Chapter 15

Lithic artefacts: overview and approach to analysis

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INTRODUCTION AND APPROACH TO ANALYSIS

The focus of the analytical approach was not only to make a technological and typological record of the collection that allowed its comparison with the wider British and NW European Lower/Middle Palaeolithic record, but also to investigate the behaviour and cognitive processes behind the lithic remains by analysing the *chaîne opératoire* and the spatial organisation of production. Complementing these cultural and archaeological goals, and as a necessary prelude to them, site formation and taphonomic processes were also investigated, as it was necessary to consider how these might have affected and/or distorted the lithic remains, disguising (or perhaps falsely presenting) patterns relating to hominin activity.

There is a danger in lithic analysis of indiscriminate recording of an over-abundance of superfluous empirical data. This may happen for various reasons. Partly, there is a long history in lithic analysis of untheorised empiricism, whereby the lithic analytical chapter just starts along the lines: 'The artefacts from xxx [site/layer/period] can be grouped into xxx main groups ..' followed by, for each group, sections on raw material, handaxes, cores, flake-tools and perhaps flakes, without any preceding discussion of the basis and objectives of classification. Partly perhaps, the act of measurement brings a reassuring empiricism and scientific control to the otherwise alien world of Palaeolithic technology, allied to an unconscious equation of analysis with measurement. Finally, also perhaps partly because certain data have previously been measured or recorded, and, although no longer participating in any interpretive debate, have become embedded in the intellectual/processual DNA of lithic analysis. However, it was attempted here to adopt a more focused approach to the recording of lithic data. The analysis of the lithic collection was undertaken with a number of clear objectives in mind (paragraph 1, above), and all recorded observations and measurements were chosen as relevant to these objectives. The methods of analysis and the data chosen for recording are outlined below, complemented by a lithic methodological appendix with more detailed descriptions of the technological and typological categories used and the measurement protocols for quantitative attributes (Appendix 6).

The sequence at the site included at least nine different major depositional phases, Phases 1-9 (Chapter 4) probably all from the Pleistocene, the majority of which contained lithic remains. The collection was initially divided into assemblages by stratigraphic phase. Consideration was then given as to the integrity of the assemblage from each phase, and whether further subdivision into smaller assemblages for analysis was useful. This was done on the basis of artefact condition, spatial concentration and (for the artefact-rich horizon of the Phase 6 clay) refitting and microdebitage distribution.

METHODS OF ANALYSIS

Study of the artefact collection initially involved going through each artefact in turn, checking and recording its provenance, and recording the range of data identified at the outset as relevant to the analysis. Full details of the analytical process and the data recorded are presented in Appendix 6. In summary, five groups of data were recorded, plus miscellaneous notes (Table 15.1):

- recording reference
- packing/storage information
- site provenance data
- lithic technological/typological data (categorical)
- lithic analytical data (quantitative)

The main lithic technological categories identified are summarised here (Table 15.2), and the more detailed typological subdivisions, for instance of handaxe shape and flake tool type, are given in Appendix 6 (Table A6.4; Table A6.9). Although a bipartite technological classification was initially applied during recording, following the categories and subcategories C1 and C2 specified in Table 15.2, this was simplified for subsequent analysis with each technological category regarded as of potential interpretive significance being allocated a single numeric code (Table 15.3). These categories and codes are used in the assemblage summary tables in the subsequent lithic chapters. Most of the technological and typological categories applied are uncontroversial, although distinguishing between some of the categories requires a (usually not discussed) emic engagement with the mind of the knapper, for instance distinguishing between flake-tools and flakes/irregular waste used as cores, or between cores and core-tools. At an etic level, both these pairs of categories could be subsumed under, respectively, the two categories 'worked flakes' and 'worked nodules'. Readers can, if they wish, perform this sleight-of-mind for themselves when considering the results, and distance themselves from my interpretation of knapping desire and purpose. However, part of this analysis has been to make these interpretations, founded ultimately on not just many years of looking at early Palaeolithic flint artefacts, but most importantly upon many years of experimental flint working leading to a reasonable basis for understanding and interpreting prehistoric engagements with the same material. Also, to develop an understanding of the site, and the hominins who inhabited it, based on the accumulated interpretations of the artefactual collection and the lithic *chaîne opératoire* in its landscape and environmental context.

