The archaeology of persistent places: the Palaeolithic case of La Cotte de St Brelade, Jersey

Andrew Shaw[1], Martin Bates[2], Chantal Conneller[3], Clive Gamble[1], Marie-Anne Julien[1], John McNabb[1], Matt Pope[4] and Beccy Scott,[4,5]

[1]*Centre for the Archaeology of Human Origins (CAHO), Department of Archaeology, University of Southampton, Avenue Campus, Highfield, Southampton SO17 1BF, UK (Email: a.d.shaw@soton.ac.uk; clive.gamble@soton.ac.uk; m.julien@soton.ac.uk; j.mcnabb@soton.ac.uk)*

[2]*Department of Archaeology, University of Wales Trinity Saint David, Lampeter, Ceredigion SA48 7ED, UK (Email: m.bates@tsd.ac.uk)*

[3]*Department of Archaeology, University of Manchester, Oxford Road, Manchester M13 9PL, UK (Email: chantal.conneller@manchester.ac.uk)*

[4]*Institute of Archaeology, University College London, 31–34 Gordon Square, London WC1H OPY, UK (Email: m.pope@ucl.ac.uk)*

[5]*Department of Prehistory and Europe, The British Museum, Franks' House, 38–55 Orsman Road, London N1 5QJ, UK (Email: rscott@britishmuseum.org)*

Introduction

Recent interdisciplinary research has established the Middle Pleistocene as key to human behavioural evolution (Box 1). Advances in quaternary stratigraphy, science-based dating, molecular studies, palaeoecology and large-scale archaeological projects have transformed our understanding of the period 780ka – 130ka years ago (e.g. Ashton *et al.* 2011); the Middle Pleistocene is no longer merely a 'muddle in the middle' (Butzer & Isaac 1975). Instead, a complex interplay between environmental process and adaptive human response has become apparent, calling into question historical focus on an Upper Pleistocene "human revolution", albeit one that has been thought (Mellars & Stringer 1989; Klein 2008) and rethought (McBrearty & Brooks 2000; Mellars *et al*. 2007; Shea 2011) many times.

In this paper we present a first examination of the appearance of ***persistent places*** (cf. Schlanger 1992) during the Middle Pleistocene: places hominins repeatedly used beyond ethnographic (generational) timescales, forming a focus of activity over geologically measurable timeframes (i.e. between glacial/interglacial cycles). We consider persistent places in the landscape as crucial, structuring features which must be investigated when considering changing hominin behaviour from a co-evolutionary perspective. In our approach, the appearance of persistent places demonstrates that hominin niche construction is both a culturally constituted and ecologically informed activity: persistent places act as an index for hominin familiarity with, and enculturation of, landscapes. We illustrate this concept with a new analysis of Middle Pleistocene deposits from La Cotte de St Brelade, Jersey (Callow & Cornford 1986; Scott *et al*. 2014). The emphasis here is on understanding the sediment and stone tool taphonomy, in order to understand persistent rhythms of reoccupation and abandonment of this place.

BOX 1: The significance of the Middle Pleistocene in human evolution
During cycles 5 – 2 of the Middle Pleistocene (MIS 15 – 7; 600 – 200ka years ago) the following global features of hominin evolution have been observed or inferred.

Observed
Encephalisation: Significant increase (25%) in brain size 600 to 400kya (Rightmire, 2004; Ruff *et al*., 1997)
Technology: Change in large cutting tools (McNabb *et al*., 2004); appearance of composite tools (Barham 2010); earliest Levallois technique (White & Ashton 2003); managed fire (Rolland 2004; Gowlett 2010; Alperson-Afil & Goren-Inbar 2010)
Diet: Increasingly efficient hunting, targeting prime-age herd animals (Stiner *et al*. 2009)
Site biography: Widespread appearance of long-term, rich occupation sites, including caves and rock shelters (Stiner 2002; Rolland 2004)
Inferred
Group size: Modern primate brain; group size correlations suggest interaction communities of ~112 for *H.erectus*, ~126 for *H. heidelbergensis* and 141 for *H. neanderthalensis* (Dunbar 1992; Gamble 2013: Table 5.2).
Language: The larger group sizes inferred suggest language necessary for social interaction (Aiello & Dunbar 1993; Gamble *et al*. 2014). Physical apparatus of language in place (MacLarnon & Hewitt 2004); hierarchical cognition involved in the manufacture of composite artefacts suggests a conceptual grammar (Barham 2010).
Speciation: aDNA suggests Eurasian Neanderthal / African *H.sapiens* divergence sometime during the early Middle Pleistocene (Green *et al*. 2010: 713).

Home bases or persistent places?

Persistent places are, historically speaking, some of the more important sites in the Palaeolithic canon. Long sequences with rich, well-stratified artefact collections have been used to chart culture histories of traditions, industries and technocomplexes. Sequences from sites as different in time, space and species as Klasies River Mouth (Singer & Wymer 1982), the Mount Carmel complex (Garrod & Bate 1937), and Combe Grenal (Bordes 1972) have framed important debates about technological variability, its meaning, and environmental impact on hominin behaviour. Previously, these sequences have been discussed in behavioural terms as home bases. This model began with site catchment analysis applied to Near Eastern and European Palaeolithic sites (Vita-Finzi & Higgs 1970; Higgs 1975). Isaac (1978) further refined the concept, discussing central place foraging and the evolution of cultural behaviour. More recently Rolland (2004) has defined the home bases as:

"A fixed location combining night sleep and protection of juvenile and defenceless individuals against natural elements and predation. It is the place where animal and vegetal foods are introduced, shared, and consumed, and a setting favouring the transmission of knowledge and behaviors through prolonged learning by the young of shared and transmitted technical, socio-economic, and cognitive repertoires necessary for ensuring group survival (Rolland 2004: 263)".

He stresses the importance of fire in reorganizing the day and night, allowing home bases to replace the older pattern of core areas. Furthermore he draws attention to the appearance of a home base settlement pattern during the later Middle Pleistocene (ibid 2004: 257-8). We differ from Rolland in the wider role we see for hominin niche construction. We cannot know what occurred at these home bases, though Rolland provides a plausible list. More to the point is evidence for repeated accumulation of materials, lithic artefacts and food residues, at chosen localities. This was niche construction (Odling-Smee 1993) that both aided hominins in their physical survival and shaped their cultural development. These places were more than refuges or learning environments. They were integral to becoming a hominin in a cultural, behavioural and physical sense. Most importantly such niche-construction enshrined the co-evolution of environment and hominin: the interaction between humans modification of the natural affordances of place through use, subsequently relying upon the qualities of such "artificially enhanced" natural places. Consequently, hominin and environment can no longer be separated as analytical concepts.

