Revisiting the 'Big Deal about Blades': a full contextualisation of prismatic (volumetric laminar) technology before Marine Oxygen Isotope Stage (MOIS) 5

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Introduction

Since the earliest classifications and sub-divisions of the Palaeolithic (Lubbock 1865; de Mortillet 1867; Brueil 1912), prismatic (volumetric laminar) blade technology has been seen as a recent and sophisticated technological strategy. Originally seen as a hallmark of "modern behaviour" (see Mellars 1989; Mithen 1996), laminar technology has now been refuted as a technological strategy solely used by anatomically and behaviourally modern *Homo sapiens* (Bar-Yosef & Kuhn 1999; Henshilwood & Marean 2003). It is now evidenced throughout Neanderthal populations in Western Asia, and Europe, and their contemporaries in Africa. The most extensive and descriptive review of laminar technology, throughout early prehistory, is Bar-Yosef & Kuhn's (1999) publication *The Big Deal about Blades*. In this publication, laminar technology before the Upper Palaeolithic was outlined, alongside Levalloisian blades, and compared to selected sites from early Upper Palaeolithic contexts e.g. Chatelperronian and Bohunician sites (Bar-Yosef & Kuhn 1999). However, given new data and refined radiometric dates for these contexts, and more extensive investigations in the earliest manifestations of blade technology, a new review of blade technology is essential. Furthermore, the origins and significance of laminar technology is poorly understood and has not been theorised before.

This article provides a review of the author's Masters dissertation on this subject. It will review the evidence for laminar technology, prior Marine Oxygen Isotope Stage (MOIS) 5, c. 120,000 BP. Evidence after this period has been investigated before by the author (Hoggard 2012) and, given extensive reviews into techno-complexes during MOIS 5 (Delagnes 2000; Delagnes & Meignen 2005; Locht *et al.* 2010), it is much more pertinent to discuss the earliest occurrences. It will initially outline the fundamentals of laminar technology, how it is a different technological strategy to Levalloisian blade technology, before highlighting the evidence in Europe, Western Asia and Africa, and hypothesising the origins of this technique through the construction of a spatio-temporal chronology. It will also outline current research undertaken by the author.

Defining laminar blade technology

Laminar blade technology refers to the series of stereotyped blade removals, down the lateral edge of the core. Often labelled as "prismatic" or "volumetric" technology, the reduction strategy, as the name suggests, utilises some or the whole volume of the core, and is a proceduralised strategy involving many stages. For blade *débitage*, the convexity, or the longitudinal curvatures of the blade core need to be maintained for successful laminar removals; this is achieved through platform *débitage* (Inizan *et al.* 1999: 75). Vertical ridges/crests on the transverse edge of the core are also prepared, by a series of alternating/bifacial knapping strikes, for the initial blade removal (crested blade/*lame à crête)*. Once struck, the removal leaves two arrises which continues the sequence of *débitage* removal. This technology can be divided into five broad categories of volume management, with one or more systems present within an assemblage (see Figure 1). Distinguishing between Levalloisian and laminar blades has been problematic for decades. There are, however, many proxies for distinguishing between these systems. These include:

- The observation of a crested/semi-crested blade (*lame à crête);*
- The degree of standardisation between end-products (laminar products are often more standardised than Levalloisian products);
- Laminar products are often narrower and longer with a lack of convergence on the parallel edges (with the exception of retouched laminar productions into elongated points);
- A trapezoidal or triangular cross-section is more apparent in laminar systems of blade production;
- The butt of a laminar product is often narrower than its maximum width;
- The appearance of a "*chapeau de gendarme*", or *éclats débordants*, characteristic of some Levallois products, may be apparent.

For more extensive discussions on the process of laminar technology see (Anderson 1970; Boëda 1988; Cahen 1984; Crabtree 1968; Meignen 1995, 2000; Rasif & Andrefsky Jr. 2001; Tixier 1963, 1972, 1984).

The archaeological evidence for laminar technology

In total, there are forty-two different contexts featuring laminar technology before c. 120,000 BP (see Figure 2). Many of the typical features of laminar reduction strategies are not apparent in all instances. In some cases, the natural ridges are utilised and the degree of platform preparation is minimal. Nevertheless, all examples utilise the volume of the core similarly to Upper Palaeolithic systems of laminar technology.

