Mesolithic and late neolithic/Bronze Age activity on the site of the American Express Community Stadium, Falmer, East Sussex

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Excavations on the site of the American Express Community Stadium, Falmer, East Sussex have revealed evidence for over 7,000 years of human activity. The earliest occupation was a mesolithic camp, where the production of flint tools (microliths) was carried out, on a scale unprecedented in East Sussex. There was little recognisable human activity in the early and middle neolithic but geoarchaeological investigations have shown that the landscape continued to change, with probable deforestation causing colluvial deposition within the river valley to the west. In the late neolithic/Early Bronze Age, a series of three ring ditches were dug, close to the location of the mesolithic pits. There are a number of possibilities as to what these ring ditches represent, but the most likely explanation is a group of barrows or other type of ceremonial ring ditch. Whatever their function, the structures were re-visited later in prehistory, a testament to the continued topographic importance of the site. Finally the site became the focus of Anglo-Saxon habitation, including a sunken-featured building, perhaps an outlying part of the precursor to Falmer village.

THE STRUCK FLINT

by Hugo Anderson-Whymark

INTRODUCTION AND QUANTIFICATION

A total of 7,636 stuck lithic artefacts, seven flint hammerstones and one imported quartzite pebble were recovered from excavations on the site of the American Express Community Stadium (Table 9). In addition, 557 pieces of burnt unworked flint weighing 3.127kg were recovered. The vast majority of these lithics date from the late mesolithic and a significant proportion of the assemblage (2,985 flints) were recovered from 15 contemporary pits (Period 1). Fourteen of these pits were located with a small area about 25m in diameter and these features clustered in four groups: G1, G2 and G4 consisted of three pits and G3 comprised five pits. The remaining isolated pit (G5) was located to the east of the main cluster. A further 11 pits containing limited artefact assemblages have been tentatively dated to the mesolithic (G20). Later archaeological features, including three probable neolithic/Bronze Age ring ditches and associated features, incorporated a significant quantity of residual late mesolithic flint, but 23 tools are considered to date from the neolithic or Bronze Age and undoubtedly a small number of flakes and cores of this date range are also present. However, it was not possible to distinguish the debitage with absolute confidence. This report characterises the assemblage and discusses its wider affinities.

METHODOLOGY

The flint assemblage was recorded onto a Microsoft Access database using standard morphological and typological descriptions (Jacobi 1978; Bamford 1985, 72–77; Healy 1988, 48–49; Bradley 1999, 211–227; Butler 2005). A blade is defined as a flake with a length to breadth ratio of 2:1 or higher. A bladelet is a small blade less than 40mm in length. Blade-like flakes exhibit traits of true blades, for example parallel sides, but do not achieve blade proportions. Chips are flakes with a maximum dimension less than 10mm. Core typology follows Bradley (1999, 212), rather than the commonly adopted classification of Clark (Clark *et al*. 1960), as the former is more informative for reduction strategies. Microliths were classified using Roger Jacobi's type series for Sussex (Jacobi 1978). Additional information was recorded on the condition of the artefacts including burning, breakage, the degree

Table 9. The lithic assemblage from phased features by artefact/debitage type. Note that post-mesolithic features contain significant numbers of residual mesolithic artefacts. Only approximately 400 flints, predominately flakes, may be contemporary with the neolithic and Bronze Age phase features; diagnostic artefacts have been marked with an asterisk.

FEATURES BY PERIOD	**Period 1 Mesolithic**	**Period 1? Mesolithic?**	**Period 2 Neolithic/EBA**	**Period 3 Later Prehistoric**	**Post-prehistoric/ unphased**	**Total**
LITHICS TYPE						
DEBITAGE						
Flake	1755	88	1142	674	1086	4745
Blade	142	16	93	52	133	436
Bladelet	408	19	218	116	185	946
Blade-like	82	3	55	30	64	234
Irregular waste	17		18	8	7	50
Chip	100		54	9	18	181
Sieved chips 10–4 mm	128	10	50	8	79	275
Sieved chips 4–2 mm	182	3	62		24	271
Rejuvenation flake core face/edge	4	1	1	1	3	10
Crested blade	8	1	4	5	7	25
Rejuvenation flake tablet	7		4		2	13
Micro-burin	40		17	3	17	77
Burin spall	1		1			2
Tranchet axe sharpening flake	3		1		4	8
Thinning flake					1	1
Unfinished core tool	3		1	1	2	7
Unfinished microlith	5		5	1	3	14
CORES						
Single platform blade core	6	2	2	5	12	27
Bipolar (opposed platform) blade core	5	1	2	2	7	17
Other blade core	2		3		2	7
Tested nodule/bashed lump	10	2	11	6	9	38
Single platform flake core	8	3	10	5	23	49
Multiplatform flake core	15	1	7	6	19	48
Keeled non-discoidal flake core	1					1
Flake core on a flake	4		5	2	10	21
Unclassifiable/fragmentary core	2		1	1	1	5
TOOLS						
Microlith	18	1	11	7	6	43
Backed blade			1			1
Truncated flake	9	1	7		3	20
Burin	2			1		3
Chisel arrowhead					1*	1
Laurel leaf					1*	1
End scraper	4		2*	1+2*	3+2*	14
End scraper on blade	1			1		2
Side scraper				1*		1

FEATURES BY PERIOD	Period 1 Mesolithic	Period 1? Mesolithic?	Period 2 Neolithic/EBA	Period 3 Later Prehistoric	Post-prehistoric/ unphased	Total
End and side scraper				2*	1*	3
Disc scraper			1*			1
Denticulated Scraper					1*	1
Scraper on a non-flake blank			1*			1
Piercer	1		1			2
Notched piercer	2		2	4	2	10
Spurred piece			1*			1
Serrated flake			1*			1
Denticulate			1*			1
Notch/Notched tool	1		1*		1*	3
Other knife	1				1*	2
Retouched flake	5		3+1*	1	2	12
Misc. retouch			1*			1
Tranchet axe	2				1	3
OTHER						
Hammerstone	1			3	3	7
Imported Stone					1	1
Total	2985	152	1802	958	1747	7644

of edge damage and the degree of cortication. Unworked burnt flint was quantified by weight and number. A copy of the catalogue has been deposited with the archive.

RAW MATERIALS

The raw material for the struck lithics was flint available from the local landscape. The majority of the flint was light to mid-mottled grey and the cortex, where present, was typically 2–4mm thick and buff coloured, with a slightly weathered surface. This material is available from the surface of the chalk downs and the local Tertiary deposits. A small number of flints exhibited more extensively abraded and pitted cortical surfaces indicating that the raw material was obtained from a fluvial source, such as gravels. In addition, fourteen pieces of Bullhead Bed flint, which exhibits an olive green cortex with an underlying orange band, were recovered; this flint was probably obtained from local Tertiary deposits. Thermal flaws and thermally fractured surfaces were observed on many of the lithics, but these only hindered the knapping of larger core tools. Overall, the raw material was of good flaking quality and reasonably substantial flint nodules were readily available.

CONDITION

The majority of the lithic assemblage recovered from archaeological features was in fresh condition. In contrast, artefacts from the topsoil exhibited extensive edge damage, probably resulting from ploughing and soil movement. The majority of artefacts exhibited a light to moderate bluish-white surface cortication, but a small number of flints, including several of the neolithic and Bronze Age artefacts, were entirely free from cortication.

POSSIBLE LATE UPPER PALAEOLITHIC OR EARLY MESOLITHIC LITHICS

Three blades measure more than 100mm in length and are considerably larger than the other blades and flakes in the assemblage (see below). These comprise a blade measuring 109 by 36mm, 12mm thick, that was struck from a single platform blade core (Fig. 20, 65), a slightly plunging distal trimming blade with a slight distal break, 17mm thick and measuring 115+ by 42mm, that was struck from a single platform core with platform-edge abrasion (pit [227], fill [228]) and a broken blade, measuring 126+ by 42mm, 14mm thick, that represents an early removal from a single-platform blade core (Fig. 20, 66). Superficially, these blades are comparable to late upper palaeolithic long blades, but their mode or production from single-platform cores is not entirely consistent with this early industry as long blades are typically struck from opposed platform cores, with blades removed alternately from each end. These blades are therefore more consistent with early mesolithic reduction techniques, although dating can only be tentative and it is possible that these flakes are unusually large late mesolithic products.

Significantly, one of these blades (Fig. 20, 65) was recovered from a late mesolithic pit, potentially indicating that it is contemporary with this feature, although it is possible that it represents an earlier blade imported to the site in the late mesolithic.

THE LATE MESOLITHIC ASSEMBLAGE

The greater part of the lithic assemblage dates from the late mesolithic. These lithics are described by artefact/debitage type in detail below. The compositions of the *in situ* assemblages are considered in the discussion of the mesolithic assemblages, below.

TOOLS AND DEBITAGE FROM TOOL MANUFACTURE

Tools form 1.5 percent of the stratified mesolithic assemblage. These artefacts are dominated by microliths (Fig. 18, 1–44), truncated flakes and piercers (Fig. 19, 45–51). Small numbers of edge-retouched flakes, scrapers, burins and tranchet axes were also found, as well as single examples of a notched tool and knife (Fig. 19, 52–60, and Fig. 20, 61–64). Debitage from the manufacture of tools forms 1.7 percent of the stratified mesolithic assemblage. The debitage comprises micro-burins, unfinished microliths, unfinished core tools, burin spalls, tranchet axe sharpening flakes and a thinning flake. These tools are described in detail below.

Microliths

Forty-three microliths were recovered (Tables 10 and 11). A low proportion of broad blade forms were present, comprising one edge-blunted point (Fig. 18, 1), five small obliquely blunted points (Fig. 18, 2–6), one isosceles triangle (Fig. 18, 7), a broken bi-truncated rhombic point (Fig. 18, 8) and six convex-backed points (Fig. 18, 9–14). The convex-backed points include three examples with convex backing along one side, comparable to Jacobi's type 4 (Fig. 18, 10–12), a large point with a convex back and straight retouch along the majority of the opposite edge that is broadly comparable to Jacobi's type 3d (Fig. 18, 9) and two variant forms with convex backs and slightly concave retouch along the opposite edge which create hooked proximal points (Fig. 18, 13–14).

Narrow blade rod and scalene micro-triangle microliths dominate the assemblage. Rod forms include five examples of Jacobi's type 5, with backing along only one edge (Fig. 18, 15–19), and a further example with a distal truncation that compares to Jacobi's type 5c, although a proximal break precludes firm identification (Fig. 18, 20). A further six rods exhibit retouch along both sides and are classed as Jacobi's type 6 (Fig. 18, 21–26). One of the latter rods (Fig. 18, 26) exhibits an oblique distal truncation and it may alternatively be considered as an exceptionally elongated scalene triangle of Jacobi's type 7a2. It is also worth noting that the breaks on another rod (Fig. 18, 24), which create form of a rhomboid, occurred during manufacture and are an intentional part of the design. Three rods also retain their bulbar ends, indicating that they were not produced by the micro-burin technique (Fig. 18, numbers 1, 25 and 26).

Fourteen scalene micro-triangles were present. Three of these exhibit an oblique truncation with retouch along the back edge and are of Jacobi's type 7a1 (although in one case an abrupt flake scar provided the backing; Fig. 18, 27–29), but the other eleven examples are of Jacobi's type 7a2 (Fig. 18, 30–40). The latter examples typically exhibit retouch on all sides of the scalene triangle, but three variants were recorded. One exhibits a square retouched truncation to the base (Fig. 18, 31) and two examples are not retouched on the back edge (Fig. 18, 39–40). It is also notable that the sides on two of the 7a2 scalene micro-triangles converge to form pointed distal ends (Fig. 18, 30 and 34), whereas the majority of examples exhibit square snapped bases. The elongated slender proportions of a few examples are particularly distinctive (e.g. Fig. 18, 35–37).

In addition to the forms considered above, one micro-lunate (Jacobi's type 9; Fig. 18, 41) and two unclassifiable forms (Fig. 18, 42–43) were recovered. The latter are most comparable to Jacobi's type 5 rods, although they are also comparable to edge-blunted points.