Schlanger (1992) first used the term "Persistent Place" when studying Anasazi settlement systems in Colorado, as a mechanism to link findspots and concentrations of material ("sites": see also Barton *et al*. 1995) and understand patterns of occupation and abandonment. Schlanger identified persistent places as localities with evidence for repeated use during long-term occupations of regions, and specifically associated them with three key features:

1) Unique qualities particularly suited to certain activities/ behaviours.
2) Features that focus reoccupations.
3) Form on landscapes through extended occupation / revisitation independent of cultural features, but dependent on the presence of cultural material.

Significantly, Schlanger identifies landscape itself as persistent, and argues that cultural features within landscapes structure how they are used and reused. Whilst we agree that landscape features may be persistent, adopting the co-evolutionary approach necessary for longer, Middle Pleistocene timescales requires that we acknowledge how landscapes themselves change in response to geological, ecological and cultural factors. Furthermore, it is the relationship between fixed places and shifting environments that makes "persistence" a useful quality for investigating changing human landscapes, particularly during the deep time of the Pleistocene record.

Persistence and the Palaeolithic

In later periods, persistence is easy to identify; sites are defined by walls, ditches and settlement aggradations. This persistence, marked by accumulated materials must, however, have a longer ancestry. We define Palaeolithic persistent places as those showing evidence for ***repeated and frequent use over long periods of time*** — both open and sheltered sites (e.g. caves and abris) over at least one interglacial phase. We view the emergence of persistent places as an *intensification* of deep-rooted hominin practices: the repeated use and discard of artefacts around waterholes in Africa (cf. Potts 1984) and Boxgrove (e.g. Pope & Roberts 2005) representing the antecedents of our "persistent places".

Behaviours defining Palaeolithic persistent places are particularly evident in dense accumulations of anthropogenic material within caves. This is due to accumulation and preservation patterns, as well as research focus: however, of particular interest is the repetitive revisiting of specific locations beyond inter-generational timescales. Persistence reflects humans becoming increasingly habituated within landscape: of particular paths being used, and places visited, more frequently — depositing more material at them. Thus persistent places are those at which humans leave material over geologically perceptible timeframes, irrespective of climate-driven change in local ecology and topography. Long-term persistence enables the ***changing use of fixed places with fixed affordances*** to be linked with ***changing landscapes and changing affordances*** in a given region. Thus it enables the identification and reconstruction of changes in how early humans ***structured their use of place and landscape***. Here an example is needed, and we thus present new work at La Cotte de St Brelade.

La Cotte de St. Brelade: An early Middle Pleistocene Persistent Place

<FIGURE 1>

Composed predominantly of igneous geologies (Figure 1), Jersey drops from steep cliffs along the north coast to southern, low lying embayments. Pleistocene fluctuations in climate and sea level have profoundly affected the region; during cool-cold low sea level events, Jersey was a high level, terrestrial plateau connected to the continent, with large areas of intersected terrestrial landscape exposed to the south-west and north. During warmer intervals, marine transgression progressively isolated the island between two now-submerged rivers to the north-west and south (Figure 1b).

La Cotte itself is a T-shaped ravine system on the south-west corner of Jersey (Figure 2) formed through marine erosion widening joints in the granite sea cliffs. These ravines captured sediments from at least 240 ka years ago — a complex sequence of aeolian and slope deposits rich in anthropogenic material, reflecting continuous occupation from MIS 7 through to MIS 3, punctuated by abandonment during the coldest phases (Huxtable 1986, Bates *et al*. 2014). The La Cotte sediments were repeatedly truncated by climate-driven rise in sea level, with deposits in the North Ravine being cut by the Eemian (MIS 5e) transgression.

The Middle Pleistocene sequence is over 5 metres thick (Figure 3) and was excavated by Charles McBurney between 1961-78, yielding >100,000 lithic artefacts and >10,000 faunal remains from ten archaeological units (McBurney & Callow 1971; Callow & Cornford 1986), reflecting occupation during MIS 7/6.

<FIGURE 2>

The lowermost deposits form six units, predominantly temperate slope deposits containing thermophilous pollen (Layers H-C: Callow 1986; Jones 1986). All these layers are rich in lithic artefacts, reworked within the site to some degree (ongoing slope processes). However, Layer E represents a stable surface, a soil developing on granitic sand. This soil is truncated and surmounted by deposits (Layers D-C) reflecting climatic deterioration (pollen and bone gelifraction). Temperate units H-C are surmounted by slope and aeolian sediments assigned to six units (Layers B-6.1), reflecting cooling, culminating in two episodes of cold-climate loess deposition (Layers 3 and 6.1). The loessic levels reflect cold, steppe-tundra landscapes (Layers 3 and 6.1 both contain lemming) and are largely devoid of artefacts, but overlie units containing occupation debris. This includes two “bone heaps" (Top of Layer A/Layer 3 and Layer 5/base of 6.1), comprising fauna typical of cold, steppic environments (Scott 1980; 1986).

<FIGURE 3>

The La Cotte sequence reflects a semi-continuous human presence, punctuated by episodes when human behaviour was brought into sharper focus through sedimentary lacunae (eg. soil formation) or increased sedimentation (loess deposition). Within the ravine, erosion (of granite and existing sedimentary infill) and redeposition operates as a stochastic, climate-driven system. Erosion includes chemical and thermal weathering of the granite, resulting in rock fracture and deposition of head deposits/granitic sands. Deposition of these erosion products is augmented by periodic input of loess during periods of extreme cold. These thick deposits protected existing (including anthropogenic) sediments, forming the parent material that was subsequently reworked further as slope deposits. The shifting balance between these different processes allows repeated phases of human activity to be investigated, at appropriate scales.

Hominins were present throughout temperate, cooling and cool conditions, returning whilst local environment, offshore topography, and regional geography underwent dramatic shifts. Despite these profound changes in regional setting and local affordances, people continued to come to La Cotte, often carrying their toolkit with them. The cooler Layers A and 5 occupations precede full steppe-tundra conditions, when humans are absent. Correlating occupation with the exact nature of these changes is complicated, but extreme low sea level can be inferred for layers that reflect the coldest periods (Layers 3 and 6.1), with sea levels being low throughout the preceding period of cooling. Modelling precisely how marine regression affected the surrounding landscape is difficult, but a profoundly different regional geography prevailed during temperate conditions (Layer E) versus the cool-cold environments of Layers A and 5. Throughout the aggradation of these deposits, Jersey does not appear to have been an island as today; even during the warmest conditions of MIS 7, sea level remained at least 5m-10m below modern levels (using sea level curve of Waelbroek *et al*. 2002). A drop of -7m would reconnect Jersey to the continent. Climatic deterioration and falling sea level would have exposed a larger coastal plain extending towards the Channel River, with a drop in excess of -25 m exposing the nearest bedrock flint source (20km north).

