 2008), and from the Rue du Manège site at Amiens. Although the
40 Champ de Mars site is no longer available for reinvestigation, recent re-dating of the
41 Carpentier site using a combination of terrace stratigraphy, biostratigraphy and ESR
42 suggests an age for the handaxe assemblage within MIS 14 (Voinchet *et al.*, this
43 volume). The same ESR technique at the Rue du Manège site has yielded an age of
44 around 550 ka for the handaxe assemblage, although the artefacts are not in primary
45 context. An age within MIS 15 or MIS 14 is therefore indicated (Antoine *et al.*, 2015).
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48 The Thames terrace sequence dates back to the Early Pleistocene (c. 1.9 Ma) (e.g.,
49 Gibbard, 1988; Whiteman and Rose, 1992; Bridgland, 1994; Westaway *et al.*, 2002).
50 However, despite the substantial number of Cromerian Complex sites in Britain, not
51 a single primary context archaeological site of definitive pre-MIS 12 age has been
52 identified in the Thames Valley (Wymer, 1999). Further information comes from the
53 terrace staircases of the Solent River and its tributaries in southern England and
54 interdigitating raised beach sequence, best expressed at the site of Boxgrove (West
55 Sussex). There, an abundance of handaxes (and hominin remains) has been found
56 in association with lagoonal silts and freshwater spring deposits and a late early
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3 Middle Pleistocene mammalian faunal assemblage (Roberts and Parfitt, 1999).
4 Again, although absolute dates are limited, the available evidence tentatively
5 highlights the appearance of the Acheulean prior to MIS 12 in southern England
6 (Ashton and Hosfield, 2010).
7

8
9 In Iberia, the fluvial record also provides a potential dating framework for the Lower
10 Palaeolithic record, although better dating control of the Spanish and Portuguese
11 river-terrace sequences is required (cf. Raposo and Santonja, 1995; Bridgland *et al.*,
12 2006; Santisteban and Schulte, 2007). Palaeomagnetic criteria have allowed the
13 Matuyama–Brunhes boundary to be defined in several Iberian systems, including the
14 Ebro, Tagus and Guadalquivir, as reviewed by Santisteban and Schulte (2007); they
15 noted, however, that the archaeological record was being used as an indication of
16 the Middle Pleistocene in some systems, based on the occurrence of Acheulean
17 material at particular stratigraphical levels, such as in Terrace 7 in the Gadiana
18 basin. Similarly, non-handaxe (Mode 1 flake and core) archaeology was taken as
19 evidence for a Jaramillo age for high-level Tagus terrace deposits with normal
20 magnetic polarity (Santonja and Pérez-González, 2000–2001; Santisteban and
21 Schulte, 2007), although given the younger occurrence of Mode 1 assemblages in
22 other parts of Europe (e.g. at Pakefield, UK, in the early Middle Pleistocene; Parfitt *et*
23 *al.*, 2006), this cannot be taken as a reliable indicator of age. Clearly an independent
24 dating system is desirable if the transition into the Acheulean is to be charted in this
25 important region, given that immigration from Africa may have occurred across the
26 Gibraltar Strait. Although a proliferation of open air sites in Italy have been put
27 forward as documenting hominin occupation in the Early Pleistocene and first half of
28 the early Middle Pleistocene (Mussi, 1995; Arzarello *et al.*, 2007), the best evidence
29 for pinpointing the appearance of the Acheulean within a fluvial sequence comes
30 from Notarchirico (see Pereira *et al.*, this volume).
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34 In the cases of the Lower Thames in south-east England and the Somme in northern
35 France, both river systems are apparently responding on a 100 ka climate cycle, for
36 the last 450 ka in the case of the former (Bridgland, 1994, 2006), and for over 1 Ma
37 for the latter (Antoine *et al.*, 2015). It is not yet unequivocally established whether
38 terrace formation in the Bytham River of the English Midlands, which was obliterated
39 by the MIS 12 glaciation (Rose, 1994), is responding on the same timescale,
40 although a similar MIS 13 age is inferred for the appearance of the Acheulean at
41 sites such as Waverley Wood in Warwickshire (Shotton *et al.*, 1993), Brooksby
42 (Stephens *et al.*, 2008) and Warren Hill in Norfolk (Wymer *et al.*, 1991; see Bridgland
43 and White, this issue) on the basis of their altitudinal position (Westaway 2009a,
44 2009b, but see Lee *et al.*, 2004 for a contrasting age model).
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47 The combination of biostratigraphy and aminostratigraphy also allows for correlations
48 to be made with other Acheulean sites that occur outside the main fluvial sequences,
49 for example those within the Cromer Forest-bed Formation of eastern England, such
50 as Happisburgh I in Norfolk (Ashton *et al.*, 2008), where deposits of multiple ages
51 within the early Middle Pleistocene Cromerian Complex crop out at sea level and
52 individual finds of handaxes are often made. A small number of cave sequences
53 have yielded Acheulean assemblages, dated through a combination of mammalian
54 biostratigraphy and absolute methods (notably Uranium-series dating), including
55 Kents Cavern (south-west England; Campbell and Sampson, 1971), the basal levels
56 of Aragón and Montmaurin in southern France (Falguères *et al.*, 2004; Lumley and
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3 Barsky, 2004), the Gruta de Aroeira in central Portugal (Hoffman *et al.*, 2010) and
4 Galería at Atapuerca (northern Spain; Berger *et al.*, 2008; García-Medrano *et al.*,
5 2014).
6