The examination of oblique truncations on the proximal and distal ends of the microliths reveals

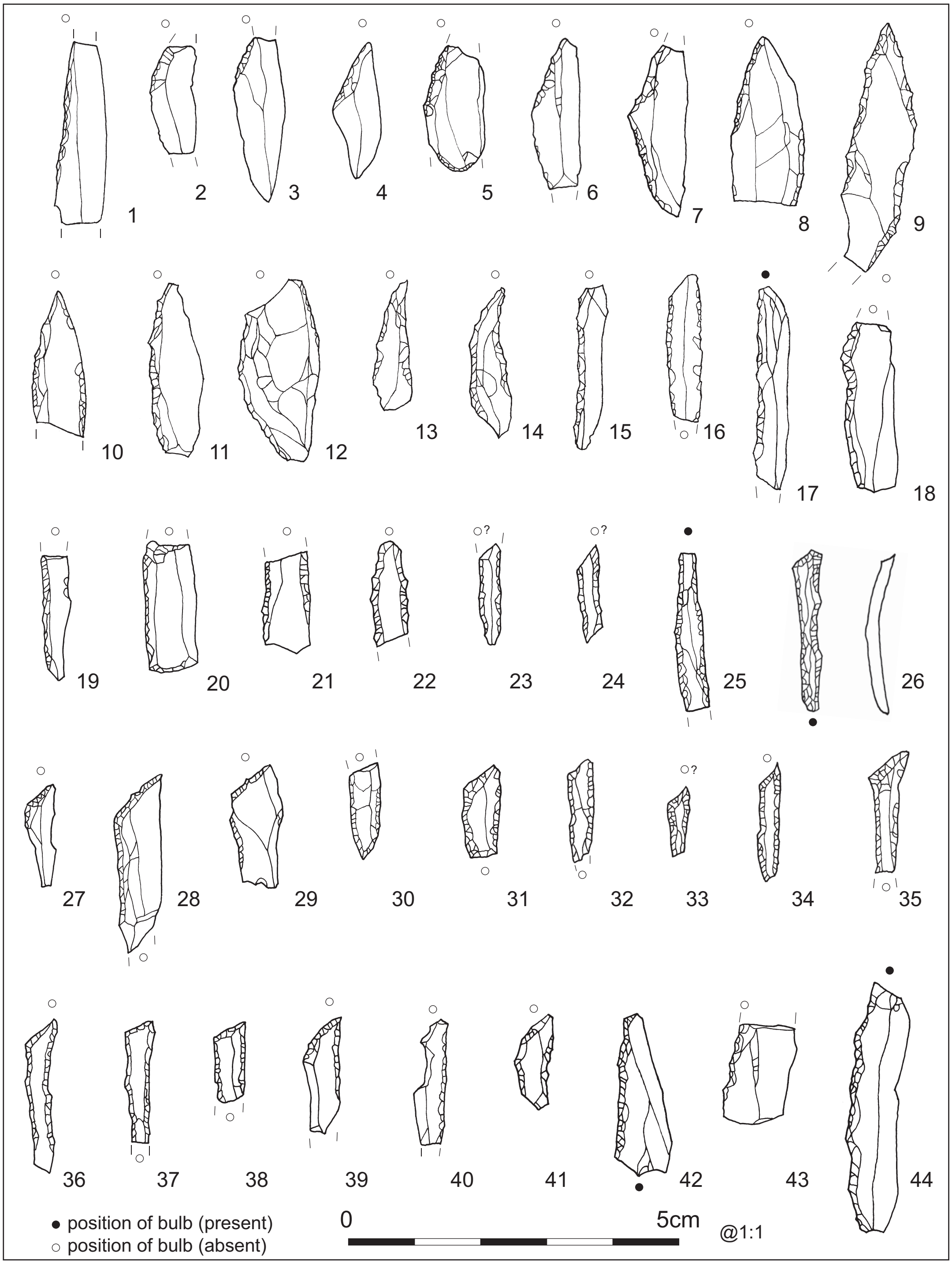

Fig. 18. Flint illustrations 1–44.

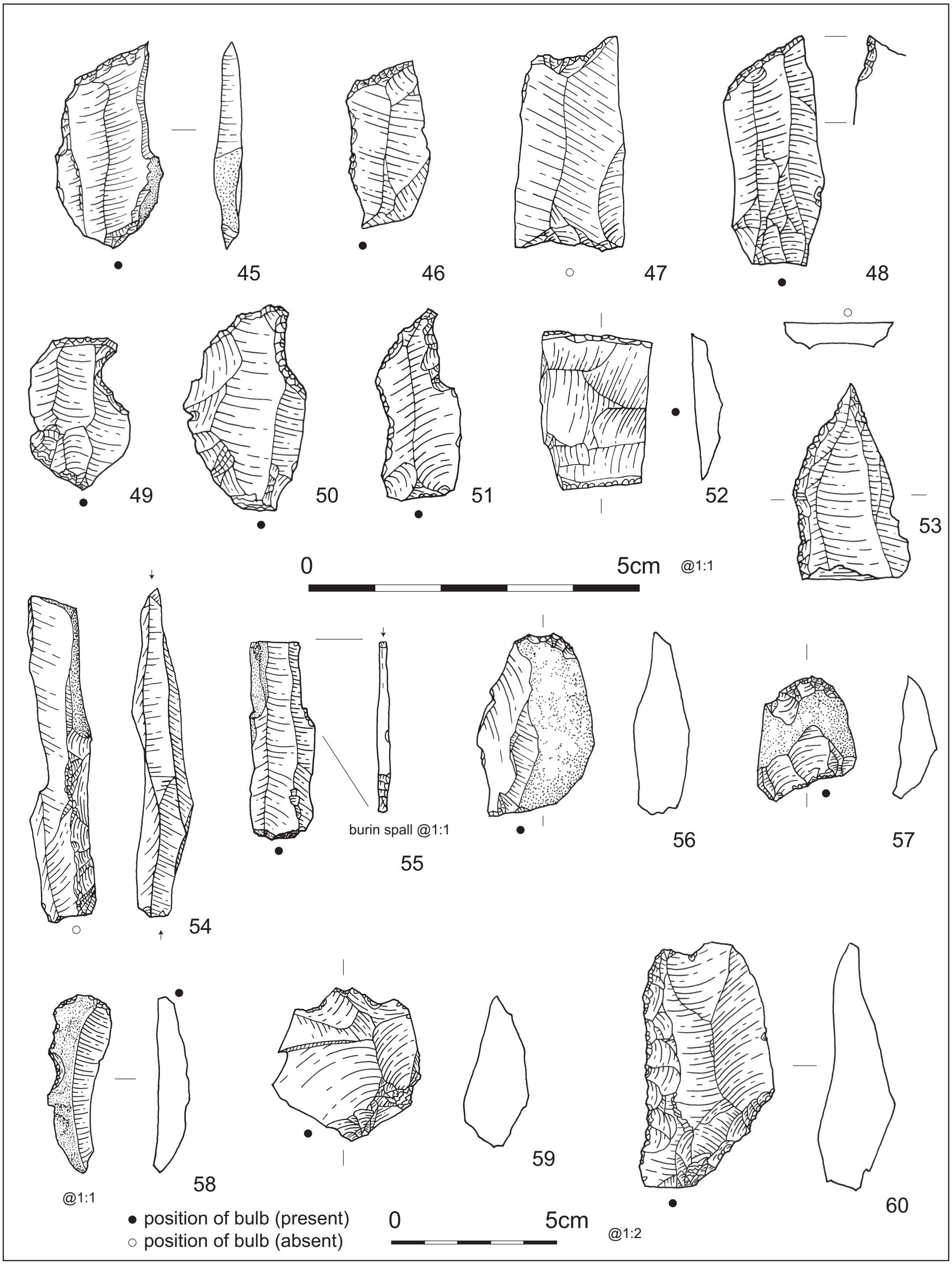

Fig. 19. Flint illustrations 45–60.

Table 10. Microliths.

		Phase					
Microlith type	**Jacobi code**	**Mesolithic**	**Mesolithic?**	**Neolithic/ EBA**	**Later Prehistoric**	**Post prehistoric /unphased**	**Total**
Edge-blunted point		1					1
Obliquely-blunted point	1a	3		1	1		5
Isosceles triangle	2a		1				1
Convex-backed point	3d			1			1
	4	3					3
	4 variant				2		2
Bi-truncated rhombic point	3a	1					1
Rod	5	2			2	1	5
	5c			1			1
	6	2		3		1	6
Scalene micro-triangle	7a1	2			1		3
	7a2	4		2		2	8
	7a2 variant			2		1	3
Micro-lunate	9					1	1
Microlith (unclass)	5?			1	1		2
Grand Total		18	1	11	7	6	43

that 24 were truncated on the proximal right hand side and six were truncated on the distal left hand side. The majority of these truncations were probably initiated using the micro-burin technique to remove the proximal or distal end, but additional retouch has removed the micro-burin scar on all except one (Fig. 18, 12); it is therefore possible that some of the slight distal truncations were simply created by retouch. The preference towards the truncation of microliths on proximal right hand side truncations is clear, however, at 86.6 percent of the total, and this figure compares well with the proportion of micro-burins notched on the proximal right hand side (92.2 percent see below).

Unfinished microliths

Fourteen artefacts have been classed as unfinished microliths. These comprise six blades notched at the proximal or distal end in preparation for snapping using the micro-burin technique and eight blades snapped using the micro-burin technique that have not been further modified into microliths. The location of the micro-burin notches on the unfinished microliths is variable, but there is a distinct preference towards the proximal right hand side, particularly among the examples that have been snapped (Table 12). In addition to the notches, one of the unsnapped microliths exhibits retouch along the left hand side and distal right hand side that forms a point, and one snapped example exhibits retouch extending along the right hand side. The snapped unfinished microliths all appear to have been abandoned due to the micro-burin snap failing to propagate in the correct direction (towards the bulb on a proximal micro-burin and towards the distal end on a distal micro-burin). Notably, the micro-burin scar on one finished microlith (Fig. 18, 12) remains prominent and unretouched, but the artefact was complete enough to allow classification as a convex-backed point.

Micro-burins

Seventy-seven micro-burins were recovered from the excavations. The vast majority of these were notched on the proximal right hand side (92.2 percent) and all notches were initiated by percussion on the ventral surface (Table 13). Knapping experiments by the author indicate that micro-burins notched on the proximal right hand side and distal left hand side are most easily created using

Table 11. Dimensions of microliths by form.

Context	Small Find No.	Microlith Type	Jacobi code	Broken	Length (mm)	Breadth (mm)	Thickness (mm)
414	23	Edge-blunted point		yes	26.5	6.5	2.5
347	25	Obliquely-blunted point	1a		22.5	6.9	2
231	33	Obliquely-blunted point	1a	yes	18.2	8.6	2.5
164	3	Obliquely-blunted point	1a		20.2	6.6	1.9
128	42	Obliquely-blunted point	1a	yes	15.5	5.5	2
135	27	Obliquely-blunted point	1a		24.4	6.8	2.9
454	56	Isosceles triangle	2a		25.8	8.2	3.1
164	38	Bi-truncated rhombic point	3a	yes	25.4	10.5	1.8
130	1	Convex-backed point	3d		36.8	9.8	3.1
414	35	Convex-backed point	4		26.7	11.8	2.2
299	26	Convex-backed point	4		25.3	7.8	2.2
243	22	Convex-backed point	4	yes	19.5	7.2	2.8
348	19	Convex-backed point	4 variant		18.1	5.3	2.3
395	31	Convex-backed point	4 variant		21.2	5.4	2.8
414	20	Rod	5	yes	23	3.6	2.3
286	30	Rod	5	yes	30.2	4.3	2.7
164	40	Rod	5		24.1	3.2	1.8
437	52	Rod	5	yes	18.1	3.5	1.3
255	24	Rod	5		21.7	4.4	1.6
286	29	Rod	5		25.1	7.5	2.6
342	99	Microlith (unclass)	5?	yes	14.9	8.6	2.4
234	17	Microlith (unclass)	5?		24	8.2	2.5
234	18	Rod	5c		19.2	7.3	2.8
182	8	Rod	6	yes	14	2.5	1.4
414	49	Rod	6	yes	49	6.7	1.5
437	6	Rod	6		23.4	3.5	1.5
184	45	Rod	6		13.7	2.5	1.5
156	13	Rod	6	yes	14.9	4.5	1.5
274	54	Scalene micro-triangle	7a1		17.6	7.2	2.2
176	10	Scalene micro-triangle	7a1		26.2	6.6	2.6
135	44	Scalene micro-triangle	7a1		14.8	4.1	1.4
231	7	Scalene micro-triangle	7a1 variant		13.3	5.2	2.3
164	39	Scalene micro-triangle	7a2		17.5	4.4	3
129	46	Scalene micro-triangle	7a2		14.4	3.4	1.1
130	43	Scalene micro-triangle	7a2		9.6	2.5	1.5
128	41	Scalene micro-triangle	7a2		13.8	3.8	1.1
164	4	Scalene micro-triangle	7a2		16.6	2.7	1.5
164	37	Scalene micro-triangle	7a2		22.1	3.5	2
272	12	Scalene micro-triangle	7a2		17.5	3.7	1.7
437	51	Scalene micro-triangle	7a2	yes	11	4.1	1.5
437	5	Scalene micro-triangle	7a2 variant		17.9	3.8	1.6
301	47	Scalene micro-triangle	7a2 variant		16.9	4.7	1.3
258	14	Micro-lunate	9		3.6	4.5	1.8
214	62	Backed blade			36.5	8.1	2.7

Table 12. Cross-table highlighting the position of the notch in relation to the orientation of the blade on notched or snapped unfinished microliths

	Side of blade notched					
	Left hand side		**Right hand side**		**Side indeterminate**	
End of flake notched	**Notched**	**Snapped**	**Notched**	**Snapped**	**Notched**	**Snapped**
Distal	1		1	1		
Medial						
Proximal	2*		2	6		
End indeterminate						1

* One notched on the ventral surface

the right hand for percussion, and that proximal left hand notches and distal right hand notches are most easily made using the left hand for percussion. However, a left handed knapper (as the author is) may produce micro-burins notched on the right hand side and distal left hand side by rotating the hand holding the flint (the right hand) in a slightly awkward position akin to a left-hander holding a pen from around the back. The dominance of micro-burins notched on the proximal right hand side therefore may indicate predominately right handed production, but equally the position of the notches may reflect cultural preference to which both left and right handed individuals commonly adhered.