To understand behaviour at La Cotte and the wider region, we focus on lithic assemblages from units that relate to clearly defined units of the sedimentary system: Layer E, the top of Layer A, and Layer 5. The selected units represent subdivisions of a continually accumulating system, within which the input and modification of stone tools and faunal remains allows the relationship between site and landscape to be examined. A broad impression of intensity of use can be inferred by contrasting artefact density with sedimentary regime (see Table 1), with the highly anthropogenic more temperate unit (Layer E) being much denser than the overlying layers associated with cooler climate occupation and a loessic input.

<TABLE 1>

Layer E

Layer E reflects occupation during a broadly temperate interval, evidenced by clay illuviation (forest soil formation) and a lack of frost disruption (van Vliet-Lanoë 1986). At this point, Jersey was not an island, and La Cotte itself overlooked a substantial, now submerged, coastal landscape. The deposits were rich in fragmented, burnt bone; a small, heavily fragmented assemblage (461 NSP), of which a third (29.7%) are burnt; burnt artefacts are also present (2.6% of assemblage) reflecting fire setting during this occupation. Some 6,325 lithic artefacts were recorded from ~3m^3 (2108.3 artefacts/m^3), suggesting intense or repeated occupation; these are extremely fresh (refitting material is present) with limited edge damage. Poor quality (frequently flawed) beach flint dominates; other raw materials are relatively rare (only 15.3% of the assemblage). Some flint artefacts retain thicker, chalky (though chatter marked) cortex, suggesting that some beaches may have been near bedrock sources, the closest of which is 20km north of the site (see Figure 4); the presence of a few flint flakes (2.8%) with unrolled fresh chalky cortex might suggest that bedrock sources were also directly exploited. This combination of beach flint from a near bedrock source, and a temperate climate is intriguing, possibly suggesting a regional "lag" or decoupling between climate change and sea level.

<FIGURE 4>

The assemblage reflects a partial *chaîne opératoire*; there is little cortical material and few cores considering the number of flakes present (1:31). Notably, many cores are on flakes (40% of core assemblage). The predominant technological strategy is discoidal flaking; Levallois flaking is barely present. Bifaces are rare, though handaxe thinning flakes are present, many of which are retouched. The largest flakes were frequently used as flake tools and cores. Since these flakes were struck from flawed beach cobbles, this may represent a deliberate provisioning strategy. Producing a series of flakes allows raw material to be assessed close to source; only the least flawed blanks were transported away for use elsewhere. Interestingly, there was little attempt to replace this poor flint with locally available non-flint material. This suggests that Layer E reflects repeated, short-term use of the site, rather than intense use of the local landscape, which would require provisioning of place using local raw materials.

Layer A

Layer A is thick (~1m) and comprises bone fragments in a loessic matrix, surmounted by loess (Layer 3). As climate deteriorated, the sea retreated to the north and west. Loess deposition may have also masked some sources of beach flint. Artefacts were analysed from the upper 5 cm (4,616; the unit produced 40,906), reflecting final occupation preceding deposition of the Layer 3 loess, together with 628 pieces from the Layer A/3 boundary. The assemblage is unabraded, though some pieces exhibit light edge damage. The final stages of reduction dominate; an elegant method of rejuvenating small-medium flakes is notable (Figure 5) — elongated flakes were removed at an oblique angle down one margin, usually from the distal end. Both retouched (51.3% of spalls) and unretouched flakes were resharpened in this way, but were rarely subsequently retouched, indicating that plain, sharp edges were perhaps required (cf. Cornford 1986). These (re)sharpened flakes, and the spalls themselves are common (11.1% of flint debitage); Neanderthals extended the life of their tools, before switching to lower quality local raw material sources. This technique allows flakes to be used again without becoming excessively small.

Cores were also reworked; most are discoidal, though some were originally Levallois cores. There are some bifaces (14), and thinning flakes are present (34). A few artefacts retain thick chalky cortex (1.2% cortical debitage) indicative of bedrock sources, but such outcrops were not extensively exploited; beach pebbles are more common. Other lithologies (from within 5km) were also used (21.0% of artefacts), suggesting that hominins were more locally active than during the Layer E occupation. Layer A has produced faunal remains exhibiting direct evidence for human interaction with medium-mega-herbivores: green bone breakage, including conchoidal scars and flakes, as well as large notches with medullar flaking (i.e. parallel cone fractures). Cut marks have also been observed; their location and orientations largely suggest defleshing.

<FIGURE 5>

This occupation reflects ongoing use of La Cotte as climate cooled, with apparent abandonment during extreme cold (Layer 3 loess). Flakes and tools were resharpened to conserve the edges of a transported toolkit, potentially for butchery. Visits may have been brief; the flint-dominated toolkit was transported, reworked and conserved during occupation, but local lithologies were not extensively exploited. This unit reflects mobile groups exploiting cool, open environments within which La Cotte remained a focal point, although local setting and affordances had changed.

Layer 5

Layer 5 is a comparatively lower density unit (178.5 artefacts/m^3) bracketed between loess Layers 3 and 6.1. It is a loessic colluvial loam containing bone and granite fragments rearranged by freezing (van Vliet-Lanoë 1986, 94). Sea level retreated further during these cold conditions, exposing landscapes towards the Channel River and revealing Cretaceous flint sources. The upper bone heap is embedded within Layer 5 (Callow 1986, 81), although bones forming this pile are also attributed to the base of loessic Layer 6.1 above. Stratigraphically, therefore, the bone heap is within Layer 5: the Layer 6.1 loess simply surmounts it.

Minimal post-depositional modification is apparent: the lithic assemblage is predominantly unabraded, with light edge damage only. Mammoth dominates (40% NSP of the assemblage: at least 11 individuals; Scott 1986). The excavators describe these bones as stacked against the western ravine wall, surmounted by two rhinoceros skulls (Scott 1986: 159). Hominin interaction with the fauna is evidenced by cut marks (MNE=5) and green bone breakages (conchoidal scars; MNE=23). Young and prime age adults dominate the age profile, indicating human predation (Scott 1986), and little carnivore activity was identified (MNE = 3), suggesting a primary anthropogenic input (Julien et al. in review).