7 8 **4. Contributions within the special issue**

9
10 As highlighted in McNabb and Cole's (2015) recent evaluation of handaxe symmetry
11 and refinement, there is an urgent need for a robust chronological underpinning, if
12 any evolution of material culture is to be genuinely identified. Without better dating,
13 the recognition of such patterns and any linkage to biological or behavioural change
14 will be forever obscured (*contra* Hodgson, 2015).
15

16 Two papers in the Special Issue tackle the problems of chronology. **Voinchet *et al.***
17 document the recent application of geochronological techniques to date the earliest
18 Acheulean sites of northwestern Europe. These authors have applied ESR dating of
19 sedimentary quartz and ESR/U-series dating of fossil tooth enamel to obtain new
20 age estimates from a range of key sites age, albeit with large associated
21 uncertainties in many cases. By and large the resultant data fit well with previous
22 evidence, largely based on biostratigraphy and the framework control of river-terrace
23 sequences. For Britain, the arrival of Acheulean technologies in late MIS 15 through
24 to MIS 9 is reinforced, with a similar pattern in northern France. Although there is
25 evidence from La Noira in the Cher valley to suggest that the Acheulean was present
26 in central France as early as MIS 17, it remains clear that handaxe-making first
27 appeared in NW Europe significantly later than in the southern parts of the continent.
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31 The second paper on chronology, by **Pereira *et al.***, concerns the dating of
32 Notarchirico, the oldest hominin fossil site in Italy. The site preserves a series of
33 fluvial deposits interbedded with volcanoclastic materials, which have yielded a series
34 of handaxes and a femur of *Homo heidelbergensis*. The authors present new
35 combined Argon-Argon and ESR dates that place both the archaeological
36 assemblage and the hominin specimen within MIS 16. Not only does the new
37 chronological attribution affirm the *H. heidelbergensis* femur as the oldest Middle
38 Pleistocene hominin fossil known from Italy, but the study demonstrates the
39 importance of the Italian peninsula for hominin populations during this stage. Despite
40 the aforementioned MIS 17 ages from La Noira (Voinchet *et al.*, 2010 and this
41 volume), there is no evidence from either this site or any further north that hominins
42 withstood the subsequent severe cold-climates of MIS 16 *in situ*. The Italian
43 peninsula may therefore have acted as a refugium for hominin populations and as a
44 source for subsequent re-colonisation during interglacials or interstadials.
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48 With a robust chronological framework in place, even a relative one, the possibility to
49 investigate patterns within the archaeological data then becomes realistic. The paper
50 by **Bridgland and White** explores the extent to which differing handaxe forms can
51 have chronological relevance, using river terrace sequences in Britain as a chrono-
52 stratigraphical template. This builds on work done many years ago by Derek Roe
53 (1968a), who recognized statistically meaningful handaxe groups in Britain, with
54 differences in form; however, given the inadequate Quaternary chronostratigraphy of
55 the time, he could make little sense of their distribution. There are now clear
56 indications of patterns, with two of Roe's groups characterizing early Middle
57 Pleistocene assemblages, another, with high incidence of twisted handaxes,
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3 representing MIS 11–10 and a group in which cleavers and ficrons are common
4 seeming to be associated with MIS 9 contexts. The extent to which these patterns
5 can be extended into France is touched upon, although the emphasis is on a
6 requirement for future research aimed in this direction. Similarly, the available
7 chronological frameworks also set the scene for exploring differences in the
8 archaeological repertoires of northern and southern Europe, for example, the use or
9 otherwise of large flakes for bifacial manufacture, or the presence or otherwise of
10 cleavers made on flakes. This diversity continues through time, even if assemblages
11 dated to 500–350 ka are sometimes considered to be more standardized in terms of
12 their bifacial tools.
13

