Lithic Identification and Analysis (incl. 3 x appendices)

Lithic analysis typically includes measuring the length, width and thickness of an artefact as well as recording its weight (metrical analysis), in order to produce a series of statistics that describe any given piece (appendix 1). The length-width ratio, for example, gives an indication of how long a flake is in relation to its width. Flakes with a length-width ratio of 2:1 or greater are usually assumed to be blades and if it is less than 2:1 then they are thought to be flake tools; however, these proportions should be used only as a guide as blades can be more squat with a lower length-width ratio. If an assemblage is dominated by flakes with a length-width ratio of 2:1 or more it would be classified as belonging to a blade-based industry. However, blades do not necessarily have to be twice as long as they are wide as it is the intentional flaking of a linear detachment, often with parallel sides, that creates a blade form.

The classification of flints can be hampered by the widespread plough damage that is common on lithic artefacts recovered from arable fields. Identification can be obscured by parts of the piece being missing or by edge damage appearing similar to intentional retouch, so it is important to be able to distinguish between breaks resulting from modern plough damage and intentional chipping (see Mallouf 1982). Useful explanations of how to get started in measuring, describing, analysing and classifying lithic artefacts can be found in Andrefsky (1998), Saville (1980) and also Watson (1968).

Presenting lithic scatter data from fieldwalking and test pit projects can usefully be made more compatible so projects can be compared. The following examples show tables of data for summarising information from fields walked as part of one project into a single chart and used to produce lithic density per hectare counts. The second table shows how the overall data from a given project can be averaged and compared to similar statistics from other surveys.

Table 1 Example summary of fieldwalking results for a number of fields.

Field	NGR	Dominant Landform Element	Field Size (ha)	Density Per ha	Cores	Flakes	Blades	Scrapers	Edge-Trimmed, retouched utilised	Microliths & Microburin	Other	Periods	Total No. Lithics
1	SE 2638 9525	Sands and Gravels and Till (1a, 1b, 1c)	21.36	12.5	47	95	39	11	47	5	Arrowhead, bashed lump, debitage, ceramics, clay pipe	LUP, Mes, Neo, Roman, Med, Post-Med	269
2	SE 2691 9529	Till, sands and gravels and alluvium (1a, 1c, 2a)	12.57	6.8	15	24	10	8	18	5	Burin, debitage, ceramics, slag	Mes, Roman?, Med, Post-Med	86
3	SE 2556 9536	Till and peat (1a, 2d)	10.55	6.1	1	14	17	5	19	3	Awl, debitage, gun flint, ceramic, tile, clay pipe,	Mes, Roman?, Med, Post-Med	65
4	SE 2587 9551	Till and sands and gravels (1a, 1b)	16.66	13.4	24	66	30	29	59	5	Burin, knife, debitage, ceramics, clay pipe	Mes, Roman?, Med, Post-Med	223
5	SE 2536 9609	Sands and gravels and alluvium (1b and 2a)	3.81	10.0	1	11	8	2	12	2	Debitage, pot, coin,	Mes, Med,	38
6	SE 2569 9630	Sands and gravels and alluvium (1b and 2a)	15.35	7.6	7	37	28	10	31	2	Debitage, ceramic	Mes, Med,	116
7	SE 2689 9644	Alluvium,	28.93	0.6	-	4	1	2	5	2	Abundant	Mes, Post-	16

		palaeochannels and till (2a, 2b and 1a)									ceramics and clay pipe	Med	
8	SE 2647 9656	Alluvium and palaeochannels (2a, 2b)	10.73	0.1	-	-	-	-	1	-		Mes	1
9	SE 2663 9571	Sands and gravel (1c)	6.03	2.2	-	2	3	2	6	-	Debitage,		13
10	SE 2643 9561	Sands and gravel (1b and 1c)	11.41	78.4	64	384	181	99	150	13	Awl, knives, debitage, gun flint, ceramic,	LUP, Mes, Med, Post-Med	894
11	SE 2625 9545	Sand and gravel (1b)	2.42	95.0	18	85	52	20	46	2	Poss gun flint, ceramic, glass, oyster shell	Mes, Post-Med	230
12	SE 2626 9590	Sand and gravel (1b)	5.30	12.1	6	24	7	8	17	-	Debitage, ceramic	Mes, Post-Med	64
Total			145.12	13.9av									2015

Table 2 Comparative table showing lithic densities per hectare from various fieldwalking studies in North-East England.