Two micro-burins exhibit a double notch, with only the second notch achieving a successful micro-burin snap, and five micro-burins exhibit snaps that propagated in the wrong direction or cut straight across the blade. The latter represent knapping errors, but the low proportion of these pieces (6.5 percent of micro-burins) indicate that when the micro-burin technique was employed a successful microlith blank was produced on the majority of occasions. Notably, all eight of the unfinished microliths snapped using the micro-burin technique exhibited failed breaks.

In addition to the formal micro-burins, it was observed that the assemblage contained numerous proximal fragments of blades and flakes snapped at the proximal end, just below the bulb. These breaks were probably achieved by flexion and would have produced blade and flake segments for use or further modification.

Truncated blades and flakes

Eighteen truncated blades and two truncated flakes were recovered, making these tools the most common retouched artefacts after microliths. The truncated blades and flakes included both proximal and distal truncations, although the latter are most common, and the truncations were either straight across the blade or angled to the right or left. The angle on latter truncations was typically 20° to 30°; this angle is notably lower than the truncations present on obliquely-blunt microliths. The retouch on the truncations varied between convex, straight and concave. These attributes have been tabulated for ease of comparison (Table 14). Table 16 reveals that distal truncations on the left hand side are most numerous and these pieces commonly exhibit concave or straight retouched edge (see Fig. 19, 45–47). Notably, the dominant orientation of the truncation on these flakes (left distal) is opposite to the dominant orientation of the truncation on microliths (right proximal), but as the tools are typically orientated in the opposite

Table 13. Cross-table highlighting the position of the micro-burin notch in relation to the orientation of the blade. Note the dominance of notches on the proximal right hand side.

	Side of blade notched		
End of flake notched	Left hand side	Right hand side	Side indeterminate
Distal	2 (2.6%)	1 (1.3%)	
Medial	0	0	
Proximal	1 (1.3%)	71 (92.2%)	
End indeterminate			2 (2.6%)

Table 14. Cross-table highlighting the position and form of retouch on truncated blades and flakes.

		Orientation of truncation		
Location of truncation	**Form of retouch**	**Left hand side**	**Right hand side**	**Transverse**
Proximal end	Convex			
	Concave			1**
	Straight		3	
Distal end	Convex	1*		
	Concave	8**		
	Straight	5	2	1

* Exhibits slight additional retouch on right hand distal ventral surface and may be alternatively classed as a piercer.
** One blade is truncated at both ends and appears in this table twice.

direction (the tip of a microlith is typically at the bulbar end, while the tip of a truncated point is at the distal end of the artefact), the artefacts share a similar form. It may also be significant that the only convex truncated flake exhibited a very limited area of additional retouch on the ventral surface on the right side and in this respect it is similar to some of the piercers with straight or convex distal truncations and additional retouch on their distal right hand edges, considered below (Fig. 19, 48). The concave truncations also create strong points that are suitable for piercing.

Piercers

Twelve piercers were recovered. Two of these represent flakes with natural points that have been enhanced with slight retouch, but the other ten examples exhibit further modification and are classed as notched piercers; these tools are sometimes termed micro-awls. Four examples exhibit concave retouch on the distal right hand side and convex retouch along the distal edge that forms a strong point on the right hand distal corner (*see* Fig. 19, numbers 49 and 50, for examples). A further three examples exhibit very slightly concave retouch on the distal right hand edge and a straight to slightly convex distal truncation that forms a strong point (*see* Fig. 19, 51). The final three examples achieve a similar form but the distal edge is snapped and not retouched. The points on two of the latter tools are on the distal right hand side and one is pointed on the distal left hand side.

Burins and burin spalls

Burins represent an uncommon tool form and only three examples were found. Each of these burins was manufactured using subtly different techniques, although in all cases the burin scar was present on the side of a blade or bladelet. A large, 96mm long, uni-facial crested blade exhibits slight retouched truncations at the proximal and distal ends and burins have been removed from each end along the left hand side of the blade (Fig. 19, 54). A second blade exhibits a burin removal struck along the right hand edge from an unretouched distal end towards a slight notch in the artefact's side (Fig. 19, 55). The third example exhibits three burin scars struck from a snap. In addition, two small burin spalls were recovered, indicating that burins were produced at this location.

Scrapers

Scrapers are comparatively uncommon in the assemblage with only four end scrapers on flakes (e.g. Fig. 19, 56–57) and one end scraper on a blade present in the mesolithic phase assemblage; the latter tool also exhibits a broad notch on its right hand side (Fig. 19, 58). The scrapers recovered from later phases are predominately considered to date from the neolithic and Bronze Age and are discussed below, but one further end scraper on a flake and one end scraper on a blade date are considered to date from the mesolithic. The mesolithic scrapers only exhibit retouch on the distal edge and in all cases the retouch is comparatively limited and has not significantly altered the original form of the flake. The retouch is typically semi-abrupt and was applied using direct percussion. The exceptionally limited number of scrapers indicates that little hide preparation was undertaken at this location.

Edge-retouched flakes

Eleven Mesolithic, or possibly Mesolithic, edge-retouched flakes were recovered. The majority of these flints represent small broken fragments of flakes or have limited edge-retouch that cannot be classified, but two artefacts are of particular note. The first is a wedge-shaped fragment of broad flake that exhibits slight edge-retouch along both sides (Fig. 19, 52). This shape has been formed by intentional breakage, so this artefact may be considered as a wedge-shaped tool. The second flint of interest is a broad, blade-like flake with a hinged distal end and a broken proximal end that exhibits semi-abrupt retouch along the right hand side extending onto the break. This artefact vaguely resembles a microlith, although it is thicker and more crudely manufactured (Fig. 19, 53).

Notched tool

This artefact is distinctive, but without ready parallel. It has been manufactured on a broad, thick flake by the removal of two small flakes at the distal end to create a distinct nose. At the end of the nose a small notch, measuring 4mm wide by 1mm deep, has been delicately retouched. This notch, along with the two created by the adjacent flake removals, all appear to have been utilised (Fig. 19, 59).

Other knife

The function and categorisation of this tool is tentative, but heavy retouch along the left hand side and proximal right hand side appear to provide backing for the distal right hand edge, which exhibits clear use damage (Fig. 19, 60). The retouch may have assisted with the hafting of this artefact.

Tranchet axes, unfinished core tools and axe sharpening flakes

Two complete tranchet axes and one broken example were recovered. The two complete examples are crudely flaked and may be unfinished, although they are classifiable, as tranchet blows have been struck to form a blade edge (*see* Fig. 20, 62). These tools weigh 124g and 271g, respectively. The broken tranchet axe is flaked to a higher standard and exhibits a narrow blade edge with a clear tranchet removal (Fig. 20, 63). In addition, seven unfinished core tools in various stages of manufacture were recovered. Two large examples, weighing 655g and 725g respectively, have been crudely flaked, but exhibit enough working to indicate that they are rough-out mesolithic picks or tranchet axes. The remaining five rough-outs exhibit little or no cortex and were abandoned at later stages of manufacture. Three complete examples weigh 76g, 114g and 178g and two broken examples weigh 83g and 390g. The largest broken example is particularly well worked and exhibits two tranchet-style removals, although the blade edge is off-centre and unfinished (Fig. 20, 64). The presence of these unfinished core tools indicates that they were probably being produced at this location.

In addition, eight tranchet axe sharpening flakes were recovered. In all cases these represent primary sharpening flakes, rather than removals that rejuvenate utilised tranchet axes (*see* Fig. 20, 61). A single thinning flake was also recovered. The presence of these flakes further demonstrates that tranchet axes were being manufactured on this site.

Flake debitage

Flakes, blades, bladelets and chips dominate the lithic assemblage, representing 93 percent of the total. The vast majority of these date from the mesolithic, although it is probable that a small number of neolithic and Bronze Age flakes are present in the post-mesolithic contexts. It is not possible to distinguish the latter with confidence, but it may be significant that blades and bladelets form 23.3 percent of the mesolithic/mesolithic? phase assemblage, but only 21.7 percent of the post-mesolithic assemblage. In real terms, this equates to approximately 400 additional flakes in the post-mesolithic assemblage that could potentially date from the neolithic and Bronze Age. However, it is worth noting that the proportion of blades in individual mesolithic features varies between 18.6 and 34.8 percent (excluding features containing less than 100 flakes and blades), so this small variation may be insignificant. Overall, the proportion of blades in the mesolithic assemblage is comparatively low for the period as mesolithic assemblages commonly contain >34 percent blades (Ford 1987, 72). The low proportion of blades may, however, reflect the specific range of activities performed on this site, such as core tool production that produces numerous broad flakes.

The blade component was not measured, but it was visually sorted against graph paper into bladelets (blades less than 40mm) and blades. In total, 68.5 percent of the blades measured less than 40mm and the vast majority of these were between 30 and 40mm in length. The larger blades typically measured between 40 and 60mm and

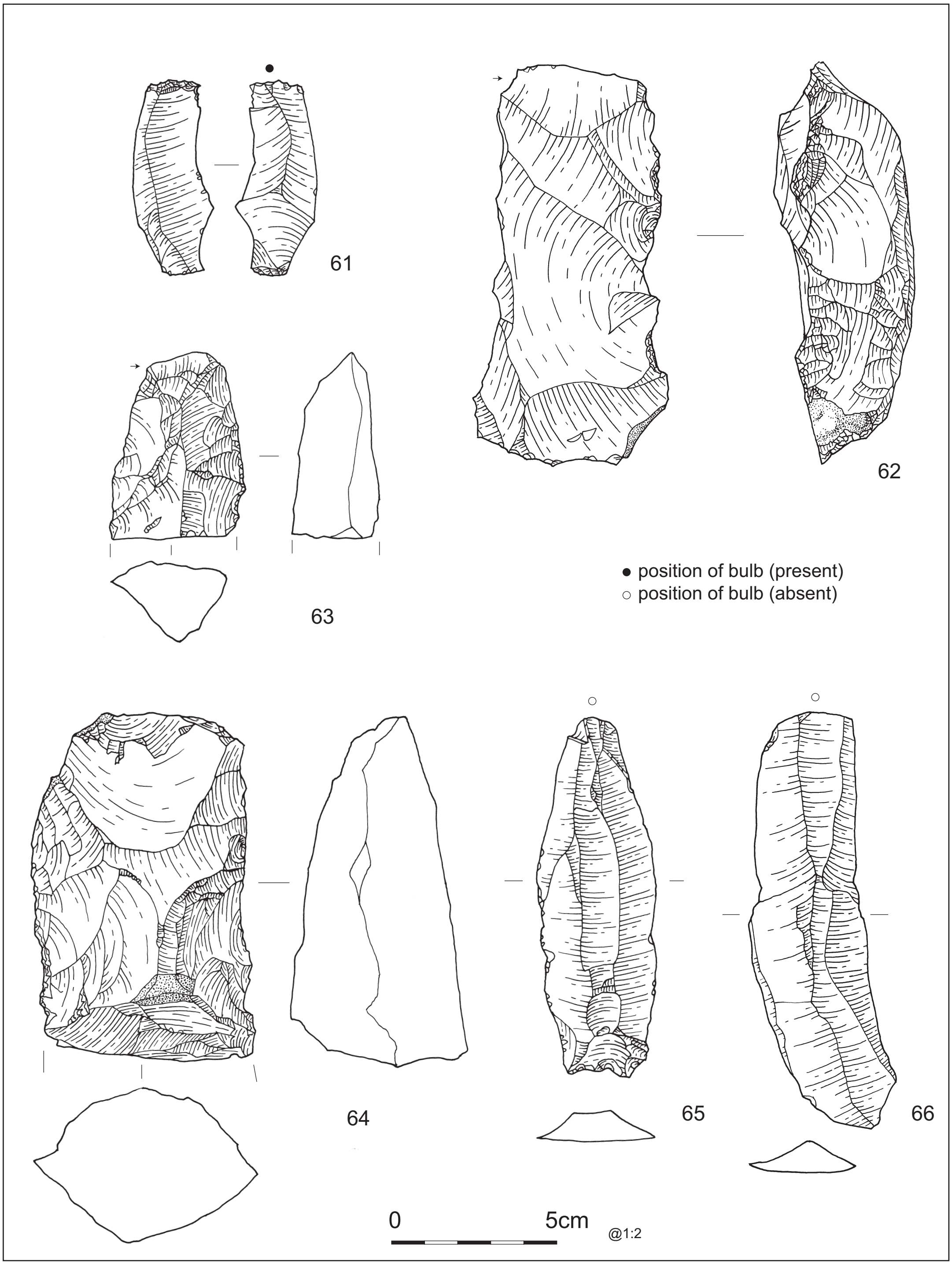

Fig. 20. Flint illustrations 61–66.

only about 25 blades were larger than 60mm in length, including the three blades that measured over 100mm that have been tentatively discussed as dating from the late upper palaeolithic or early mesolithic (see above). The blades commonly exhibit platform-edge preparation, indicating a carefully controlled reduction strategy. The majority of blades are regular, but were probably struck using direct percussion with a soft hammer, such as antler. A small number of exceptionally regular, parallel-sided and double-ridged 'prismatic' blades were recorded. These may have been produced by indirect percussion using a punch.