Layer 5 is dominated by non-flint material (61.9%), including feldspathic sandstone and schist from local outcrops 5-10 km to the south-east (see Figure 4). Other material has come from further afield; many flint artefacts come from bedrock sources (37% of cortical debitage), the nearest of which is 20km to the north. This suggests low a sea-level (>-25m) exposing such sources, and that before coming to La Cotte, people were active over a considerable area.

The assemblage does not reflect the early phases of core working; cortical material is rare. Large flake blanks (often Levallois) were transported in. Cores are generally beach cobbles that would have been too small, even in their earliest phases, to produce such blanks, which tend to be flint. These were frequently retouched — often heavily so and involving multiple phases, so that edges are steep relative to blank thickness. Many are broken, and can be refitted. Local lithologies were treated differently; refitting sequences (12-20 pieces) are present on local stone, reflecting on-site reduction of cores roughed-out elsewhere, whereas flint cores are always heavily worked down and small when discarded.

This is a restricted occupation associated with the upper bone heap. Humans were the main agents of bone accumulation, as suggested by cutmarks, green bone breakage, a lack of carnivore activity, Mammoth age structure and the spatial arrangement of the bones. Stone tool distribution clearly relates to and respects the bones (see Figure 6), suggesting that they were present, and that stone working was undertaken around them.

<FIGURE 6>

Neanderthals carried in flint from a wide area north of the site, reflecting the low sea level (early glacial?) landscape within which they were active. These toolkits were extensively modified in transit, and local materials were used in a more expedient fashion. This dominance of local, though not immediately available, raw material suggests an emphasis on provisioning the site itself not apparent in the other units studied, reflecting more intense use of the local landscape — this material was brought, ready-prepared, into the site from a 5-10km radius. This implies a markedly different use of same place; rather than repeatedly using the site as part of a pattern of short term, repeated long distance movements, they were occupying the local landscape, although assemblage size and density (178.5/m^3) suggests this phase of site use may have been short.

Conclusion

The presence of artefacts and bones bearing processing traces throughout the sediments that infilled La Cotte from at least 240,000 year ago until after 40,000 years ago (Bates *et al*. 2013) demonstrates that this place had “persistence” within the Neanderthal landscapes of the region. The granite headland itself, and the ravine system cut into it, is an erosion-resistant landform that retains sediment today. During times of lowered sea level, the ravines offered a degree of shelter, together with views over the now-submerged landscapes to the south (Scott *et al*. 2014). The headland was widely visible, just as the Channel Islands, France and semi-submerged rock formations are inter-visible today; it may therefore have acted as a navigation point for people moving through the now-submerged offshore zone. La Cotte was constantly visited, despite shifts in climate, and concomitant changes in regional landscape and environment. Moreover, it was occupied differently, at different times; the temperate climate occupation recorded in Layer E reflects repeated short-term occupations by people carrying a transported, expedient toolkit. In contrast, the people who discarded the material present in Layer 5 stayed for longer within this area, using La Cotte as a temporary base — as marked by the transition to local lithologies.

What is critical, however, is the role that the place itself played in early Neanderthal movements around the landscape. The transported and resharpened toolkits of the final Layer A occupation and curated flint tools from Layer 5, for instance, attest to extended journeys, some exceeding 20km. Although it is impossible to be sure how long such moves took (feasible within a day), toolkit reworking might suggest that more time (perhaps several days) was spent in travelling, alongside other activities. Obviously, the social composition would impact upon travelling time, with young children, if not carried, moving more slowly than adults. Regardless of actual time spent in transit, the journey itself could be viewed as a deliberate, strategic move to the site, suggesting that La Cotte played a structuring role in how humans thought of the landscapes through which they moved. It is notable that although the headland, as a highpoint, would have had enhanced visibility, it is unlikely to have been visible over the distances people were travelling: today, Jersey drops below the horizon around 5km offshore if one walks out south-east of the island on a spring tide. La Cotte therefore provides an insight into early Neanderthal “landscapes of mind”: places distant in time and space conceived of as a destination around which life was organised. Not only are these places physically persistent (in that they resist erosion in a changing landscape), but mentally persistent, attracting human attention — drawing people not only over the days necessary to journey there, but over the tens of thousands of years of climatic change that the sequence records.

La Cotte is a persistent place because of features it possessed (prospect, shelter, waymarker), but also because of the importance that people invested in it by travelling there time and again. This interaction between people and place is a mutual one, and deep-rooted: people active around the Q1B waterhole at Boxgrove, southern England, over 500,000 years ago, for instance, would have recognised and related to the traces left by people who had passed that way before (Pope & Roberts 2005); similar parts of the Boxgrove palaeolandscape were used for similar purposes over time. This pattern intensifies, however, after 300,000 years ago; in particular, the *chaîne opératoire* became increasingly disaggregated in time and space with the adoption of Levallois flaking (eg. White & Pettit 1995). Early Middle Palaeolithic sites in the Thames Valley reflect an increasingly logistical approach to how technology was organised in the landscape — from Late MIS 8 onwards, particular places were used for particular purposes — "gearing up" at dedicated extraction and provisioning sites with transportable equipment to meet needs elsewhere in the landscape (Scott 2011). These places share the quality of persistence with La Cotte, whilst lacking its deep sequence, and the index of distance that raw material transfer distances outside chalk geologies allow.

Persistence, therefore, is a quality shared by a continuum of landuse practices — linking Oldowan artefact concentrations, on one hand, to the songlines of the Wardaaman people (Norris and Harney 2014) and medieval pilgrim shrines (Powell 2014) on the other. The organisation of human movement around particular persistent places reflects the same "release from proximity" (Gamble 1998: 443) that has been suggested to be necessary to deal with larger social groups, and arguably is attested by the technological changes apparent from around 300,000 years ago (e.g. the widespread adoption of Levallois flaking: White & Pettit 1995). In a similar way, the apparent shift towards more efficient carnivory through selective hunting (Stiner *et al*. 2009) is an index for this cognitive capacity to plan and predict, through mutual engagement between human and animal actors. We see persistent places as mutually-constituted; the natural affordances of such places affect how people use them, whilst this use in turn enhances their importance in structuring social life. Places groups return to repeatedly are invested with the qualities of the interactions that have taken place before — whether they held in direct memory, or inferred from traces observed (old fireplaces, reused lithics, bone refuse). A persistent place possesses different qualities as a locale (Gamble 1998) to a transient camp because it is overlain with this enhanced patina of extended social life; indeed, the process by which places become persistent is the process by which landscape becomes encultured and mapped.