Project/Location	**Average Adjusted (100%) density per ha.**	**Reference**
Coastal Surveys		
Maiden's Hall, Northumberland coast	51.8	Waddington 2001a
East Durham and Cleveland Coast	13.0	Haselgrove and Healey 1992, 6
Howick, Northumberland coast	11.9	Waddington 2007
Middle Warren, Durham coast	11.8	Waddington 1996, 5
Turning the Tide, Durham Coast	10.9	Waddington 1998
Inland Surveys		
Till-Tweed	11.3	Passmore and Waddington 2009
Lower Tyne Valley	10.0	(calculated from) Tolan-Smith 1997, 82
Milfield Basin, Northumberland	4.9	Waddington 2001b
Middle Tees Valley	3.1	Haselgrove and Healey 1992, 14
East Durham Plateau	0.6	Haselgrove and Healey 1992, 4
Tees Lowlands	0.3	Haselgrove and Healey 1992, 13
Wear Lowlands	0.3	Haselgrove and Healey 1992, 3

Appendix 1
List of potential attributes used in the recording of a lithic assemblage[1].

Small Find Number
Context/Field/Test Pit/Collection Method/Grid reference
Material (e.g. flint, chert, quartz, agate)
Colour
Geological Origin (e.g. nodular, glacial or beach flint)
Whether Patinated
Whether Broken/ in some cases e.g. blades record the location/type of break
Whether Burnt
Whether recycled
Type General (e.g. microlith)
Type Specific (e.g. scalene triangle)
Stage in Reduction Sequence (e.g. primary, secondary, tertiary)[2]
Period (e.g. Late Mesolithic)
Length (mm)[3]
Width (mm)
Thickness (mm)
Weight (g)
Notes

The information can be recorded directly on to a spreadsheet or data base providing a powerful analytical tool that can be used to identify patterns in the data. In addition, graphs and charts can also be easily produced from this data in order to present results in a clear and comprehensible way in subsequent reports. When recording chipped stone assemblages in this way it is general practice not to record length, width, thickness and weight if a piece is broken as it only produces erroneous data; instead only whole pieces are measured for this information. Similarly, if a piece is completely patinated the colour is not recorded as the presence of the patina prevents accurate assessment of the actual colour of the flint.

[1] The actual attributes depends on the assemblage and questions to be asked.
[2] Use type, subtype and classification. Also record whether or not it is retouched, location of retouch, type of retouch, sometimes it is useful to record platform type and bulb type, termination – whether or not there are signs of bipolar flaking.
[3] Not necessary to record length\width\thickness on all lithics – only on whole flakes, all blades, cores, nodules, retouched pieces. Not on debitage or broken flakes.

Appendix 2

Lithic Illustration

The illustration of flint artefacts requires a thorough understanding of how flints have been struck and how such characteristics are then portrayed using appropriate conventions. The key manuals that help unlock the door to lithic illustration are those by Martingell and Saville (1988), Addington (1986) and the more general work by Griffiths *et al* (1990). A number of universities provide classes within Continuing Education Departments in archaeological illustration, while membership of the Association of Archaeological Illustrators (address given in the Further Information section) brings the benefits of seminars, conferences, publications and the opportunity to seek advice from professional illustrators.

Appendix 3
Glossary of Terms

Blade An intentionally produced linear flake, usually at least twice as long as it is broad, with the long sides often parallel.

Backed Blade/Bladelet A blade or bladelet that has been blunted by retouch down one side.

Biface A tool that has been retouched (usually invasively) on both its surfaces, such as a Palaeolithic hand axe. The manufacturing of a tool with retouch over both sides is termed bi-facial working.

Bipolar Flaking A technique that results in flakes being removed from opposed ends of a core or nodule. It is achieved by resting the core on an anvil stone and then striking with a hammer stone. This removes a flake and at the same time a countershock is produced by the hard surface on which the core was placed. The countershock causes another flake to be removed from this end of the core. Sometimes referred to as 'scalar flaking' this technique is useful for flaking small pebbles, although it often results in crushed platforms and reduces control over the shape of flakes. It is most common in assemblages from northern and western Britain where access to large flint nodules is limited.

Bulb of Percussion This term refers to the smooth, raised, rounded hump on the ventral surface of a flake situated immediately below the striking platform. It is created by the impact of the hammer blow. Generally, the harder the hammer, and/or greater the force, the larger the bulb. The concavity caused on the core or nodule by the removal of the bulb is sometimes referred to as the negative bulb.

Burin A burin is the name given to a chisel-like implement made from a blade or flake that has been modified by the removal of a splinter. This involves the removal of a sliver of flint from either the long edge or either end of the blank. The splinter can be referred to as a burin spall. Burin spalls are usually a narrow sliver of flint with a triangular or trapezoidal cross-section.