The flake assemblage is, in general, quite thin and regular, and many flakes exhibit platform-edge abrasion. A good proportion of cortical and partly cortical flakes, including many of reasonably large proportions, indicate the primary working of nodules. Some of the cortical flakes probably result from the preparation of cores, while others reflect the production of core tools. The larger cortical and partly cortical flakes were typically struck using a hard hammer percussor, such as a flint hammerstone, while the more regular flakes were most commonly struck using a soft hammer percussor, such as antler.

Cores

In total 213 flint cores were recovered. Fifty-one of these cores were orientated towards the production of blades and bladelets (23.9 percent of cores). This proportion rises to 25.9 percent among mesolithic/mesolithic? phase features and falls to 17.1 percent in neolithic/Early Bronze Age features. The latter indicates that some neolithic to Early Bronze Age flake cores may be present in the neolithic/Early Bronze Age features, but these could not be readily distinguished from the residual mesolithic cores present in the same features.

The blade cores include single platform (Fig. 21, 67–69) and opposed platform forms (Fig. 21, 70–71), but the former are most numerous. The majority of blade cores are orientated to the production of small blades and bladelets, although blade scars measuring 75mm were recorded on one core. The single platform blade cores have an average weight of 68g, while the opposed platform cores were typically lighter and more extensively worked, weighing an average of 47g (Table 15). The majority of cores exhibit plain platforms and several cores were rejuvenated by the removal of a core tablet (*see* Fig. 21, no. 70). Platform-edge abrasion was present on most of the cores.

Blade production was typically initiated by the removal of a crested blade, and 25 examples were recovered. Twenty four of these crested blades were prepared on one side only, but one exhibited removals in two directions. The crested blades typically measure between 40 and 65mm in length, but the longest measures 85mm in length (a burin was also manufactured on a 96mm uni-directional crested blade, see above). The crested blades provide a good indication of the size of the desired blade products, and the majority conform to the size of the blades in the assemblage.

The flake cores are roughly equally divided between single-platform and multi-platform forms. The flake cores significantly vary in size and on average they are heavier than the blade cores, with single-platform flake cores weighing an average of 82g and multi-platform cores weighing an average of 101g (Table 15). Many of the flake cores were quite

Table 15: The weight of cores

Core type	Total No	Min. weight	Max. weight	Average weight	Standard deviation
Single platform blade core	27	12	171	68.2	42.9
Bipolar (opposed platform) blade core	17	21	109	47.2	30.1
Other blade core	7	20	125	50.9	35.4
Tested nodule/bashed lump	38	17	322	117.5	84.2
Single-platform flake core	49	15	513	81.9	76.5
Multi-platform flake core	48	27	504	100.5	80.8
Keeled non-discoidal flake core	1	31	31	31.0	-
Core on a flake	21	16	110	54.8	26.3
Unclassifiable/fragmentary core	5	33	72	55.0	15.0

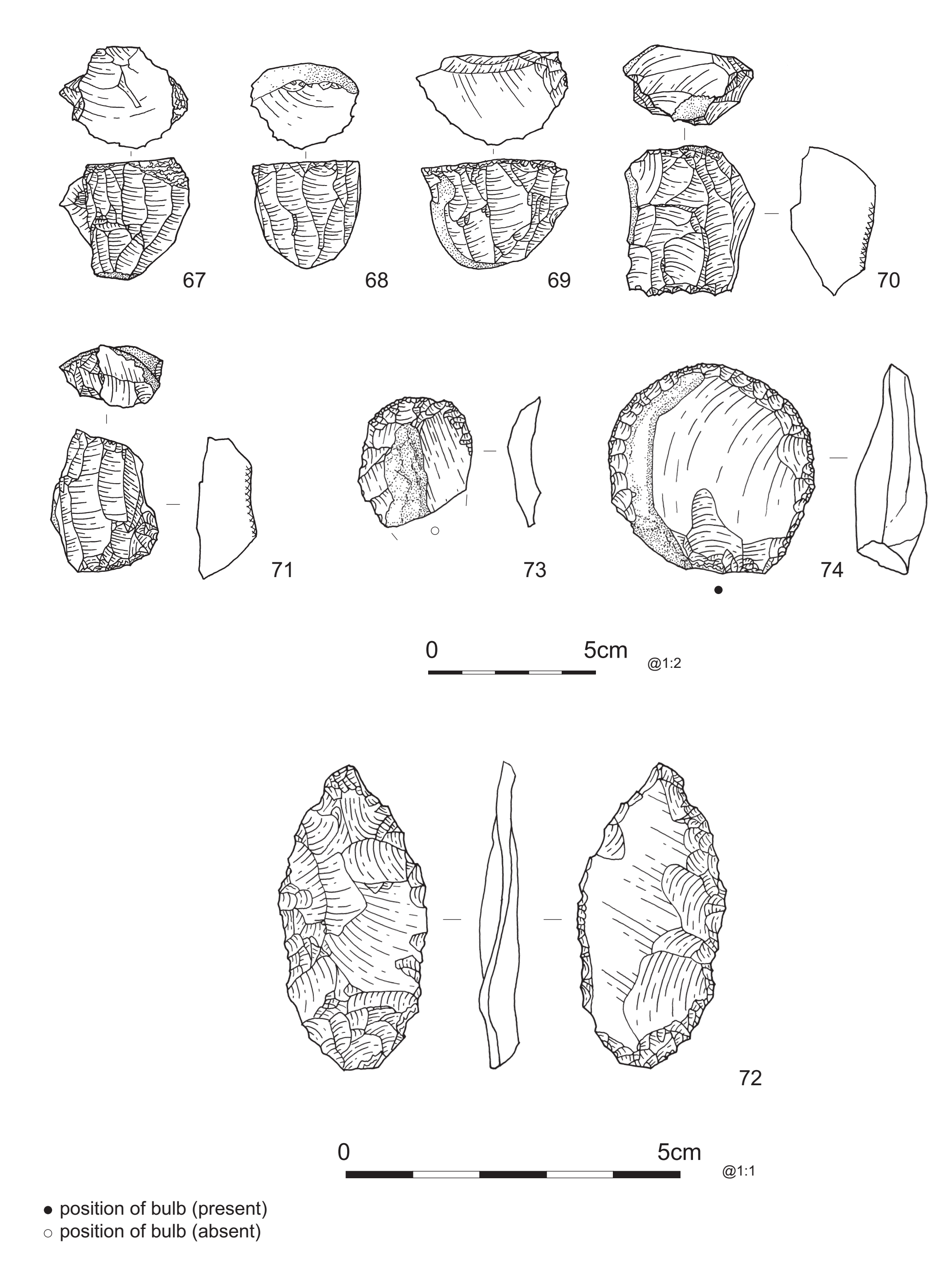

Fig. 21. Flint illustrations 67–74.

regularly worked, but the raw materials used were commonly frost-shattered and many cores were abandoned after minimal working.

Hammerstones

Seven flint hammerstones were recovered. Three examples are unworked pebbles that exhibit limited edge damage from use: these weigh 44g, 46g and 183g respectively. The other five examples, weighing 128g, 128g, 162g and 245g respectively, are flake cores that have been reused. The latter all exhibit extensive edge damage consistent with use as hammerstones for flint-knapping.

Imported stone

A well rounded, but broken, quartzite pebble weighing 98g was recovered from undated layer [123]. This raw material is not local to the region, indicating that the pebble was imported to the site. The pebble exhibits very slight pecking on one end, potentially indicating that it was used as a hammerstone or processor.

DISCUSSION OF MESOLITHIC ASSEMBLAGE

Distribution

The mesolithic lithics were predominately recovered from the south-east corner of Area B. In total, fifteen pits in five groups (G1-G5) are confidently dated to the mesolithic and further 11 pits are tentatively dated to the mesolithic (G20). In total, 2,985 flints were recovered from the mesolithic features and a further 152 flints were recovered from the features tentatively phased to the mesolithic; these features yielded 41 percent of the lithic assemblage from the site (Tables 16 and 9). Fourteen of the securely dated pits, in four clusters (groups G1-G4), were located within a very discrete area approximately 25m in diameter and the later archaeological features in this area yielded the majority of the residual mesolithic flint. The residual flintwork probably indicates that a substantial surface scatter also existed in this area, although some of the residual flint in the ring ditch (Structure 1) may result from the truncation of the mesolithic pits in pit group G3. Interestingly, field walking of the entire mitigation area prior to excavation yielded only 253 flints and no significant concentrations of activity were revealed. Indeed, the only diagnostic mesolithic flints recovered comprise a truncated blade and a crested blade (Butler 2008).

Composition of stratified assemblages and site function

The composition of the flint assemblages from mesolithic and possibly mesolithic features are shown by pit and feature group (Tables 16 and 17). The overall size of these assemblages is variable, but the majority of pits in groups G1-G4 yielded assemblages of 100–300 flints and pit [163] yielded the largest assemblage of 534 flints. In general, the composition of each pit is relatively similar, with comparable proportions of flakes, cores and tools (Tables 16 and 17). The proportion of burning and breakage are also relatively consistent between the features and on average 7.4 percent of artefacts were burnt and 35.1 percent were broken (Table 18). This indicates that each pit deposit probably results from a broad range of activities, rather than one specific task, and the high proportion of burning indicates that activities may have been undertaken close to fires. However, the quantity of lithics from each pit is comparatively small, potentially indicating that each event that created a pit assemblage was of comparatively short duration.

Flint knapping was a particularly prominent activity on this site and tasks undertaken including the preparation and working of cores for blades and flakes and the production of various tools, including tranchet axes, microliths and burins. Indeed, more tranchet axes and microliths were manufactured at this location than were deposited. On the site as a whole, ten tranchet axes and core tools were found, but only one has the appearance of a finished artefact. A further eight tranchet axe sharpening flakes further attest to the production of these tools. It is also notable that micro-burins, the debitage from manufacturing many forms of microlith, outnumber finished microliths in the mesolithic features at a ratio of 2:1. The tools being produced at this location were therefore predominately being used and lost or discarded elsewhere, although given the fairly limited excavation areas, this may be quite nearby.

As previously noted the assemblage of finished retouched artefacts is comparatively limited, comprising between 1–2.6 percent of the assemblage in each pit group, excluding chips. Overall, the retouched component of the assemblage is dominated by microliths and truncated blades, with low proportions of scrapers, core tools, piercers, burins and other tools (Table 19). The dominance of microliths, which are thought to

Table 16. The lithic assemblage from the mesolithic phase by group and feature.

	G1				G2				G3						G4				G5	
CATEGORY TYPE (cut no.)	**222**	**261**	**298**	**G1 Total**	**127**	**133**	**163**	**G2 Total**	**238**	**242**	**254**	**397**	**413**	**G3 Total**	**171**	**173**	**175**	**G4 Total**	**381**	**Total**
Flake	202	131	138	471	92	185	287	564	110	62	124	82	211	589	57	7	65	129	2	1755
Blade	19	8	8	35	11	15	19	45	9	7	9	7	13	45	6	2	9	17		142
Bladelet	48	25	27	100	30	37	91	158	17	5	23	28	30	103	16	1	30	47		408
Blade-like	13	7	5	25	7	5	13	25	4	2	6	4	5	21	2	1	8	11		82
Irregular waste	3	3	1	7		4	1	5	1				1	2			3	3		17
Chip	6	10	6	22		12	48	60	2		1	1	12	16	2			2		100
Sieved chips 10–4 mm	30	8	2	40	5	49	26	80	8					8						128
Sieved chips 4–2 mm		9	3	12	9	67	17	93	9				48	57			20	20		182
Rejuvenation flake core face/edge						1	1	2			2			2						4
Crested blade			1	1		1	1	2	3				2	5						8
Rejuvenation flake tablet		2		2			1	1		1			3	4						7
Single platform blade core	1	1		2		1	2	3								1		1		6
Bipolar (opposed platform) blade core	2	1		3			1	1					1	1						5
Other blade core			1	1								1		1						2
Tested nodule/bashed lump	1	3	2	6		1		1				1	1	2		1		1		10
Single platform flake core		1		1	1	2	2	5	1		1			2						8
Multiplatform flake core	1	1		2	1	4	2	7	3		1			4	1	1		2		15
Keeled non-discoidal flake core																	1	1		1
Core on a flake	1	2		3		1		1												4
Unclassifiable/fragmentary core							1	1									1	1		2
Micro-burin	1	4		5	2	3	10	15	1	1	1	5	5	13	3		4	7		40
Burin spall						1		1												1
Microlith			1	1	2	2	6	10		1	1		4	6			1	1		18
Unfinished microlith											1	1	3	5						5
Truncated flake	1			1	1	2	1	4		1	1		1	3			1	1		9
Burin							1	1					1	1						2
End scraper		1	1	2							1			1			1	1		4
End scraper on blade													1	1						1

	G1				G2				G3						G4				G5	
CATEGORY TYPE (cut no.)	**222**	**261**	**298**	**G1 Total**	**127**	**133**	**163**	**G2 Total**	**238**	**242**	**254**	**397**	**413**	**G3 Total**	**171**	**173**	**175**	**G4 Total**	**381**	**Total**
Piercer	1			1																1
Notched piercer	1			1																1
Other borer															1			1		1
Notch															1			1		1
Other knife						1		1												1
Retouched flake			1	1							1	2	1	4						5
Unfinished core tool						1		1				1		1	1			1		3
Tranchet axe							1	1											1	2
Tranchet axe sharpening flake							2	2									1	1		3
Hammerstone											1			1						1
Grand total	331	217	197	745	161	395	534	1090	168	80	174	133	343	898	90	14	145	249	3	2985

represent component parts of composite tools such as projectiles, may indicate an emphasis on hunting. However, considering the evidence for microlith production, it is most probable that the microliths recovered result from the maintenance of composite tools that were damaged when hunting at another location. The low proportion of scrapers indicates that hides were probably not prepared at this location. The presence of a single finished tranchet axe and the absence of serrated flakes indicate little plant working.