14
15 Of equal importance is the role of climate, environment and biogeography in the
16 spread of the Acheulean, in particular the occurrence of periods of favourable
17 climatic conditions, biogeographical barriers, competition from large carnivores and
18 changing availability of prey. The youngest interglacial in the early Middle
19 Pleistocene, MIS 13, has been highlighted above as a significant period for hominin
20 occupation in northern Europe. The paper by **Candy *et al.*** accordingly explores the
21 palaeoclimatic and palaeoenvironmental context of the earliest Acheulean in Britain
22 during this interglacial. The palaeoclimatic record from Britain and the north Atlantic
23 for MIS 13 indicates enhanced warmth, contrasting markedly with evidence for
24 cooler conditions at this time in the Iberian peninsula and in both ice and marine core
25 records (e.g. Lang and Wolff, 2011). However, the authors conclude that, although
26 there is evidence for occupation under temperate climate conditions in MIS 13, the
27 wealth of multiproxy palaeoenvironmental data from the majority of handaxe sites
28 point to cool to “post-temperate” climates, with winter temperatures at or below
29 freezing, and boreal landscapes. These findings have significant implications for
30 early hominin behavioural adaptations and coping strategies in sub-optimal
31 environmental conditions, such as subsistence practices, use of fire or clothing (see
32 also Leroy *et al.*, 2011). In this respect, the extinction of a number of large
33 carnivores during MIS 12 (Turner, 1992) may have enhanced resource availability for
34 later hominin populations, as well as reducing competition for shelter in caves.
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39 The need for quantifiable palaeotemperature and palaeoprecipitation estimates in
40 order to appreciate fully the hominin environment is highlighted by the paper by
41 **Blain *et al.*** These authors apply Mutual Climatic Range and habitat weighting
42 methods to herpetofaunal (amphibian and reptile) assemblages from key MIS 11
43 archaeological deposits in northern and central Spain, including level TD10 at Gran
44 Dolina (Atapuerca), Áridos-1 (Madrid) and Ambrona (Soria) in order to establish past
45 climatic and environmental parameters at these sites. The results not only allow the
46 observation of climatic evolution through the MIS 11 interglacial, with a decline in
47 temperatures and precipitation, combined with a decrease in woodland cover
48 through time, but also emphasise the importance of such records for depositional
49 environments where other climatically-sensitive proxies such as pollen or beetles
50 may not be preserved.
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54 The contribution to the Special Issue by **Limondin-Lozouet *et al.*** underlines the
55 value of molluscan faunas in determining the palaeo-environmental conditions during
56 the MIS 11 (Holsteinian/Hoxnian) interglacial in NW Europe, where this is recognized
57 as an usually long interglacial, important as a period during which hominin
58 populations exploited the varying landscapes, with evidence that they pursued
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3 different tool-making strategies, with both handaxe and non-handaxe traditions
4 represented (cf. White, 2000; White and Schreve, 2000; Bridgland, 2006). Once
5 again there is emphasis on fluvial contexts, with tufa deposits proving especially
6 significant; in France, these authors report on six MIS 11 tufa sites, five with
7 Acheulean assemblages (from north to south, Rue Boileau, St Acheul, St Pierre-les-
8 Elbeuf, Vernon and La Celle), whereas Britain has just two tufa sites dating from this
9 interglacial, at Hitchin and Beeches Pit, West Stow, with only the latter yielding
10 archaeology (Gowlett *et al.*, 2005; Preece *et al.*, 2007). The authors pay particular
11 attention to the unusually long malacological record obtained from the tufa at La
12 Celle, in the Seine system, which provides a precise environmental and
13 chronological framework for Acheulean occupation. Importantly, they are able to
14 demonstrate continued occupation by Palaeolithic populations during the entire
15 optimum phase of the interglacial, showing adaptation by these hominin groups both
16 to fully temperate conditions and to closed forest environments.
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20 Having established a testable chronological framework and elaborated key elements
21 of the palaeoenvironmental context of the earliest Acheuleans in western Europe, it
22 is equally timely to explore in more depth aspects of behaviour such as subsistence
23 practices. The evidence from the flagship site of Boxgrove in southern England has
24 previously demonstrated beyond reasonable doubt that by at least MIS 13, hominins
25 were hunting megafauna such as rhinoceroses, deer and horses, likely using the
26 topography of the landscape to their advantage in terms of trapping and dispatching
27 the animals (Roberts, 1996; Roberts and Parfitt, 1999). The paper of **Mosquera *et***
28 ***al.***, however, presents evidence for the oldest elephant butchery site in Europe, from
29 Barranc de la Boella in north-east Spain. Here, a lithic assemblage including several
30 hammerstones, multiple flakes (some refitting) and cores and a large cutting tool (a
31 pick) has been recovered from a palaeo-landsurface, around the disarticulated
32 carcass of a sub-adult mammoth, *Mammuthus meridionalis*. The appearance of
33 large cutting tools in the archaeological record marks the onset of the Acheulean and
34 Barranc de la Boella therefore witnesses the apparent first occurrence of this
35 industry in Europe. Although the cause of death of the animal is unknown, the
36 presence of cutmarks on the mammoth ribs points to exploitation of the carcass
37 shortly after the death of the animal, thereby providing a more complete picture of
38 Early Pleistocene hominin foraging opportunities at a time when megafaunal
39 exploitation is rare but nevertheless present in both Europe and Africa.
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43 The paper by **Rodríguez-Hidalgo *et al.*** continues the theme of analysing
44 subsistence behaviour by reviewing the origins of the prime-age ungulate hunting
45 niche that comes to the fore in the Middle Palaeolithic (Stiner, 2013). Drawing on the
46 evidence from the celebrated TD10.1 bone bed at Gran Dolina (Atapuerca, Spain),
47 dated to around 300 ka, these authors reveal that the site was used extensively by
48 hominins as a long-term residential base camp, where a diversity of domestic
49 activities were undertaken. In particular, the characteristics of the animal bone
50 assemblage indicate a predominance of prime-age ungulate carcasses (mostly of
51 red and fallow deer, with smaller numbers of bison, equids and rhinoceros). These
52 have been systematically butchered, showing signs of skinning, removal of the guts,
53 disarticulation and defleshing, human tooth marks from chewing, and frequent
54 cracking of long bones and mandibles for marrow access. Together, these lines of
55 evidence present an important overview of subsistence behaviour during the Lower
56 Paleolithic at this key site for the European Middle Pleistocene and lays the
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3 foundation for our understanding of selective prey exploitation by hominins in the
4 subsequent Middle Palaeolithic.