In some cases, it seemed very obvious that, for instance, a large flake with a blunt cortical side opposed to a sharp edge, out of which a single notching flake had been struck, should be regarded as a flake-tool. In others, there was great difficulty in attempting to decide whether several quite small and chunky pieces of flint debitage or irregular waste with several small removals should be regarded as tools or cores. Although not very convincing as tools, it was hard to imagine that the even smaller and lightweight removals were themselves more desirable as tools. Consequently these were mostly categorised as miscellaneous notched tools, although one must also of course be aware that the indestructibility of flint means that juvenile knapping results enter the archaeological record along with the adult products, so this is always a potential (although another generally undiscussed) source of confusion in the attempt to interpret lithic collections. It is perhaps particularly applicable to small-scale and hard-to-make-sense-of unstructured reduction episodes.

Another technological problem that became apparent, and this was applicable at the straight forward etic level, without any concern over emic engagement, was the distinction between flakes, irregular waste and natural unworked flint clasts that were a background part of the sediment. Flakes were attributed by being clearly recognisable as individual removals (or broken parts of) with striking platforms and ventral surfaces. Irregular waste was applied as a general category for irregular pieces of knapping debitage that did not conform to the definition of flake. The particular problem here was that, since much of the raw material contained frost-fractures, a knapping blow could easily lead to the breaking-up of a flint nodule due to pre-existing flaws. Many of the resulting pieces would not themselves always exhibit any clear evidence of hominin interference, but would result from it, and would thus conceptually be 'debitage' as much as the finest flake. This problem can in principle be addressed by total recovery and refitting, and in fact is demonstrated by some of the refitting results of the project (Chapter 18). However, this is not a practical solution to the problem at the stage of initial analysis, nor is it particularly useful since total recovery of all frost-fractured pieces is impractical, and would in any case need to matched by complete and time-consuming refitting.

Table 15.1 Lithic analysis recording proforma

Type of data	*Name*	*Description*
Recording reference	Rec sht	Recording sheet, in number order of recording
	Sht #	Line number on recording sheet
Packing/storage	OA box no.	Box number as originally received
Site provenance data	Δ ID	Unique lithic identifier, small find number
	Context	Taken from finds bag, cross-checked with paper archive
	Area	Area of site: Trenches A-D; Transects 1-3, Strips A-D
	Trench	Evaluation trenches I-XV
	Sample <>	Sample number, for lithic bulk spit-sieved samples
	Spit	Spit-number, for lithics from spits in evaluation trenches I-XV
Categorical data	Cnd	Condition
	C1	Main technological category
	C2	Secondary technological category
	T1	Technology/typology, sub-category 1 (varies acc. C1, C2)
	T2	Technology/typology, sub-category 2 (varies acc. C1, C2)
	T3	Technology/typology, sub-category 3 (handaxes, flake-tools)
	T4	Technology/typology, sub-category 3 (handaxes, flake-tools)
	WhL	Completeness, wholeness (varies acc C1, C2)
Quantitative data	%Cx	Percentage remnant cortex, on dorsal surface of flakes
	DSC	Dorsal scar count, scars from debitage estimated as ≥20mm [not including striking platform, for flakes]
	ML	Maximum length, measured along ventral surface for flakes from point of percussion, mm [*1]
	MW	Maximum width mm, orthogonal to ML[*1]
	MT	Maximum thickness mm, orthogonal to ML
	WtG	Weight grammes
Notes	N	Notes, not usually entered on database but useful on paper record