There are, however, subtle differences in the retouched assemblages from individual pits and pit groups that are potentially of great significance for dating the site and interpreting temporal patterns of activity. Firstly, the retouched tools present in pit groups G1-G4 differ, but the artefacts from each pit within a group are broadly comparable. Pit groups G1 and G4 yielded a broad range of artefacts and no particular tool type was dominant. In contrast, pit groups G2 and G3 contain elevated proportions of microliths, but the microliths from each group are of different forms. Group G2 is dominated by obliquely blunted points and scalene micro-triangles, with the only other forms comprising a rod and a bi-truncated rhombic point, while Group 3 is dominated by rods and convex-backed points, with the only other microlith type being an edge-blunted form comparable to a rod (Table 20). Groups G1 and G4 each yielded only one microlith: group G1 contained a convex-backed point comparable to those from the adjacent pits in group G3 and group G4 yielded a scalene micro-triangle comparable to those from the adjacent pits in group G2.

The microlith forms in groups G1 and G3 to the north of the main cluster are therefore distinctly different from those in groups G2 and G4 to the south of the site. This difference may result from the maintenance of different types of composite tools, but equally it may reflect chronological changes in microlith typology. This point will be returned to in relation to the programme of radiocarbon dating but, whichever the case, the difference in the range of retouched tools between pit groups G1/G4 and G2/G3, combined with the presence of different microlith types between pit groups G1/G3 and G2/G4, indicates that each of these four pit groups has its own character and that each cluster of pits is the product of spatially and/or chronologically discrete activity. This observation is of great significance as it allows speculation over

Table 17. Lithics from mesolithic? phase (G20) by feature.

	Mesolithic? features G20											Grand Total
CATEGORY TYPE (cut no.)	**161**	**169**	**227**	**367**	**447**	**453**	**455**	**463**	**499**	**501**	**503**	
Flake	5	29	5	1	5	13	5	19	3	2	1	88
Blade		3	1	2	4	2	1	3				16
Bladelet	2	4		1	1	1		10				19
Blade-like		1			2							3
Sieved chips 10-4 mm		10										10
Sieved chips 4-2 mm											3	3
Rejuvenation flake core face/edge						1						1
Crested blade					1							1
Single platform blade core		1				1						2
Bipolar (opposed platform) blade core		1										1
Tested nodule/bashed lump					1				1			2
Single platform flake core	1							1			1	3
Multi-platform flake core		1										1
Microlith (isosceles triangle)						1						1
Truncated flake								1				1
Grand total	8	50	6	4	14	19	6	34	4	2	5	152

Table 18. Burnt and broken worked flints in the mesolithic/mesolithic? feature groups (G1–G5 and G20).

	G1	**G2**	**G3**	**G4**	**G5**	**G20**	**Grand Total**
No. of burnt worked flints (%*)	66 (9.8%)	61 (7.1%)	51 (6.2%)	23 (10.1%)	–	1 (0.7%)	202 (7.4%)
No. of broken worked flints (%*)	266 (39.6%)	302 (35.2%)	272 (33.3%)	85 (37.4%)	–	27 (19.4%)	952 (35.1%)

* Percentage of total assemblage excluding chips

Table 19. Comparison of the key tools groups in the mesolithic/mesolithic? feature groups (G1-G5 and G20).

	G1		**G2**		**G3**		**G4**		**G5**		**G20**		**Total**	
Retouched tool type	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Microliths	1	14.3	10	55.6	6	35.3	1	16.7			1	50.0	19	37.3
Truncated flakes	1	14.3	4	22.2	3	17.6	1	16.7			1	50.0	10	19.6
Scrapers	2	28.6			2	11.8	1	16.7					5	9.8
Core tools (inc. Unfinished tools)			2	11.1	1	5.9	1	16.7	1	100			5	9.8
Piercing tools	2	28.6					1	16.7					3	5.9
Burins			1	5.6	1	5.9							2	3.9
Other tools (edge-retouch, notch, knife)	1	14.3	1	5.6	4	23.5	1	16.7					7	13.7
Total tools	7	100	18	100	17	100	6	100	1	100	2	100	51	100

Table 20: Microliths from the mesolithic/mesolithic? phase features.

		Mesolithic								Mesolithic?	
		G1	G2			G3			G4	G20	
CATEGORY TYPE	**Jacobi code**	**298**	**127**	**133**	**163**	**242**	**254**	**413**	**175**	**453**	**Grand Total**
Edge-blunted point	–							1			1
Obliquely-blunted point	1a		1	1	1						3
Isosceles triangle	2a									1	1
Bi-truncated rhombic point	3a				1						1
Convex-backed point	4	1				1		1			3
Rod	5				1		1	1			3
	6							1			1
Scalene micro-triangle	7a1			1					1		2
	7a2		1		3						4
Grand total		1	2	2	6	1	1	4	1	1	19

the temporality and duration of occupation on the site (*cf.* Garrow 2006).

As noted above, the individual pits yielded comparatively limited assemblages and this may indicate that each represents a brief occupation event. However, it is unclear if the pits within each group were excavated sequentially or if the pits were open and being filled at the same time. If the pits were excavated sequentially it is possible to envisage a pit group developing as one group occupying the site on one or more occasions. If the pits within a single group were open at the same time, we may envisage the contents of each pit being generated by different groups occupying the site at the same time, as the comparable assemblages from the pits within each group certainly do not indicate that the features had different functions. These scenarios can be further expanded to consider the relationship of the four pit groups. Each pit cluster could result from successive occupation events by one or more groups of people, or the four clusters could represent four groups occupying the site at the same time with each group periodically excavating pits. Various permeations and combinations of these arrangements are also possible.

Radiocarbon dating

Two radiocarbon dates have been obtained on fragments of charred hazelnut fragments from pits yielding obliquely blunted points and scalene micro-triangles to the south of the site. A charred hazelnut fragment from pit [133], (fill [135]), which is part of pit group G2, provided a date of 7410±35 BP (6400–6220 cal BC at 95.4 percent confidence), while a second piece from pit [175], (fill [176]) in pit group G4 yielded a date of 7440±40 BP (6420–6220 cal BC at 95.4 percent confidence). No dates are directly associated with the northern group of pits, as no suitable charred remains were recovered, but two pits in group G3 were truncated by the ring ditch (Structure 1) and a fragment of charred hazelnut shell, recovered from the primary fill of the ditch less than 2m from these pits, was radiocarbon dated (intervention [213], fill [214]). This hazelnut shell yielded a date of 7280±35 BP (6230–6050 cal BC at 95.4 percent confidence), which is statistically later than the dates associated with the southern pit group.

The radiocarbon dating therefore only partially assists with interpreting the temporal patterns of occupation. The dates reveal that two dated pits from the southern pit groups G2 and G4 are broadly contemporary, dating from c 6420–6200 cal BC, although the individual features may have been excavated many decades apart. However, the date from the ring ditch provides evidence for later activity on site. This date cannot be directly associated with pit group G3 and the date of the northern pit groups G1 and G3, associated with rods and convex-backed points, must remain open. The later date does, however, indicate that the late mesolithic activity was potentially of some duration, allowing the possibility that all of the pit groups were developing contemporaneously to be discounted.

Regional context

Rod and scalene micro-triangle dominated assemblages are comparatively common in Britain, but few assemblages are securely dated. The dates of 6420–6200 cal BC and 6400–6200 cal BC obtained from pits [133] and [175] respectively, represent the earliest secure dates for scalene micro-triangles in southern Britain. This microlith type, however, endures for a long period of time and its use potentially spans the greater part of the late mesolithic. The recent excavation of seven pits containing scalene micro-triangles and an obliquely blunted point on the M1 motorway widening at Junction 9 provided a series of dates that have been modelled at 5220–5060 cal BC, 68.2 percent probability (Griffiths and Stansbie forthcoming), but latest secure dates for scalene micro-triangles have been obtained from March Hill Carr in the Pennines. The dates from this site have been modelled at 4710–4610 cal BC, 68.2 percent probability (*ibid.*).

A number of sites in the more immediate landscape have yielded artefact assemblages comparable to those from the American Express Community Stadium, but unfortunately the radiocarbon dates obtained from these sites are all problematic. At Broom Hill, Braishfield, Hampshire, a remarkably similar artefact assemblage was recovered, but unfortunately this site has not been fully published and only a summary interim report is available (O'Malley and Jacobi 1978). The range of retouched tools includes obliquely blunted points, rods, scalene micro-triangles (including elongated forms), convex-backed points, notched piercers (micro-awls) and tranchet axes. A large proportion of the assemblage from this site was also recovered from a series of pits. Pit 3, was 'dominated by scalene micro-triangles and narrow rods' (O'Malley and Jacobi 1978, 35) and three dates were obtained on samples of unspecified charcoal from the base of the feature. These dates overlap in the middle of the 7th Millennium BC: 6365±150 BP (5620–4990 cal BC at 95.4 percent confidence), 6565±150 BP (5760–5210 cal BC at 95.4 percent confidence) and 6590±150 BP (5800–5220 cal BC at 95.4 percent confidence; *ibid.*, 37). The upper fill of pit 3 yielded a later date on hazelnut shells of 5880±120 BP (5050–4460 cal BC at 95.4 percent confidence), but this date may relate to later activity. Although problematic (there is potential for an 'old wood' effect), the dates from Broom Hill indicate the site is at least 500 years later than the site at the American Express Community Stadium and potentially of considerably later date. This indicates that the retouched artefacts from the stadium excavations may not represent closely datable forms.

A comparable artefact assemblage was also recovered from the rock shelter at High Hurstwood, Sussex (Jacobi and Tebbutt 1981). Notably, the range of microliths from this site includes a high proportion of lanceolate/convex-backed points that are comparable to the examples from the northern pit groups G1 and G3 from the American Express Community Stadium. Although scalene micro-triangles are also present, they are significantly outnumbered. The assemblage also contains a high proportion of truncated blades and few scrapers. Three radiocarbon dates were obtained on charcoal from the High Hurstwood cave shelter: Spit B, 6800± 100 BP (Q-1311), 5970–5520 cal BC at 95.4% confidence; Spit C, 6920± 110 BP (Q-1312), 6010–5630 cal BC at 95.4% confidence; Spit D, 7105± 70BP (Q-1562), 6210–5800 cal BC at 95.4% confidence.

These dates are again problematic due to the unspecified charcoal that was dated, but they appear to be marginally later than those obtained from the obliquely blunted point/scalene micro-triangle associated pits found during the stadium excavations. It is not possible, however, to determine on the current evidence if the elevated proportions of lanceolate/convex-backed points forms in this assemblage, or the northern pit groups G1 and G3 at Falmer, represent a chronological change in the microlith industry or variation due to the specific range of activities and tools used at these locations.

THE NEOLITHIC AND BRONZE AGE LITHIC ASSEMBLAGE

Neolithic and Bronze Age lithics were comparatively scarce and the lithic assemblages recovered from the neolithic and Bronze Age features were dominated by residual mesolithic artefacts. However, as highlighted above, the neolithic/Bronze Age features contain marginally lower proportions of blades and blades cores than the mesolithic features. This potentially indicates that a small number of neolithic and Early Bronze Age flakes and cores (approximately 400 flints) were present in the neolithic/Early Bronze Age features although, unfortunately, this material cannot be confidently distinguished from the residual mesolithic artefacts.

Neolithic to Bronze Age retouched tools were more readily identifiable on typological and technological grounds and 23 artefacts are considered to date from these periods. Neolithic/Bronze Age ring ditch Structure 1 yielded nine artefacts that may be broadly contemporary with the feature (two end scrapers, a disc scraper, a spurred piece, a serrated flake, a denticulate, a notched tool, an edge-retouched flake and a piece of miscellaneous retouch), while the internal ring ditch features yielded one further tool (a scraper on a non-flake blank). These artefacts were typically manufactured on broader and thicker flakes than were present in the mesolithic assemblage and many of the artefact types are not present in the mesolithic phase features. Two artefacts from ring ditch Structure 1 are of particular note: a pressure-flaked end scraper, probably dating from the late neolithic/Early Bronze Age (Fig. 21, 73) and a large, well-manufactured disc scraper dating from the neolithic/Early Bronze Age (Fig. 21, 74). In addition, five scrapers were recovered from three later prehistoric pits ([115], [285] and [341], G11) that truncate ring ditch Structure 1.