Chaîne Opératoire See 'reduction sequence'

Chip A chip is a small irregular piece of stone (usually less than 5mm in length) that has been removed during the flaking process. Chips are waste products not usually intended for use or modification into tools and are often referred to as debitage. Particular forms of chip can be diagnostic of particular processes.

Composite Tool This is an implement which combines two or more tool group types on the one piece. This may include artefacts such as a burin with an end scraper or a core that has also been used as a scraper.

Conchoidal Fracture Rock types with either a very fine grain or regular crystalline structure fracture in a regular and predictable way when they are struck. Conchoidal means 'shell-like' with a smooth curved surface. In the case of flint, it flakes conchoidally so that pieces of the nodule's shell detach in layers, the thickness and shape of which can be controlled. Removals frequently have a slightly crescentic profile.

Core A (usually) prepared block of raw material from which flakes and blades are removed. Cores are classified into different types depending on the knapping technique employed, such as single platform cores, opposed platform cores, multi-platform cores, bi-polar cores, pyramidal cores, Levallois cores and so on. Such core types typically characterise the blade-based technologies of the Upper Palaeolithic, Mesolithic and Neolithic; core types of the Bronze Age are less regular and are not generally classified into specific types.

Core Rejuvenation A technique that allows the working of a core to be extended by correcting irregularities in the core's form. This may include creating a new platform, removing irregularities such as crushed areas of a platform or removing the entire striking platform by a lateral blow to create a fresh platform.

Core Tablet The flake removed across a worn or damaged platform to create a new platform for further working.

Cortex The outer surface, or skin, of a rock which forms as a result of water loss and chemical action. There is considerable variation in the types and degree to which different rocks acquire a cortex. The cortex on chalk flint is often thick, white and chalky, the cortex on glacial or gravel flint is often thin and abraded, while beach flint usually has a smooth, thick, encrusted cortex. The non-chalk sources of flint are from 'derived' deposits and can be of various colours. Therefore, the character of the cortex on artefacts can be used as a guide to the contextual origin of the raw material.

Cresting This term applies to the preparation of a core for the removal of blades or bladelets involving the creation of a longitudinal ridge to guide the first removal, with the result that parallel ridges are set up for further removals.

Debitage Derived from the French term meaning the process of stone tool production by flaking. However, it is more commonly used to refer to all categories of struck waste material, irrespective of size, produced during the flaking process. Small material, just a few millimetres in size, is sometimes referred to as microdebitage.

Denticulate This is a tool with at least three consecutive notches along one edge that form a series of teeth.

Distal End The end of a flake or blade opposite the struck end.

Dorsal Surface The outer or upper side of a flake/blade which carries the scars and ridges of previous removals. If it is a primary flake chipped off a nodule the dorsal surface will carry the cortex. The dorsal surface can provide information as to the flaking techniques being practised as it often shows clear flake or blade scar removals.

Flake A generic term for any piece of stone that has been chipped from another piece of stone. Flakes occur in a vast array of forms, though they are usually more irregular than blades. The shape of a flake may be indicative of particular flaking traditions/techniques. Flakes can be subsequently modified into tools while others may be utilised without recourse to modification . The latter type are described as 'utilised flakes'.

Flintknapping The process of making stone tools by the flaking process.

Hammer Tool used to strike a stone in order to detach a flake. Hammers vary in size, hardness and material as this affects the type of blow that is delivered. Hard hammers are usually made of stone, such as quartzite or granite, while soft hammers include those made from wood, antler and softer stones, such as limestone. Hammers are sometimes referred to as 'percussors'.

Hand Axe A large knapped stone (see Fig. 27) designed to be held in the hand and used in a pounding motion. Sometimes these tools are referred to as choppers. Hand exes date to the early and middle Palaeolithic periods and were used by early types of humans. They are not to be confused with ground and polished stone axe-heads.

Holocene Sometimes referred to as the Flandrian, this is the geological name for the inter-glacial period in which we now live.

Invasive Retouch The shaping of a flake or blade by the removal of slivers of flint at a very shallow angle to the edge (see also Fig. 19).

Levallois Flake This is the term given to a specific type of flake usually associated with Middle Palaeolithic flintworking. It is characterised by overlapping flake removal scars struck from opposite edges on its dorsal side and a smooth surface on its ventral side. Sometimes these flakes are referred to as tortoise flakes because of the shell-like pattern created by the scars on the dorsal surface. See also Fig. 18 and Chapter 4.