[*1] ML, MW for debitage – estimate extra for damage/abrasion <20mm

Table 15.2 Lithic artefact technological categories, as originally recorded

C1	*C2*	*Description*
0 - Natural	-	Not humanly worked, can be interpreted as raw material, can be excluded from database, but if so needs to be quantified
1 - Raw material	-	No sign of working, but clearly a manuport
2 - Tested nodule	-	Nodule with only a couple of flakes off, no sign of whether a core or core-tool
3 - Chunk	-	Knapped chunk. Uncertain whether core or core-tool, poss. because broken, or not very knapped, or just very ugly
4 - Core	1 - Conventional	Flakes removed, generally reasonably large, from natural lump of raw material and no sign of preferential edge/part for use
	2 - On flake	Debitage used as a core
	3 - On core-tool	Eg, if re-used or after breakage
5 - Debitage	1 - Irregular waste	Lump, fragment or shatter; piece bigger than 20 mm but not otherwise classifiable, often resulting from knapping frost-fractured pieces; usually show some sign of percussive impact, but in principle can apply to pieces that look completely natural, but are interpreted as resulting from hominin knapping
	2 - Flake, blade	Flakes, or parts of flakes, must have signs of being part of a single removal, else classified as C2=1
	3 - Chip/spall	Flake/irregular waste less than 20mm
	4 - Flake-flake	Debitage from flaking a flake
6 - Tool	1 - Handaxe (core-tool)	Usually evidence of preferential edge/part for use and bifacially worked; attention to straightening, to opposing handle, removal of small shaping flakes of no use in themselves
	2 - Handaxe (on flake)	When a handaxe is made on a blank that shows definite evidence of originally having been a piece of debitage
	3 - Flake-tool	Worked/utilised flake; working can be backing (eg, possible interpretation as backed knife), retouching (eg, to form scraping edge) or notching
	4 - Percussor	Evidence of focused battering, can appear on cores/core-tools, can have some working to facilitate handling
	5 - Anvil	Battering on very large pieces, usually would be interpreted as percussors

Table 15.3 Simplified lithic technological categories, with numeric codes used in analysis

Artefact category	*Numeric code*	*C1, C2*	*Details*
Percussor	5	6, 4	Localised battering on rounded protrusions on flint nodules
Tested nodules	10	2, -	Tested/abandoned nodule; single/failed flake removals
Cores	20	7, 1	Cores; numerous flake removals, no apparent bifacial shaping or edge creation
Cores-on-flakes	30	7, 2	Cores-on-flakes; large, chunky flakes or irregular waste with several removals
Handaxes	40	6, 1	Handaxes, including very simple core-tools and 'proto' handaxes
Handaxes-on-flakes	50	6, 2	Clear evidence that bifacial shaping applied to a flake
Flake-tools	61	6, 3 (T3=20)	Flake-tool 'Utilised flakes' – flakes without secondary working, but showing macro-wear interpreted as from use
	62	6, 3 (T3=21)	Flake-tool 'Knives' – flakes with secondary working opposing a sharp cutting edge, often also with macro-wear to indicate use
	63	6, 3 (T3=10)	Flake-tool 'Single notch' – classic Clactonian notch
	64	6, 3 (T3=12)	Flake-tool 'Linear/double notch' – two (usually, v. occ more) notches beside each other on one edge of a flake
	65	6, 3 (T3=11)	Flake-tool 'Multiple notch' – more than one secondary notch scattered around a flake blank
	66	6, 3 (T3=30, etc)	Flake-tool 'Miscellaneous' – other secondarily worked flakes
Flake-flakes	80	5, 4	Debitage removals from secondary flaking, ie knapping of flakes
Flakes	90	5, 2	Debitage with clear striking platforms and ventral surfaces
Irregular waste	100	5, 1 (and 8)	Pieces of knapping waste that are not proper flakes, and natural-looking pieces that are thought to result from shattering of frost-fractured raw material during knapping
Chips	110	5, 3	Chips – pieces of knapping waste <20mm maximum dimension
Natural	120	0, -	Natural – pieces of flint thought to be wholly natural in origin