Acknowledgements

This research has been funded by the AHRC as part of the *Crossing the Threshold* Project (AH/K00378X/1). Grateful thanks are extended to Jersey Heritage and the Société Jersiaise for their support, and in particular Olga Finch, Neil Mahrer, Jon Carter, Ralph Nichols, John Renouf, John Clarke and Neil Molyneux, as well to Peter Hoare and Anne-Lyse Ravon for work on the raw materials. BS would also like to acknowledge the support of the Calleva Trust (Pathways to Britain) project.

References

AIELLO, L. & DUNBAR, R. 1993. Neocortex size, group size and the evolution of language. *Current Anthropology* 34: 184–93.

ALPERSON-AFIL, N. & GOREN-INBAR, N. 2010. *The Acheulian site of Gesher Benot Ya'aqov volume II: ancient flames and controlled use of fire*. Dordrecht: Springer.

ASHTON, N., LEWIS, S.G. & STRINGER, C. (eds.) 2011. *The ancient human occupation of Britain,* Amsterdam: Elsevier Developments in Quaternary Science 14.

BATES, M., POPE, M.I., SHAW, A. SCOTT, B., & SCHWENNINGER, J-L. 2013. Late Neanderthal occupation in North-West Europe: rediscovery, investigation and dating of a last glacial sediment sequence at the site of La Cotte de St. Brelade, Jersey. *Journal of Quaternary Science* 28(7): 647–652.

BARHAM, L.S. 2010. A technological fix for 'Dunbar's dilemma'?, in R. Dunbar, C. Gamble & J.A.J. Gowlett (eds.) *Social brains and distributed mind*: 367–89. Oxford: Oxford University Press.

BORDES, F. 1972. *A Tale of Two Caves*. New York: Harper and Row.

BARTON, R.N.E., BERRIDGE, P.J., WALKER, M.J.C. & BEVINS, R.E. 1995. Persistent Places in the Mesolithic landscape: an example from the Black Mountain Uplands of South Wales. *Proceedings of the Prehistoric Society* 61, 81–116.

BUTZER, K.W. & ISAAC, G.L. (eds.) 1975. *After the Austalopithecines,* The Hague: Mouton.

CALLOW, P. 1986. Interpreting the La Cotte Sequence, in P. Callow & J.M. Cornford (eds.) *La Cotte de St. Brelade 1961–1978. Excavations by C.B.M.McBurney*: 73–82. Norwich: Geo Books.

CALLOW, P. & CORNFORD, J.M. (eds.) 1986. *La Cotte de St. Brelade 1961-1978. Excavations by C.B.M.McBurney,* Norwich: Geo Books.

CORNFORD, J.M. 1986. Specialised resharpening techniques and evidence of handedness, in P. Callow & J.M. Cornford. (eds.) *La Cotte de St. Brelade 1961–1978. Excavations by C.B.M.McBurney*: 337–52. Norwich: Geo Books.

DUNBAR, R.I.M. 1992. Neocortex size as a constraint on group size in primates. *Journal of Human Evolution* 20: 469–93.

GAMBLE, C.S 1998. Palaeolithic Society and the Release from Proximity: A Network Approach to Intimate Relations. *World Archaeology* 29(3): 426–49.

–. 2013. *Settling the Earth: the archaeology of deep human history*. Cambridge: Cambridge University Press.

GAMBLE, C.S., GOWLETT, J.A.J. & DUNBAR, R. 2014. *Thinking big: the archaeology of the social brain*. London: Thames and Hudson.

GARROD, D.A.E. & BATE, D.M.A. 1937. *The stone age of Mount Carmel*. Oxford: Clarendon Press.

GOWLETT, J.A.J. 2010. Firing up the social social brain, in R. Dunbar, C. Gamble & J.A.J. Gowlett (eds.) *Social brain and distributed mind*: 341–66. Oxford: Oxford University Press.

GREEN, R.E., KRAUSE, J., BRIGGS, A.W., MARICIC, T., STENZEL, U., KIRCHER, M., PATTERSON, N., LI, H., ZHAI, W., HSI-YANG FRITZ, M., HANSEN, N.F., DURAND, E.Y., MALASPINAS, A.-S., JENSEN, J.D., MARQUES-BONET, T.M., ALKAN, C., PRÜFER, K., MEYER, M., BURBANO, H.A., GOOD, J.M., SCHULTZ, R., AXIMU-PETRI, BUTTHOF, A., HÖBER, B., HÖFFNER, B., SIEGEMUND, M., WEIHMANN,

A., NUSBAUM, C., LANDER, E.S., RUSS, C., NOVOD, N., AFFOURTIT, J., EGHOLM, M., VERNA, C., RUDAN, P., BRAJKOVIC, D., KUCAN, Z., GUSIC, I., DORONICHEV, V.B., GOLOVANOVA, L.V., LALUEZA-FOX, C., DE LA RASILLA, M., FORTEA, J., ROSAS, A., SCHMITZ, R.W., JOHNSON, P.L.F., EICHLER, E.E., FALUSH, D., BIRNEY, E., MULLIKIN, J.C., SLATKIN, M., NIELSEN, R., KELSO, J., LACHMANN, M., REICH, D. & PÄÄBO, S. 2010. A draft sequence of the Neandertal genome. *Science* 328: 710–22.

HIGGS, E.S. (ed.) 1975. *Palaeoeconomy,* Cambridge: Cambridge University Press.

HOMMERIL, P. 1967. *Etude de géologie marine concernant le littoral Bas-Normand et la zone pré-littorale de l'Archipel Anglo-Normand.* Unpublished PhD dissertation, University of Caen.

HUXTABLE, J. 1986. The thermoluminesence dates, in P. Callow & J.M. Cornford (eds.) 1986. *La Cotte de St. Brelade 1961–1978. Excavations by C.B.M.McBurney,* Norwich: Geo Books.

ISAAC, G. 1978. The food sharing behaviour of proto-human hominids. *Scientific American* 238: 90–108.

JONES, R.L. 1986. The flora and vegetation of La Cotte de St. Brelade and its evirons, in P. Callow & J.M. Cornford (eds.) *La Cotte de St. Brelade 1961–1978. Excavations by C.B.M.McBurney*: 99–106. Norwich: Geo Books.

JULIEN, M.-A., SHAW, A., POPE, M., SCOTT, B., GAMBLE, C. & MCNABB, J. in review. Taphonomy and Neanderthal behavior at La Cotte de St Brelade. *Journal of Human Evolution*.

KLEIN, R.G. 2008. Out of Africa and the evolution of human behaviour. *Evolutionary Anthropology* 17: 267–81.

MACLARNON, A.M. & HEWITT, G.P. 2004. Increased breathing control: another factor in the evolution of human language. *Evolutionary Anthropology* 13: 181–97.

MCBREARTY, S. & BROOKS, A.S. 2000. The revolution that wasn't: a new interpretation of the origin of modern humans. *Journal of Human Evolution* 39: 453–563.