The remaining neolithic and Bronze Age artefacts were recovered as unstratified finds. The most diagnostic artefacts are a small, early neolithic laurel leaf-type point recovered from the topsoil (Fig. 19, 72), a middle neolithic chisel arrowhead recovered from layer 469, a fragment of a neolithic/Early Bronze Age knife from pit [471] and a neolithic or Bronze Age denticulated end scraper with seven 3mm long teeth, spaced at 10mm intervals, recovered from the surface of the natural ([101]).

These flints provide some evidence for neolithic and Bronze Age activity in the landscape, with a slight focus on ring ditch Structure 1, but the assemblage is limited and provides little insight into the character of later prehistoric activity**.**

Illustration catalogue

1. Edge-blunted point with slight break to tip. Pit [413], fill [414]. SF23. Phase 1, G3. Late mesolithic.
2. Obliquely-blunted point, Jacobi 1a, with slight break to tip. Pit [127], fill [128]. SF42. Period 1, G2. Late mesolithic.
3. bliquely-blunted point, Jacobi 1a. Pit [133], fill [135]. SF27. Period 1, G2. Late mesolithic.
4. Obliquely-blunted point, Jacobi 1a. Pit [163], fill [164]. SF3. Period 1, G2. Late mesolithic.
5. Obliquely-blunted point, Jacobi 1a, burnt and broken medial fragment. Ditch [230], fill [231]. SF33. Period 2, G6. Late mesolithic.
6. Obliquely-blunted point, Jacobi 1a. Pit [341], fill [347]. SF25. Period 3, G11. Late mesolithic.
7. Isosceles triangle, Jacobi 2a, with slight damage to tip. Pit [453], fill [454]. SF56. Period 6, G20. Late mesolithic.
8. Bi-truncated rhombic point, Jacobi 3a, with broken distal end. Pit [163], fill [164]. SF38. Period 1, G2. Late mesolithic.
9. Large convex-backed point, Jacobi 3d. Ditch [131], fill [130]. SF1. Period 2, G6. Late mesolithic.
10. Convex-backed point, Jacobi 4, broken. Pit [242], fill [243]. SF22. Period 1, G3. Late mesolithic.
11. Convex-backed point, Jacobi 4. Pit [298], fill [299]. SF26. Period 1, G1. Late mesolithic.
12. Convex-backed point, Jacobi 4. Pit [413], fill [414]. SF35. Period 1, G3. Late mesolithic.
13. Convex-backed point, Jacobi 4 variant. Pit [341], fill [348]. SF19. Period 3, G11. Late mesolithic.
14. Convex-backed point, Jacobi 4 variant. Layer [395]. SF31. Period 3, G13. Late mesolithic.
15. Rod, Jacobi 5. Pit [163], fill [164]. SF40. Period 1, G2. Late mesolithic.
16. Rod, Jacobi 5. Pit [254], fill [255]. SF24. Period 1, G3. Late mesolithic.
17. Rod, Jacobi 5, broken. Pit [285], fill [286]. SF30. Period 3, G11. Late mesolithic.
18. Rod, Jacobi 5, broken. Pit [285], fill [286]. SF29. Period 3, G11. Late mesolithic.
19. Rod, Jacobi 5. Pit [440], fill [437]. SF52. Period 3, G 11. Late mesolithic.
20. Rod, Jacobi 5c?, broken. Ditch [233], fill [234]. SF18. Period 2, G6. Late mesolithic.
21. Rod, Jacobi 6, broken. Pit [413], fill [414]. SF49. Period 1, G3. Late mesolithic.
22. Rod, Jacobi 6, broken. Pit [155], fill [156]. SF13. Period 2, G6. Late mesolithic.
23. Rod, Jacobi 6, oblique break creates resemblance to Jacobi 7a2. Ditch [181], fill [182]. SF8. Period 2, G6. Late mesolithic.
24. Rod, Jacobi 6, oblique proximal and distal breaks, both prior to retouch. Ditch [183], fill [184]. SF45. Period 2, G6. Late mesolithic.
25. Rod, Jacobi 6, with slight distal break. Pit [413], fill [414]. SF20. Period 1, G3. Late mesolithic.
26. Rod, Jacobi 6 or elongated 7a2 scalene micro-triangle. Pit [440], fill [437]. SF6. Period 5, G17. Late mesolithic.
27. Scalene micro-triangle, Jacobi 7a1. Pit [133], fill [135]. SF44. Period 1, G2. Late mesolithic.
28. Scalene micro-triangle, Jacobi 7a1. Proximal end snapped without using micro-burin technique. Pit [175], fill [176]. SF10. Period 1, G4. Late mesolithic.
29. Scalene micro-triangle, Jacobi 7a1, backing retouch is relatively crude. Pit [273], fill [274]. SF54. Period 3, G12. Late mesolithic.
30. Scalene micro-triangle, Jacobi 7a2, note distal point and incomplete retouch on blade edge. Pit [127], fill [128]. SF41. Period 1, G2. Late mesolithic.
31. Scalene micro-triangle, Jacobi 7a2 variant with squared basal retouch. Ditch [230], fill [231]. SF7. Period 2, G6. Late mesolithic.
32. Scalene micro-triangle, Jacobi 7a2. Ditch [131], fill [129]. SF46. Period 2, G6. Late mesolithic.
33. Scalene micro-triangle, Jacobi 7a2. Ditch [131], fill [130]. SF43. Period 2, G6. Late mesolithic.
34. Scalene micro-triangle, Jacobi 7a2. Pit [163], fill [164]. SF4. Period 1, G2. Late mesolithic.
35. Scalene micro-triangle, Jacobi 7a2, elongated form with

slightly concave edge. Pit [163], fill [164]. SF39. Period 1, G2. Late mesolithic.

36. Scalene micro-triangle, Jacobi 7a2, elongated form with concave edge. Pit [163], fill [164]. SF37. Period 1, G2. Late mesolithic.
37. Scalene micro-triangle, Jacobi 7a2, elongated form with slightly concave edge. Pit [400], fill [272]. SF12. Period 5, G17. Late mesolithic.
38. Scalene micro-triangle, Jacobi 7a2, burnt and broken. Pit [440], fill [437]. SF12. Period 5, G17. Late mesolithic.
39. Scalene micro-triangle, Jacobi 7a2 variant without backing retouch. Ditch [302], fill [301]. SF47. Period 2, G6. Late mesolithic.
40. Scalene micro-triangle, Jacobi 7a2 variant without backing retouch. Pit [440], fill [347]. SF5. Period 5, G17. Late mesolithic.
41. Micro-lunate, Jacobi 9. Pit [257], fill [258]. SF14. Period 4, G15. Late mesolithic.
42. Unclassified microlith. Ditch [233], fill [234]. SF17. Period 2, G6. Late mesolithic.
43. Unclassified broken microlith, possibly a Jacobi 5 rod or 1a obliquely blunted point. Pit [341], fill [342]. SF99. Period 3, G 11. Late mesolithic.
44. Backed bladelet comparable to Jacobi 5 rod. Ditch [213], fill [214]. Period 2, G6. Late mesolithic.
45. Obliquely truncated flake; truncated to left hand side. Pit [222], fill [223]. SF80. Period 1, G1. Late mesolithic.
46. Obliquely truncated flake; truncated to left hand side. Pit [242], fill [243]. SF69. Period 1, G3. Late mesolithic.
47. Bi-truncated flake with distal concave truncation to left hand side and a straight proximal truncation. Ditch [213], fill [217]. SF122. Period 2, G6. Late Mesolithic.
48. Obliquely truncated flake; convex truncation to left hand side with limited retouch on ventral distal right hand side. Comparable to piercers. Pit [133], fill [135]. SF124. Period 1, G2. Late mesolithic.
49. Notched piercer. Pit [115], fill [116]. SF85. Period 3, G11. Late mesolithic.
50. Notched piercer. Pit [222], fill [223]. SF78. Period 1, G1. Late mesolithic.
51. Notched piercer. Pit [271], fill [406]. SF36. Period 6, G21. Late mesolithic.
52. Edge-retouched flake snapped into a wedge-shaped segment. Pit [397], fill [396]. SF127. Period 1, G3. Late mesolithic.
53. Broken blade with edge-retouch along right hand side. Pit [397], fill [396]. SF126. Period 1, G3. Late mesolithic.
54. Double-ended burin with truncated ends manufactured on a crested blade. Pit [163], fill [164]. SF111. Period 1, G2. Late mesolithic.
55. Burin on a blade; note the notch to terminate burin blow on right hand side. Pit [285], fill [287]. SF75. Period 3, G11. Late mesolithic.
56. End scraper on a flake. Pit [261], fill [262]. SF92. Period 1, G1. Late mesolithic.
57. End scraper on a flake. Pit [298], fill [299]. SF106. Period 1, G1. Late Mesolithic.
58. End scraper on a blade with notched side. Pit [413], fill [414]. SF113. Period 1, G3. Late Mesolithic.
59. Notched tool. Pit [171], fill [17]2. SF90. Period 1, G4. Late Mesolithic.
60. Knife? Pit [133], fill [135]. SF81. Period 1, G2. Late Mesolithic.
61. Tranchet axe sharpening flake. Pit [163], fill [164]. Period 1, G2. Late Mesolithic.
62. Tranchet axe, possibly unfinished. Pit [163], fill [164]. Period 1, G2. Late mesolithic.
63. Tranchet axe, broken. Surface of site [123]. SF60. Late mesolithic.
64. Unfinished core tool weighing 390 g. Pit [397], fill [396]. SF137. Period 1, G3. Late mesolithic.
65. Blade. Unusually large for the assemblage. Pit [261], fill [262]. Period 1, G3. Contained within a late mesolithic feature, but possibly late upper palaeolithic or early mesolithic.
66. Blade. Unusually large for the assemblage. Pit [220], fill [218]. Unphased. Possibly late uppper palaeolithic or early mesolithic.
67. Single platform blade core weighing 33 g. Pit [133], fill [135]. Period 1, G2. Late mesolithic.
68. Single platform blade core weighing 33 g. Pit [115], fill [116]. SF87. Period 3, G11. Late mesolithic.
69. Single platform blade core weighing 55 g. Pit [163], fill [164]. Period 1, G2. Late mesolithic.
70. Opposed platform blade core weighing 41 g. Pit [163], fill [164]. Period 1, G2. Late mesolithic.
71. Opposed platform blade core weighing 24 g. Pit [222], fill [223]. Period 1, G1. Late mesolithic.
72. Laurel leaf. Topsoil [13/001]. Early neolithic.
73. End scraper with pressure flaked retouch, proximal break. Ditch [213], fill [216]. SF112. Period 2, G6. Late neolithic/ Early Bronze Age.
74. Disc scraper. Ditch [131], fill [129]. SF104. Period 2, G6. Neolithic/Early Bronze Age.

THE ANGLO-SAXON POTTERY

by Luke Barber

INTRODUCTION

A small assemblage of early/mid Anglo-Saxon pottery, comprising 14 sherds and weighing 116g, was recovered during the excavations. Although most sherds are small (to 20mm across), a few slightly larger ones are present (to 50mm) and all are fresh/unabraded, suggesting that they have not been subjected to extensive reworking. Considering the generally low-fired nature of the fabrics, it is considered likely the material derives from activity on, or adjacent to, the excavated area. A number of fabrics are represented, all of which can be matched at the larger assemblage from St Anne's Road, Eastbourne, and the same fabric codes have been used in the current report (Barber 2016).

SAND-TEMPERED FABRICS

The earliest fabric consists of the dense fine/medium reduced sand–tempered wares, frequently with an external burnish (fabric ES/Q/AS/1.Total 7/56g).

These sand–tempered wares are quite typical of the early Saxon period in Sussex. The presence of a flower stamp on one sherd (Fig. 22, 1) suggests the current examples may be of 6th century date, although this small sherd was intrusive in an earlier feature (trample layer [395] associated with S2). Although no stamps of this type were present in the Bishopstone and Itford assemblages (Bell 1977; Barber 2003) similar, but not exact, types have been noted from Mucking (Hamerow 1993, Fig. 33 [205]).

Pit [435], (fill [434]), produced three sherds of fabric ES/Q/AS/1 from at least two different vessels and the only other feature sherd in this fabric, a simple rim from an unburnished vertical rimmed bowl (Fig. 22, 2) similar to an example from Bishopstone (Bell 1977, Fig. 102, 10). A single sherd tempered with fine sand and sparse flint is present (fabric, ES/F/AS/4). A 4g body sherd from pit G15 ([257], fill [258]), it may represent transitional material spanning the main sand and flint tempering traditions.