In practice, many pieces that lacked clear artificially-induced fracture planes were categorised as irregular waste. This was on the basis of sometimes very faint indications that hominin interference had precipitated their fragmentation, such as a contrast in condition between different frost-fracture planes, or a slight impression of more directional conchoidal ripples on a fracture plane. Although this categorisation is unlikely to have provided a 100% accurate record of the genuine situation, it is hoped that mis-attributions may have been equally made, so that the overall composition of the assemblage is reasonably accurate. Even with the possibility that some pieces of natural flint have been categorised as irregular debitage, it is better that this should happen (both at the excavation stage, as well as the analytical stage) than that they should be totally omitted. The refitting results demonstrated that pieces that superficially appeared natural did on occasion derive from knapping reduction sequences. A particularly important instance of this was the broken percussor from around the elephant skeleton (see Chapter 17), for which most of the pieces showed no obvious sign of hominin interference. They were nonetheless collected during mechanical excavation of the clay beyond the immediate vicinity of the skeleton, where they were out-of-place sedimentologically in relation to the surrounding homogenous clay.

In addition to this recording process, which was applied to every lithic object recovered, the substantial part of the lithic collection from the Phase 6 clay was studied in more detail. Refitting and investigation of the microdebitage distribution was used to investigate taphonomy and site formation, and ultimately it was hoped, to reveal details of intra-site organisation of behaviour. It was clear during the excavation that there was a substantial concentration of lithic artefacts south of Trench D, another concentration surrounding the elephant skeleton and otherwise a sparse scatter of relatively isolated artefacts in the other areas of the clay. It was decided during excavation that investigation of the distribution of microdebitage associated with these two lithic concentrations could help in establishing whether they were undisturbed. Therefore a sampling programme was carried out to recover microdebitage from these concentrations (details in Chapter 3), the results of which are discussed subsequently in the respective chapters on the material from around the elephant skeleton (Chapter 17) and the concentration south of Trench D (Chapter 18).

A refitting programme was also carried out on the collection from Phase 6. This programme contributed to a number of analytic objectives. In the first place, it addressed the issue of taphonomy and disturbance, since one could expect high proportions of refitting material for undisturbed knapping scatters. Secondly, it allowed investigation of the significance, or otherwise, of finer stratigraphic subdivisions recognised during excavation process. Thirdly, dependent upon the degree of disturbance, it had the potential to investigate intra-site movement of the end-products of knapping sequences, and the general spatial organisation of lithic production within the site. It was also possible that the distance and directions of refitting material relative to each other might alternatively reflect site formation processes. And fourthly, when refitting was successful in reconstructing knapping sequences, it provided a much better view of the knapping *chaîne opératoire* than possible from separate artefacts.

Carrying out the refitting programme required that all artefacts involved were marked with their site find number, so that they could then be arranged on tables for refitting. Exceptional care was taken to avoid loss of provenance information, with the initial marking checked before re-bagging against the original finds bag marked with the original site provenance, and then checked again when subsequently removed for refitting. A few marking errors were found and corrected during both checking stages, indicating that both were necessary. Refitting was carried out at the British Museum, Department of Early Prehistory, Franks House, which was the only available venue with adequate space to lay out the Phase 6 collection, which included more than 2200 artefacts, many of them of substantial size. Particular gratitude is due to Nick Ashton of the British Museum for facilitating this.

Three different assemblages of material were defined within Phase 6: the concentration south of Trench D (assemblage 6.1), the sparsely distributed material from the rest of the Phase 6 clay (assemblage 6.2), and the material from around the elephant skeleton (assemblage 6.3). For assemblage 6.1, the large quantity of material (n=2010) was initially divided into three sub-groups (North, Middle and South) based on subsidiary spatial concentrations within the scatter. Each sub-group was also initially divided into upper and lower phases, based on site stratigraphy. The approach to the refitting programme was, for each of these sub-groups, to lay out the artefacts together and attempt to refit material within them. These initial sub-groupings were then gradually amalgamated. There was a general drift in the refitting process towards arranging the amalgamated assemblage 6.1 material on the basis of raw material type and technological category (core, flake, flake-flake and irregular waste) in the attempt to find further refits that crossed stratigraphic boundaries and that were separated by greater distances.