MCNABB, J., BINYON, F. & HAZELWOOD, L. 2004. The large cutting tools from the South African Acheulean and the question of social traditions. *Current Anthropology* 45: 653–77.

MELLARS, P.A. & STRINGER, C. (eds.) 1989. *The Human Revolution: behavioural and biological perspectives on the origins of modern humans,* Edinburgh: Edinburgh University Press.

MELLARS, P., BAR-YOSEF, O., STRINGER, C. & BOYLE, K.V. (eds.) 2007. *Rethinking the human revolution,* Cambridge: McDonald Institute.

NORRIS, R.P & HARNEY, B.Y. 2014. Songlines and Navigation in Wardaman and other Aborginal Cultures. *Journal of Astronomical History and Heritage* 17(2): 141–48.

ODLING-SMEE, F.J. 1993. Niche construction, evolution and culture., in T.Ingold (ed.) *Companion encyclopedia of anthropology: humanity, culture and social life*: 162–96.

POWELL, H. 2013. Pilgrimage, performance and miracle cures in the twelfth-century Miracula of St Aebbe, in S. Gordon, E. Gemi-Iordanou, R. Matthew, E. McInnes & R & Pettitt (eds.) *The Archaeology of Medicine, Healing and Performance*. Oxford: Oxbow

POPE, M.I. & ROBERTS. M.B. 2005 Observations on the relationship between Palaeolithic individuals and artefact scatters at the Middle Pleistocene site of Boxgrove, UK, in Gamble, C.S. & Porr, M. (eds.) *The hominid individual in context: Archaeological investigations of Lower and Middle Palaeolithic, landscapes, locales and artefacts*: 81-97, London: Routledge.

POTTS, R. 1984 hominind hunters? Problems of identifying the earliest Hunter/Gatherers. In: R.Foley (ed.) Hominid Evolution. New York: Academic Press.

RIGHTMIRE, G.P. 2004. Brain size and encephalization in early to Mid-Pleistocene Homo. *American Journal of Physical Anthropology* 124: 109–123.

ROLLAND, N. 2004. Was the emergence of home bases and domestic fire a punctuated event? A review of the Middle Pleistocene record in Eurasia. *Asian Perspectives* 43: 248–80.

RUFF, C.B., TRINKAUS, E. & HOLLIDAY, T.W. 1997. Body mass and encephalization in Pleistocene *Homo*. *Nature* 387: 173–76.

SCHLANGER, S.H. 1992, Recognizing persistent places in Anasazi settlement systems, in J. Rossignol & L. Wandsnider (eds.) *Space, time and archaeological landscapes*: 91–112. New York: Springer.

SCOTT, K. 1980. Two hunting episodes of Middle Palaeolithic age at La Cotte de Saint Brelade, Jersey. *World Archaeology* 12: 137–52.

– 1986b. The bone assemblages from layers 3 and 6, in P. Callow & J.M. Cornford (ed.) *La Cotte de St Brelade 1961–1978. Excavations by C.B.M. McBurney*: 159–85. Norwich: Geo Books.

SCOTT, B. 2011. *Becoming Neanderthals: The Earlier British Middle Palaeolithic.* Oxford: Oxbow.

SCOTT, B., BATES, M., BATES, R., CONNELLER, C., POPE, M., SHAW, A. & SMITH, G. 2014. A new view from La Cotte de St Brelade, Jersey. *Antiquity* 88: 13–29.

SHEA, J.J. 2011. Homo sapiens is as Homo sapiens was: behavioural variability versus "behaviuoural modernity" in Palaeolithic archaeology. *Current Anthropology* 52: 1–35.

SINGER, R. & WYMER, J. 1982. *The Middle Stone Age at Klasies River Mouth in South Africa*. Chicago: University of Chicago Press.

STINER, M.C. 2002. Carnivory, coevolution, and the geographic spread of the genus *Homo*. *Journal of Archaeological Research* 10: 1–64.

STINER, M.C., BARKAI, R. & GOPHER, A. 2009. Cooperative hunting and meat sharing 400-200kya at Qesem Cave, Israel. *Proceedings of the National Academy of Sciences* 106: 13207–212.

VAN VLIET-LANÖE. 1986. Micromorphology, in Callow, P. & Cornford, J.M. (eds.) *La Cotte de St. Brelade 1961–1978. Excavations by C.B.M.McBurney*: 91–96. Norwich: Geo Books.

VITA-FINZI, C. & HIGGS, E.S. 1970. Prehistoric economy in the Mount Carmel area of Palestine, site catchment analysis. *Proceedings of the Prehistoric Society* 36: 1–37.

WAELBROECK, C., LABEYRIE, L., MICHEL, E., DUPLESSY, J.C., MCMANUS, J.F., LAMBECK, K., BALBON, E. & LABRACHERIE, M. 2002. Sea-level and deep water temperature changesderived from benthic foraminifera isotopic records. *Quaternary Science Reviews* 21: 295–305.
WHITE, M.J. & ASHTON, N.M. 2003. Lower Palaeolithic core technology and the origins of the Levallois method in North-Western Europe. *Current Anthropology* 44 (4): 598–609.
WHITE, M. & PETTITT, P. 1995. Technology of Early Palaeolithic Western Europe: An Heuristic Framework. *Lithics* 16: 27–40

Figure captions:

Figure 1. A) Channel Islands within north-western Europe; B) Jersey in relation to other Channel Islands and French coast; C) simplified geological map of Jersey, showing main sites. Based upon an image supplied by John Renouf.
Figure 2. Location and plan of La Cotte ravine system.
Figure 3: Composite section (west-facing) through the deposits infilling the North Ravine (modified from Callow 1986a: 61, fig. 6.6).
Figure 4: Bedrock geology of Jersey and the surrounding region (data derived from British Geological Survey, 2000. Guernsey 1:250 000 Series and Hommeril 1967)
Figure 5. Artefacts with resharpening removals (1-2) and resharpening spalls (3-5) from La Cotte, Layer A.
Figure 6. Distribution plan of faunal material from Layers 5 and 6.1, and lithic artefacts from Layer 5.

Table 1: La Cotte de St Brelade lithic artefact samples selected for analysis.