FLINT-TEMPERED FABRICS

Fully flint-tempered sherds are more common in the assemblage. These are mainly represented by handmade, low-fired, reduced or oxidised bodysherds tempered with moderate/abundant medium multicoloured (alluvial) flint grits to 1mm (ES/F/AS/1. Total 2/15g), or a similar, but slightly finer, fabric (ES/F/AS/2. Total 4/41g). The only feature sherd consists of a simple everted rim from a reduced jar from Structure 5, context [406] (Fig. 22, 3). These flinty wares began in the 6th century, but are far more common in the 7th century.

DATE RANGE

Taken together the assemblage would suggest activity spanning the 6th to 7th centuries although some of the flinty wares could run as late as the 8th century.

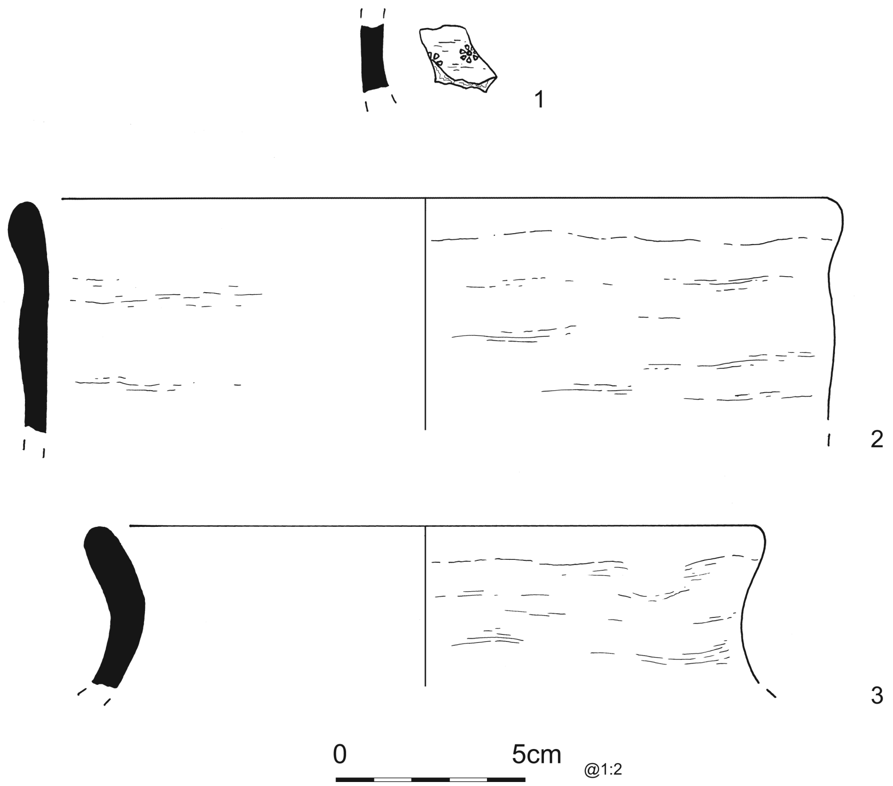

Fig. 22. Pottery illustrations 1–3.

CHARRED MACROBOTANICAL REMAINS

by Lucy Allott

INTRODUCTION

A total of 92 bulk environmental samples were assessed for macrobotanical remains. Small wood charcoal fragments were present in the majority of these and 41 samples contained charred macrobotanical remains (fewer than 10 in each sample). These deposits contained insufficient plant remains to examine vegetation conditions or the evidence for agriculture; however, cereal grains were recorded in several features phased to the late mesolithic and neolithic/Bronze Age periods. While charred plant remains were not unexpected at the site, the occurrence of cereal grains in association with late mesolithic flintwork was potentially very significant and required further investigation. This was carried out prior to interpreting the botanical assemblage in order to clarify its association with the prehistoric phases of land use and to establish whether the deposits contained remains of mixed origin.

In a review of radiocarbon dates on cereals from sites across Britain and Ireland, Brown (2007) recorded a date range of 3800–3000 cal BC for early cereal cultivation but notes that the onset of cultivation in this region may date to between 3950–3800 cal BC. There has been significant debate regarding the modes of transition to farming in Britain, whether by the indigenous populations adopting methods observed on the continent or by migrant population/s from mainland Europe. Collard *et al.* (2010) have demonstrated a coincidence between the earliest dates for cereals and a marked increase in population at approximately 6000 cal BP which favours the hypothesis for migrant farmers. Rather than interpreting the occurrence of cereals at this site as early evidence for cultivation, it was assumed during assessment that they were more likely to be intrusive within the features although, as their dates and the taphonomic processes leading to their deposition were not fully understood, it was recommended that a programme of radiocarbon dating should be undertaken. Features of particular interest, or those for which dates would assist their interpretation, were selected. Given that macrobotanical remains were scarce, final selection of samples for dating was also constrained by the presence of sufficient identifiable remains.

METHODS

Charred macroplant remains selected for dating were identified through comparison with reference material at the UCL Institute of Archaeology and were photographed prior to dating. Many of the cereal grains were abraded, their seed coats damaged or absent, making detailed identification difficult. However, all remains submitted for dating were identified to genera.

RESULTS

Dating results are presented in Tables 22 and 23. Table 21 shows the macro-botanical remains present in the samples selected for dating.

Period 1: late mesolithic

Samples from a series of pits (groups G1, G2 and G4) produced small assemblages of wood charcoal fragments and macrobotanical remains. Wheat grains (*Triticum* sp.) and shell fragments of hazel nuts (*Corylus avellana*) were selected from pits [133] and [175] and a possible bread wheat grain (*Triticum* cf. *aestivum*) was extracted from post-hole [222]. In each of the pit samples conflicting dates were returned. The cereal grains provided Anglo-Saxon dates, AD 880–1030 (SUERC-32617) from context [135] and AD 780–1000 (SUERC-32622) from context [176]), while the hazel nut shells from these contexts were dated to 6400–6200 BC (SUERC- 32618) and 6420–6220 BC (SUERC-32623) respectively. The cereal grains are clearly intrusive within these deposits although, as no cereal remains were recovered from the lower fill of pit feature [133], disturbance or infiltration of younger botanicals may not have affected the lowermost deposits within this feature.

Only one identifiable macrobotanical remain was present in context [223] from post/stake-hole [222]. This also provided an AD date (AD 1450–1650, SUERC 32616) and is therefore associated with post-medieval activities at the site. Samples from pit group G3, located to the east, and the later, intercutting, ring ditch Structure 1 also contained hazel nut shell fragments as well as poorly preserved cereal grain fragments and possible weed seeds which were spread through the pit features. Without dates on each individual item within these features it must be assumed that these pits

Table 21. Macrobotanical remains in samples selected for dating.
Key * = 1-10, ** = 11-50, *** = >50 fragments

	Period	1	1	1	2
	Land Use	OA2	OA2	OA2	ST1
	Group	1	2	4	6
	Parent context	222	133	175	213
	Sample number	41	4	17	35
	Context	223	135	176	214
	Context / deposit type	Fill of stakehole	Fill of pit	Fill of possible pit	Fill of ring ditch
Taxonomic Identifications	**Sample Volume**	40	20	40	20
***Triticum* sp.**	**wheat caryopses**	1	2 (ASE_DS_ 00061, SUERC - 32617)	1 (ASE_DS_ 00063, SUERC - 32622)	
Triticum* cf. *aestivum	**bread wheat caryopes**	1 (ASE_DS_ 00060, SUERC - 32616)			1 (ASE_DS_ 00058, SUERC - 32614)
Cerealia	**indeterminate cereal**			1	
Corylus avellana	**hazel nut shell fragments**		1 (ASE_DS_ 00062, SUERC - 32618)	3 (ASE_DS_ 00064, SUERC - 32623)	1 (ASE_DS_ 00059, SUERC - 32615)
Indet cpr frags				1	
Charcoal >4mm		**			*
Charcoal <4mm		***	**	*	*
Charcoal <2mm		****	***	***	**

are equally likely to contain mesolithic and Anglo-Saxon, or later, botanical remains and that remains associated with other phases of land use could also be present.

Period 2: neolithic/Bronze Age

This period of land use encompasses ring ditch Structures 1, 2 and 3 and features located within these ring ditches. With the exception of the large ring ditch Structure 1, wood charcoal fragments and charred macrobotanical remains were infrequent. The ring ditch deposits contained poorly preserved charred remains including some wheat grains, occasional wild/weed taxa (including goosefoots and wild radish) and hazel nut shell fragments. Charred remains from the primary fill [213] of ditch [214] Structure 1 were submitted for dating. A possible bread wheat cereal grain (*Triticum* cf. *aestivum*) and hazel nut shell fragment were dated to AD 103–1230 (SUERC-32614) and 6230–6050 BC (SUERC-32615), respectively. Dates obtained suggest that the hazelnut shell fragment is residual while the cereal grain is intrusive within an assemblage that is otherwise characterised by mesolithic flintwork.

Period 3: later prehistoric, Period 4: Anglo-Saxon, Period 5: post-medieval

Due to the evidence for residual and intrusive remains in features grouped within the earlier occupation periods (see above), it cannot be assumed that any of the remaining undated botanical remains are associated with the features in which they are located. Remains were, in fact, very infrequent in features from periods 3, 4 and 5 although in each, small quantities of wood charcoal, hazel nut shells, poorly preserved cereals, common pea and occasional seeds of arable weeds/wild taxa such as goosefoots, wild radish and wild grasses were apparent.

Period 6: undated

Wood charcoal fragments and charred macrobotanical remains were particularly infrequent in samples from undated feature groups G20, G21 and G22. A common pea and a possible barley grain were the only macrobotanical remains recorded in discrete pit feature group G20. These remains are almost certainly intrusive as the pits are thought to be associated with the mesolithic occupation.

SUMMARY

Dates obtained for macrobotanical remains have confirmed the presence of hazel nut shells that may represent food remains associated with mesolithic occupation at the site. Scientific dating has also highlighted significant evidence for the movement of botanical remains and, although not necessarily located within mesolithic features, many of the other hazel nut shells noted may also date to this land use. Evidence for agricultural practices associated with the different occupation periods is somewhat less clear. Seeds of wild taxa may represent arable weeds introduced to the site amongst crop and dating has revealed cereals from Anglo-Saxon and post-medieval periods. None of the remaining undated crops identified are diagnostic of specific periods of agriculture and, without dates on each individual item, it is not possible to determine whether the macrobotanical remains are associated with the late neolithic and Early Bronze Age or later prehistoric occupations.

Although taphonomic processes at this site are complex and little information regarding agricultural practices has been obtained, the programme of dating has highlighted the importance of obtaining absolute dates for botanical remains. This is particularly true for small assemblages, where associations between the assemblages and artefacts or features are not clear and where there is potential mobility of remains within the deposits.

SCIENTIFIC DATING

by Pete Marshall

INTRODUCTION

Eleven samples for optical stimulated luminescence (OSL) dating, ten of which were collected in the field, were taken by the Luminescence Dating Laboratory, University of Oxford, and seven samples were submitted to the Scottish Universities Environmental Research Centre, East Kilbride (SUERC), for radiocarbon analysis.

AIMS AND OBJECTIVES

The overall aim of the scientific dating programme was to contribute to the understanding of the site formation processes and, in particular, to evaluate whether the scientific dating and artefactual evidence supports the theory that a high degree of soil movement and artefact/ecofact translocation has taken place.

The specific objectives of the scientific dating programme were to date the infilling of ring ditch Structure 1, thereby giving an indication of its function; to provide complementary dating evidence for selected pits/post-holes with good flint assemblages and to date selected cereal grains from possible early prehistoric contexts to contribute to current research into the origins of agriculture in southern England.

RADIOCARBON METHODS

The samples submitted to SUERC, single entity (Ashmore 1999) carbonised cereal grains and hazelnut shells, were pre-treated following the acid-base-acid protocol (Stenhouse and Baxter 1983). All the samples were then converted to carbon dioxide in pre-cleaned sealed quartz tubes (Vandeputte *et al*. 1996), graphitised as described by Slota *et al.* (1987) and measured by Accelerator Mass Spectrometry (Xu *et al* 2004).

The laboratory maintains a continual programme of quality assurance procedures, in addition to participation in international inter-comparisons (Scott 2003). These tests indicate no laboratory offsets and demonstrate the validity of the measurement quoted.

RESULTS

The scientific dating results are given in Table 22. The radiocarbon results are quoted in accordance with the international standard known as the Trondheim convention (Stuiver and Kra 1986). They are conventional radiocarbon ages (Stuiver and Polach 1977).

Radiocarbon calibration

The calibrations of the results, relating the radiocarbon measurements directly to calendar dates, are given in Table 22 and in Fig. 23. All have been calculated using the calibration curve of Reimer *et al* (2009) and the computer program OxCal v4.1.5 (Bronk Ramsey 1995; 1998, 2001, 2009). The calibrated date ranges cited in the text are those for 95 percent confidence. They are quoted in the form recommended by Mook (1986), with the end points rounded outwards to 10 years. The ranges in Table 22 have been calculated according to the maximum intercept method (Stuiver and Reimer 1986), while those in Fig. 23 are derived from the probability method (Stuiver and Reimer 1993).