For the much smaller quantity of lithic material in assemblages 6.2 (n=135) and 6.3 (n=93), there was no need to create spatial sub-groups. Otherwise the same process was followed, with initial separation of the material stratigraphically, followed by amalgamation on the basis of raw material and technological category. This phase of amalgamation also, incidentally, included attempts to find refits between the different Phase 6 assemblages of 6.1, 6.2 and 6.3; however, no inter-assemblage refits were achieved.

The results of the refitting programme are discussed subsequently, in the respective chapters on the material from around the elephant skeleton (Chapter 17) and the concentration south of Trench D (Chapter 18).

Table 15.4 Overview of lithic collection by stratigraphic phase and analysis groups

Phase	*Context/s*	*Analysis assemblage*	*n flints (total)*	*Notes and relevant chapter*
11 – Not *in situ*	0 40001 40039? 40100?	Group 11.2	12	Technologically distinctive group attributed to 18th century gunflint manufacture (Chapter 21)
	0 40001 40012 40039? 40048? 40069? 40100? 40100?? 40133	Group 11.1	43	Various out-of-context Palaeolithic material (Chapter 21)
T1 – Transect 1	40080 40081 40082 40083 40084	Group T-1	8	Uncertain how these deposits relate to main site sequence (Chapter 21)
9–10	40176	Group 9-10	10	Rejected by Hugo Anderson-Whymark as Holocene, so perhaps mystery later L/M Pal assemblage (Chapter 21)
9 – Brickearth bank	40053 40076	Group 9.1	20	Brickearth at main site, and brickearth bank to N of main site (Chapter 21)
8 – Sandy gravel (palaeo-Ebbsfleet)	40014 40048 40050 40071 40102	8c	160	Upper beds of fluvial gravel; recovered by a variety of means: stray finds, bulk sieving and during machining (Chapter 20)
	40047	8b	22	More widespread bed of more gravelly gravel, overlying basal bed (Chapter 20)
	40098	8a	27	Basal, sandy bed of fluvial gravel (Chapter 20)
7 – Mixed clay gravel (syncline infill)	40045	-	1	A natural flint; part of group of contexts at top of syncline infill sequence (40044-40046) that interdigitate with base of Phase 8 gravels (Chapter 19)
	40042 40043 40164 40166 40167	7	90	Recovered by a variety of means: stray finds, bulk sieving and during machining (Chapter 19)
6 – Grey clay, with organic-rich beds and tufaceous channel deposits	40039 40078 40078? 40099 40100 40103	6.3	93	Flints from near elephant skeleton; recovered by hand-excavation (Chapter 17)
	40039 40068 40069 40070 40078 40099	6.2	135	More dispersed flints that were not near the elephant skeleton or part of the main scatter south of Trench D, including some from within the Phase 6b tufaceous channel fill; mostly recovered during machine-reduction (Chapter 18)

continued overleaf

Table 15.4 (continued)

Phase	*Context/s*	*Analysis assemblage*	*n flints (total)*	*Notes and relevant chapter*
	40100 40103 40144 40158 40036 40039 40039? 40078 40100	6.1	2010	Flints from main concentration south of Trench D; mostly recovered by hand excavation (Chapter 18)
5 – Clay-laminated sand	40025 40072	5	21	(Chapter 16)
3 – Chalky/silty/gravelly sand	40028 40061 40062 40159	3	8	(Chapter 16)
2 – Parallel-bedded sand/clay	40060	2	1	Probably natural (see Chapter 16)
1 – Tilted block	40056	1	1	Probably natural (see Chapter 16)
Total			2662	

As an adjunct to the refitting programme, and as part of the general objective of investigating/representing the rich Phase 6 lithic collection, a 3-D GIS model was constructed. Each artefact was given a different symbol according to its technological category, sized according to its weight, and coloured according to its stratigraphic provenance within Phase 6. Once the model was constructed, it was then possible to examine the 3-D distribution of the artefacts, focusing on any selected combination of artefact types. It was also possible to make a direct visual assessment of whether there were any trends in, for instance, size distribution spatially across the site or vertically within the Phase 6 clay. Refitting connection lines were also added into the model, likewise making it easy to visualise/explore in three dimensions the vertical and spatial connections between refitting material. This model is available online in the Archaeology Data Service (ADS) archive http://dx.doi.org/10.5284/1018062, and interested readers are encouraged to investigate it.