Microburin A microburin is a waste piece from microlith manufacture. It is made by detaching usually the proximal (or 'bulbar') end of the blade (see Fig. 39) by notching, and then snapping, with the other end of the piece being further modified to produce a microlith. Microburins are generally the waste from microlith production although they are themselves sometimes utilised and/or occasionally retouched.

Microlith A small stone tool made by blunting the edges of tiny blades often made to specific forms. In Britain they are divided into geometric (e.g. scalene triangles, isosceles triangles, trapezes, rhomboids, crescents, backed blades, needle points and rods) and non-geometric forms (e.g. obliquely blunted points, backed points). The geometric forms are typical of the Late Mesolithic period while the non-geometric forms are associated with the Early Mesolithic. In addition the later geometric forms tend to be made on smaller narrow blade blanks while the earlier microliths tend to be made on larger and wider blade blanks. Used for a variety of purposes though most commonly used as armatures (barbs) in hunting weapons. These forms are the hallmark of the Mesolithic period.

Notched Tool An implement with a deep concavity on one edge produced either by a single blow, a series of small retouch removals or a pressure flake removal.

Nodule An unchipped lump of stone.

Obliquely blunted/truncated A feature on some blades and microliths whereby a snapped bladelet has had microlithic retouch across the snap running obliquely across the piece.

Patination More commonly referred to as recortication or cortication, this is the name given to the early stage in the re-formation of cortex on the surface of chipped stone tools. The process of patina formation remains poorly understood although it is a product of chemical action affected by the presence of water, weathering and soil conditions over time. As the timespan involved in cortex formation is considerable, the presence of patinas on stone tools is sometimes used as a proxy (though not definitive) indication of considerable age.

Percussion Flaking The flaking of a stone involving the direct use of a hammer (percussor) to detach flakes.

Platform The surface of a core or nodule that is struck to remove flakes or blades during the knapping process. It is sometimes called the striking platform. Although any suitable surface can be used, specially prepared flat platform surfaces are common. This allows the angle at the platform edge to be more carefully maintained as it is the angle at which a core is hit that determines the shape of the detached piece. Cores or nodules may have more than one platform.

Pressure Flaking This is a type of direct flaking which involves placing a pointed tool (usually of antler or bone) onto the edge of the piece being worked and then increasing the pressure on the tool until a flake is removed. This flaking strategy is frequently used in the latter stages of tool production, often to produce fine, thin and accurate removals.

Proximal End The end of the flake or blade at which the removal blow was struck. It is the end that contains the butt and the bulb of percussion and is therefore sometimes referred to as the ‘bulbar’ end.

Reduction Sequence This term refers to the series of stages that are followed when creating stone tools. The main stages of flaking a flint artefact run through nodule - primary flaking - secondary flaking - tertiary product (tool). Related to this term is the 'Chaîne Opératoire' which translates as the operational sequence. This latter term has a wider significance as it refers to the entire sequence of stone tool production from the acquisition of the raw material through to the final discard of a tool.

Retouch The intentional modification of a flake or blade in order to shape it and prepare it for use. This may include sharpening an edge, blunting an edge or thinning a flake or blade.

Shouldered Points This is the name given to points common on Late Palaeolithic sites. They include a shoulder, usually towards the pointed end of the piece, formed by retouch and frequently have oblique truncation at the opposite end.

Test Piece (or Bashed Lump) A nodule that has had a flake or two chipped off it, usually to find out the flaking quality of the nodule.

Ventral Surface The surface of the flake or blade which originally faced into the nodule/core. It is the smooth inner surface that occasionally has ripples caused by the shock of the hammer blow and is the surface with the bulb of percussion.

References

Addington, L. R. 1986. *Lithic illustration: drawing flaked stone artifacts for publication*. Chicago and London: University of Chicago Press.

Andrefsky, W. 1998. *Lithics. Macroscopic approaches to analysis*. Cambridge: Cambridge University Press.

Mallouf, R. J. 1982. An analysis of plow-damaged chert artifacts: the Brookeen Creek Cache (41H186), Hill County, Texas. *Journal of Field Archaeology* 9: 79-98.

Martingell, H. and Saville, A. 1988. *The Illustration of Lithic Artefacts: A Guide to Drawing Stone Tools for Specialist Reports*. Northampton: Lithic Studies Society Occasional Paper No. 3 and Association of Archaeological Illustrators and Surveyors Technical Paper No. 9.

Saville, A. 1980. On the measurement of struck flakes and flake tools. *Lithics* 1: 16-20.

Watson, W. 1968. *Flint Implements. An account of Stone Age techniques and cultures*. London: British Museum