Layer	Lithic artefacts >2cm	Area excavated (m^3)	Lithic artefact density (per m^3)	Description	Environment	Date	Affected by?
Layer 5	3321	18.6	178.5	Bleached loessic loam	Cool	MIS 6	Freeze thaw, soil creep
Layer A/3	628			Intersection between base of Layer 3 loess and underlying deposits of Layer A	Cool/Cold	MIS 7/6	
Top of Layer A	4616	5.8	795.9	Rich occupation in loessic matrix	Cool	MIS 7/6	Ranker formation, channelling of surface (run-off): freeze-thaw
Layer E	6325	3.0	2108.3	Occupation: burnt bone in granitic sand matrix	Temperate	MIS 7	Soil formation: upper part of soil eroded

Figure 1

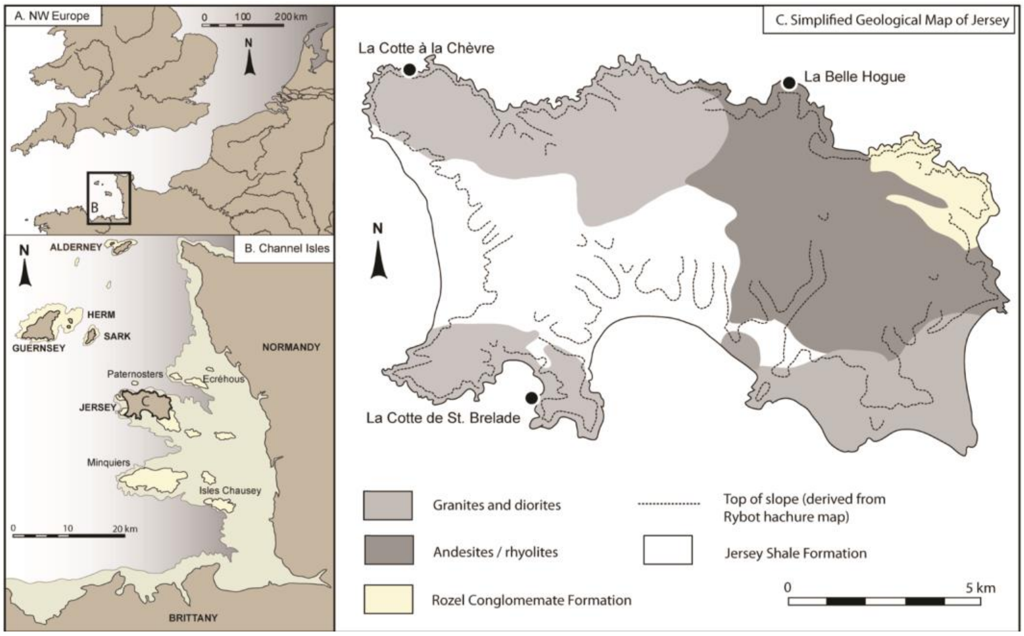

Figure 2

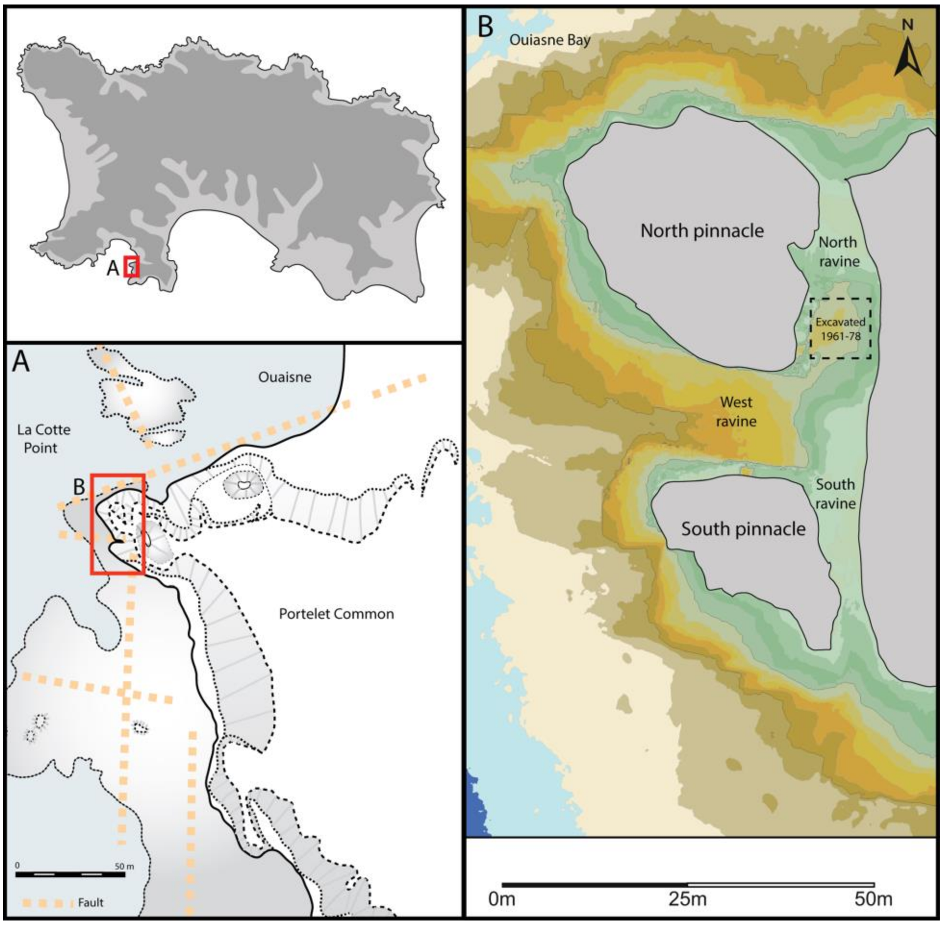

Figure 3

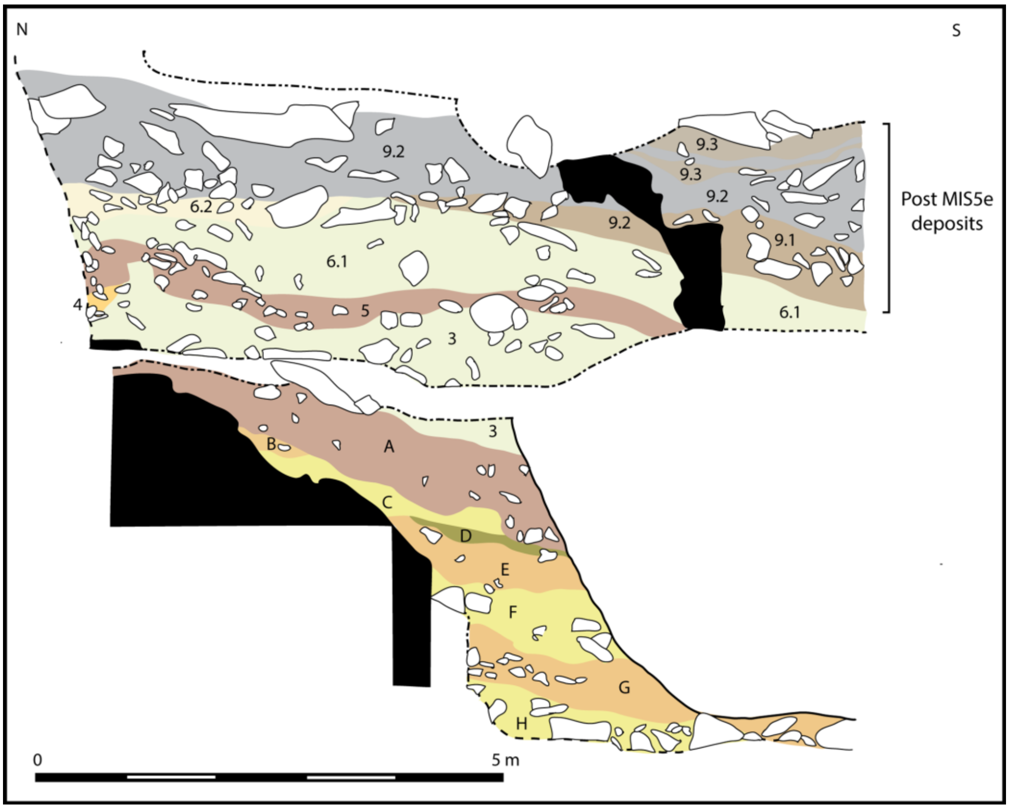

Figure 4

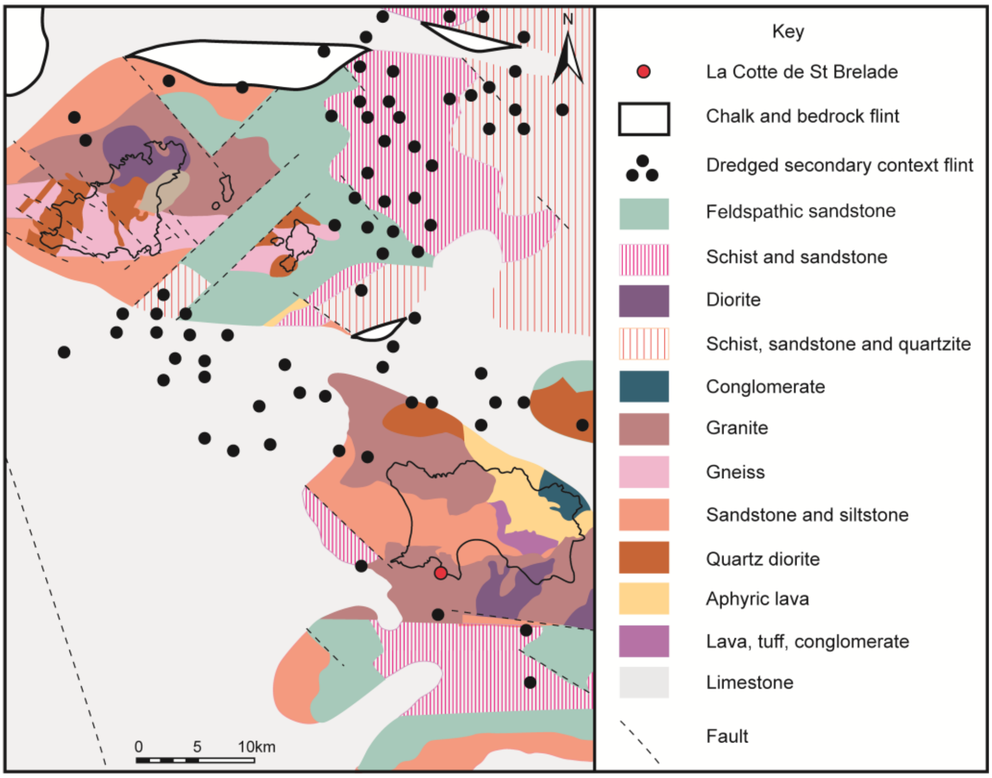

Figure 5

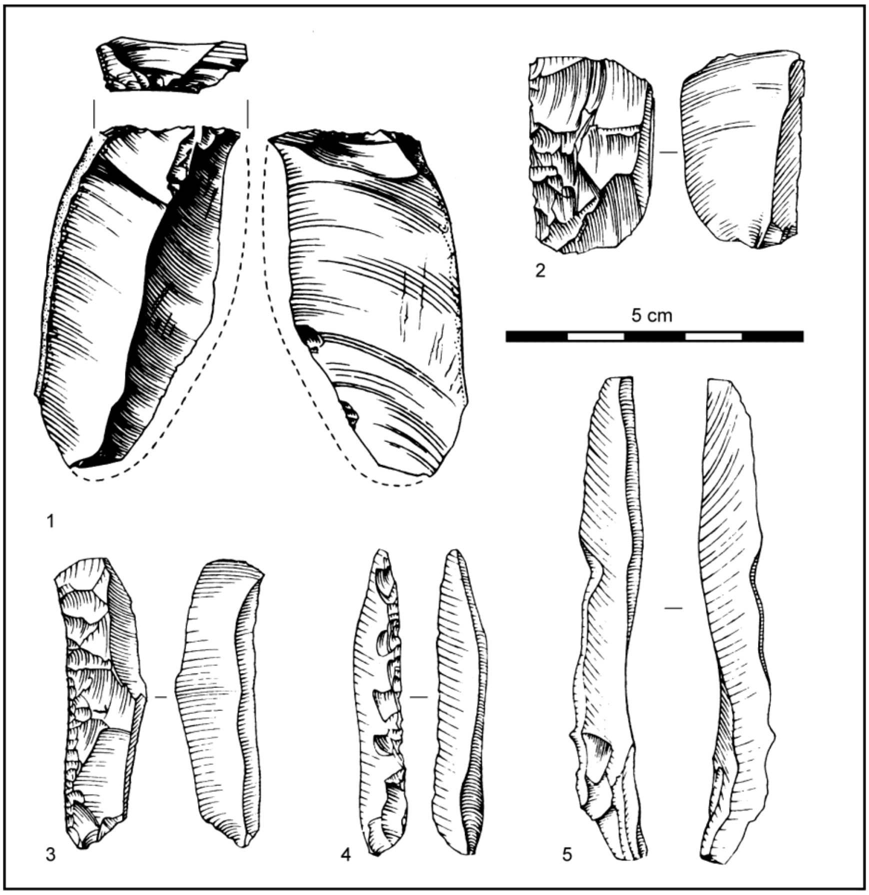

Figure 6