OVERVIEW OF THE LITHIC COLLECTION

In total, there were 2662 lithic items in the collection resulting from the Southfleet Road excavation (Table 15.4), including a quite substantial number (n=202) of wholly natural unworked pieces. This reflects a deliberate policy that excavators who were uncertain whether a lithic object was worked should treat it as if worked, and record it as a small find for future consideration. This hopefully has meant that as-many-as-possible genuine artefacts were recovered. The deposits at the site included numerous natural flint clasts for which it was obviously impractical to attempt recovery, and their presence was recorded in context sedimentological descriptions. In the Phase 6 clay, from which the greatest part of the lithic collection came (n=2238), there was also the greatest number of natural flints recovered (n=157). In this case they provide a useful sample, supplementing memory and written notes, of the natural clasts that were present but not collected in this predominantly fine-grained deposit. Their presence also has site formation implications because it is necessary to either regard them as hominin manuports, which is considered unlikely for the great majority that appear to have no value as raw material or as a tool in their own right, or to consider by what natural process they became incorporated in the sediment. Then to consider whether this also has implications for accumulation of the associated artefactual content (see Chapter 18).

As can be seen from the summary table (Table 15.4), there were very few lithic finds from Phases 1, 2 and 3. Those from Phases 1 and 2 were almost certainly of natural origin, although a few undoubted artefacts were recovered from Phase 3. The material from these phases is discussed in the following chapter (Chapter 16).

There were slightly more lithic finds in the sand of Phase 5 (n=21), although three of these were of natural origin. These finds mostly came from towards the top of the Phase 5 sands, and, particularly for some of the larger ones, it is possible that some of them more properly belong with the overlying Phase 6 material, from which they are technologically and typologically indistinguishable (Chapter 16).

Above the Phase 6 clay, from which the great majority of lithic finds were recovered as discussed above, a reasonably substantial assemblage (n=90) was recovered from the Phase 7 deposits of the syncline infill. Most of these were recovered by sieving of bulk samples, once it was discovered during mechanical excavation that artefacts were present in these deposits; the details of the lithic assemblage from Phase 7 are considered in Chapter 19.

Above the Phase 7 deposits, another reasonably substantial lithic collection was recovered from the Phase 8 gravel (n=209). These artefacts were mostly recovered by a combination of sieving of bulk spit samples and during careful monitoring of machine reduction, so the majority are securely provenanced not just to the gravel in general, but to specific beds within it. This allowed the collection to be divided into three assemblages from different levels within the gravel for more detailed analysis (Chapter 20).

A single artefact was recovered *in situ* from the Phase 9 brickearth during the watching brief phase of machine reduction. Otherwise, all the artefacts from this phase of the site sequence where recovered either from a bulk spit sieve sample from Trench A (n=3), or from the stripped brickearth surface *c* 75m to the north of the main site (n=16). The Phase 9 collection is discussed in Chapter 21, together with other material for which the context was not certain, namely:

1. The small collection from Transect 1 (n=8), which could not be phased stratigraphically in relation to the main site sequence.

2. Material recovered from late prehistoric features that was deemed to be derived Palaeolithic material on account of its condition and lack of similarity with known late prehistoric lithic material by the late prehistoric lithic analyst (Hugo Anderson-Whymark).

3. Material recovered from what was thought to be recently made ground or out-of-context loose on the ground surface in various parts of the site. This latter collection included a fresh condition and technologically distinctive assemblage, apparently from recently-made ground close beneath the asphalt road surface that capped the site sequence; this was initially puzzling, but was subsequently attributed to 18th-century gunflint manufacture (Chapter 21).