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6 The identity of the handaxe makers must also be discussed, with *Homo ergaster* or
7 *erectus* (e.g. Rightmire *et al.*, 2006), or *H. antecessor* (e.g. Bermúdez de Castro *et*
8 *al.*, 1997) inferred for any Early Pleistocene Acheulean localities and *Homo*
9 *heidelbergensis* for the Middle Pleistocene (e.g. Roberts *et al.*, 1994; Pérez *et al.*,
10 1999). However, handaxe manufacture (and therefore the Acheulean) persists into
11 the Middle Palaeolithic under the Neanderthals. The final paper in the Special Issue,
12 by **Compton and Stringer**, examines an important series of late Middle Pleistocene
13 hominin teeth from the site of Pontnewydd Cave in north Wales, dated to around 225
14 ka and found in association with both handaxes (the furthest north-west extent of any
15 hominin to be associated with these tools) and Levallois artefacts. Based on the
16 characteristics of the Pontnewydd teeth, the authors classify them as “pre
17 Neanderthal”, drawing particular comparisons with the morphology and size of
18 specimens from the Sima de los Huesos at Atapuerca, and grouping them with other
19 hominin fossils such as Swanscombe (UK) and Bilzingsleben (Germany), which
20 show a similar stage of “neanderthalization”. The authors further refute the view that
21 the Pontnewydd and Sima de los Huesos individuals should be regarded as *H.*
22 *heidelbergensis* (*contra*, for example, Martínón-Torres *et al.*, 2007) and highlight the
23 diversity in degree of Neanderthal affinities that are present within apparently
24 contemporary European Middle Pleistocene specimens.
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29 To conclude, the papers presented in this Special Issue address core problems in
30 our understanding of the Acheulean in western Europe, related principally to
31 chronology, environment, behaviour and identity. These papers not only pinpoint the
32 first occurrence of the Acheulean in northern Spain during the Early Pleistocene but
33 also present new dating evidence for hominin fossil material and key archaeological
34 sequences in Italy, northern France and England. In turn, the establishment of a
35 more robust chronology, developed through a multiproxy lithostratigraphic,
36 biostratigraphic, aminostratigraphic and geochronological approach, allows for a
37 more nuanced interpretation of patterns in the archaeological record, as well as
38 direct comparison of variability within the hominin fossils, subsistence practices and
39 detailed palaeoenvironmental records of this region.
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41

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3 Dawn of the Acheulean in north-western Europe: an interdisciplinary study”
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6

7 **Figure 1:** John Frere’s “Flint Weapon found at Hoxne in Suffolk” (Frere, 1800).
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John Frere's "Flint Weapon found at Hoxne in Suffolk" (Frere, 1800).
165x202mm (299 x 299 DPI)