Results: isolated pits

The radiocarbon results from pits [133] G2 and [175] G4 both show identical patterns, with single fragments of charred hazelnut dating to the third quarter of the seventh millennium cal BC and single charred cereal grains (*Triticum* sp) dating to cal AD 880–1030 (SUERC-32617) and cal AD 780–1000 (SUERC-32622) respectively. The charred hazelnut fragments clearly relate to mesolithic activity on the site and it is therefore likely that the date of 6420–6220 cal BC (SUERC-32623) is contemporary with the *in-situ* flintwork (microliths and knapping debitage) from pit [175], G4. The date of 6400–6220 cal BC (SUERC-32618) provides a *terminus post quem* for the flintwork.

The two measurements on hazelnut fragments from pits [133] and [175] are statistically consistent (T'=0.3; ν=1; T'(5%)=3.8; Ward and Wilson 1978) and could therefore be of the same age.

Results: ring ditch (Structure 1)

The radiocarbon results from the primary fill of ring ditch Structure 1 are very similar to those from the two isolated pits to the south, with a single charred hazelnut fragment dating to the third quarter of the seventh millennium cal BC and a single charred cereal to cal AD 1030–1230 (SUERC-32614). Both these samples are stratigraphically below OSL sample X3515, taken from the upper fill of the ring ditch Structure 1. The date obtained from the hazelnut, 6420–6220 cal BC (SUERC-32623) must be residual, given the context from which it was recovered, and the cereal grain is clearly intrusive.

A second OSL sample from the upper fill of the ring ditch (X3516) is statistically consistent with

Table 22. Radiocarbon results from the American Express Community Stadium.

Laboratory Code	**Sample ID**	**Material and context**	**$\delta^{13}C$ (‰)**	**Radiocarbon age (BP)**	**Calibrated date (95% confidence)**
SUERC-32617	ASE_DS_00061	Charred cereal, *Triticum* sp. from the fill [135] <4> of pit [133]	–21.7	1085±35	AD 880–1030
SUERC-32618	ASE_DS_00062	Charred plant remains, *Corylus avellana*. from the fill [135] <4> of pit [133]	–26.7	7410±35	6400–6220 BC
SUERC-32622	ASE_DS_00063	Charred cereal, *Triticum* sp. from the fill [176] <17> of pit [175]	–22.8	1030±35	AD 780–1000
SUERC-32623	ASE_DS_00064	Charred plant remain, *Corylus avellana* from the fill [176] <17> of pit [175]	–25.0	7440±40	6420–6220 BC
SUERC-32614	ASE_DS_00058	Charred cereal, *Triticum* cf. aestivum from the primary fill [214] <35> of Structure 1	–24.4	880±35	AD1030–1230
SUERC-32615	ASE_DS_00059	Charred plant remain, *Corylus avellana* from the primary fill [214] <35> of Structure 1	–24.7	7280±35	6230–6050 BC
SUERC-32616	ASE_DS_00060	Charred cereal, *Triticum* cf. aestivum from the fill [223] of post-hole [222] on alignment with Structure 1	–22.8	335±35	AD 1450–1650

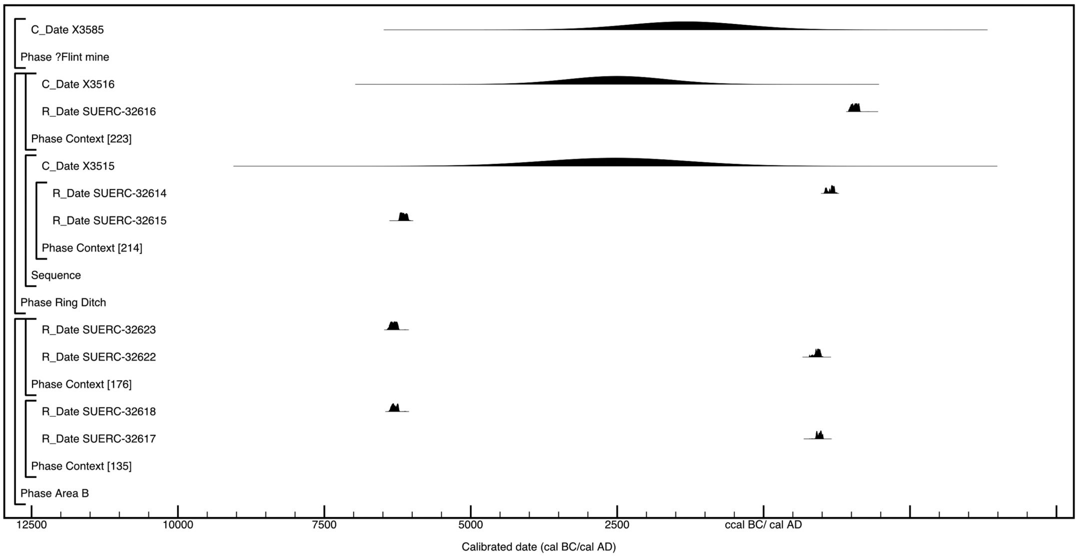

Fig. 23. Probability distributions of dates, SD1.

X3515 (T'=0.0; ν=1; T'(5%)=3.8; Ward and Wilson 1978) and both samples could therefore be of the same age. These two measurements therefore provide *termini ante quos* for the construction of ring ditch Structure 1.

A measurement (SUERC-32616) on a single cereal grain from fill [223] of post-hole [222] on alignment with the ring ditch is post-medieval in date (cal AD 1450–1650).

Results: large pit Structure 5

OSL date X3858 from near the base of Structure 5 provides a very wide date range (see OSL report below for a detailed explanation) and it is therefore unclear whether the feature could be neolithic in date.

DISCUSSION

The scientific dating methodology from the American Express Community Stadium was designed to answer some very specific questions related to the site's geology in addition to providing a chronology for some of the key archaeological features. In terms of chronology, the scientific dating programme has provided dates for mesolithic activity that was occurring on the site in the second half of the seventh millennium cal BC (Fig. 24). Given that the three results on hazelnuts are not statistically consistent (T'=10.9; ν=2; T'(5%)=6.0; Ward and Wilson 1978) the results suggest that this mesolithic activity was happening over a period of time, although this could have been relative short in nature.

Some of this charred material (a hazelnut fragment) was incorporated into the fill of ring ditch Structure 1, for which two OSL dates (X3515-6) provide *termini anti quos* for its construction.

The charred cereal grains are not related to prehistoric activity on the site, but to medieval and post-medieval activity (Fig. 25). As was suspected, the sandy nature of the site has resulted in significant movement of material down profile, in this case charred cereal grains.

OPTICALLY STIMULATED LUMINESCENCE DATING

by Jean-Luc Schwenninger

INTRODUCTION AND METHODOLOGY

Eleven samples for OSL dating were submitted to the Luminescence Dating Laboratory, Research Laboratory for Archaeology and the History of Art, University of Oxford. Following an initial assessment of two samples (OSL1 and CSB08/486), three samples were selected for full dating (OSL1, OSL2 and OSL5) and a feasibility study was carried out on sample OSL 4. Initial measurements revealed

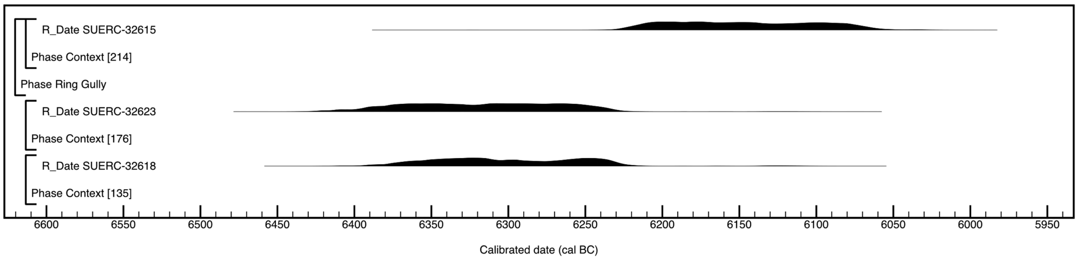

Fig. 24. Probability distributions of dates, SD2.

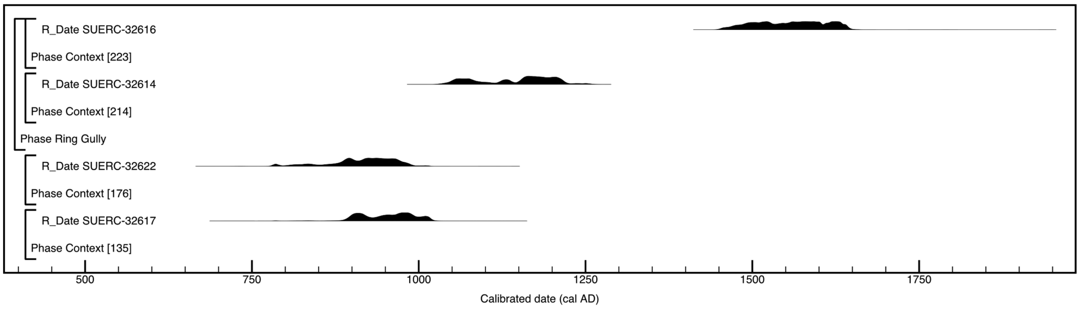

Fig. 25. Probability distributions of dates, SD3.

considerable variability between aliquots of the same sample. This prompted the processing of more samples to help identify those which could result in more robust age determinations for the archaeological event of interest. These additional investigations confirmed that the majority of samples appear to have been insufficiently reset at deposition, probably as a result of rapid rates of sedimentation within the ditch as well as the associated archaeological features (various pits and post-holes).

RESULTS

The results are based on luminescence measurements of sand-sized quartz (180–255 *m*). All samples were measured in automated Risø luminescence readers (Bøtter-Jensen, 1988, 1997, 2000) using a SAR post-IR blue OSL measurement protocol (Murray and Wintle 2000, Banerjee et al. 2001, Wintle and Murray 2006). Dose rate calculations are based on the concentration of radioactive elements (potassium, thorium and uranium) within the samples, as well as field gamma-ray spectroscopy measurements. The beta dose rates were derived from elemental analysis by ICP-MS/AES using a fusion sample preparation technique. Gamma dose rates are based on the *in-situ* radioactivity measurements. The final OSL age estimates include an additional two percent systematic error to account for uncertainties in source calibration. Dose rate calculations are based on Aitken (1985). They incorporated beta attenuation factors (Mejdahl 1979), dose rate conversion factors (Adamiec and Aitken 1998) and an absorption coefficient for the water content (Zimmerman 1971). The contribution of cosmic radiation to the total dose rate was calculated as a function of latitude, altitude, burial depth and average over-burden density based on data by Prescott and Hutton (1994). Results inserted in brackets are not considered to be reliable due to insufficient resetting of the OSL signal at deposition. Samples highlighted in bold are those which were part of the original commission. Additional samples were processed to help identify more suitable samples, for example OSL3, CSB08/486.

Of the total of eleven samples only five samples (OSL1, OSL2, OSL8, OSL10 and CSB08/486) could be successfully dated (see Table 23). In the case of OSL8 and OSL10 it is clear that the dates do not relate to the archaeological event of interest but instead are more likely to provide an age estimate for the deposition of the parent material.

Large pit [471]

In the case of sample CSB08/486, which was taken from the base of a large pit (possible flint quarry) infilling, the error on the date is rather large due, in part, to the uncertainty in the environmental dose rate estimation. This sample was taken from a basal fill overlying bedrock. In the absence of *in-situ* gamma-ray spectrometer measurements, a relatively large uncertainty of 20 percent was attached to the external dose rate estimation and this further inflated the error on the age estimate. There is also a real possibility that our evaluation of the external dose rate may be incorrect (too high) and that the calculated age is therefore too young, due to an overestimation of the true environmental dose rate. Our evaluations, which are based on a geochemical analysis of a subsample of the sediment, may not sufficiently take into consideration the reduced external gamma dose rate originating from the underlying limestone bedrock, which generally contains reduced concentrations of radioisotopes. For this reason the results for this sample should be interpreted with caution.

Ring Ditch (Structure 1)

In terms of the dating of the ring ditch, it seems that only measurements performed on samples OSL2 and OSL3 can be considered reliable. It is interesting to note that both these samples were secured from the upper fill when sedimentation rates may have slowed down. Although they cannot be considered to relate directly to the construction of the ring ditch, they are likely to be close in time to the primary phase of activity. Given the stratigraphic position of these samples the results should perhaps be interpreted as minimal age estimates. Samples taken from the primary fill (OSL1, OSL4 and OSL6) could not be successfully dated. The same is true for samples collected from pit fills (OSL7 and OSL8) and post-holes (OSL9). As mentioned above, the likely cause for this is likely to be related to the presence of rogue grains which have retained a geological signal. The effect of this can be seen in the calculated dates, which are far too old and inconsistent. These results (inserted in brackets in Table 23) are not reliable and have only been included for the purpose of highlighting the effect on the age determinations.

CONCLUSION

Despite the difficulties encountered in the dating of this set of samples, the dates obtained for samples OSL2 and OSL3 are likely to be correct and provide reliable minimum age estimates, within the quoted error margins, for the ring ditch.

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