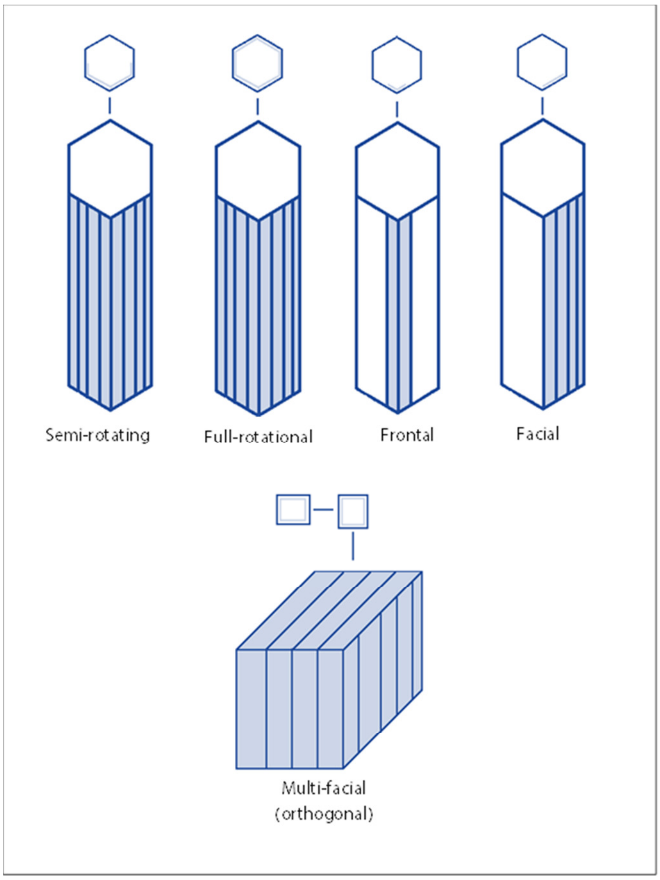

Figure 1. *A schematic representation of the different core volume management strategies* (modified from Delagnes & Meignen, 2005).

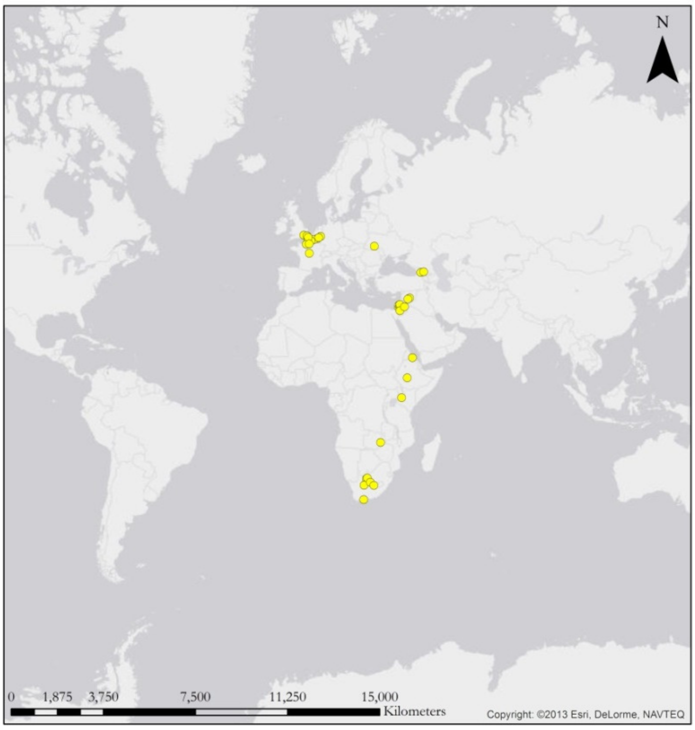

Figure 2. *A map of all known contexts to feature laminar technology* (yellow dot = context) (Image Copyright: C S. Hoggard).

In Europe there are fourteen individual contexts to feature laminar technology, with only one known context outside north-west Europe. These range from c. 300,000 BP, are not restricted to interglacial or glacial conditions, and are constantly seen throughout until the beginning of the “North-west Technocomplex” (see Delagnes 2000). The number of laminar products range from 11 to 103, very rarely feature retouch, and represent a small percentage of the overall assemblage.

		Site													
		Rissori	Mesvin	Saint-Valery-sur-Somme	Bagarre	Bakers Hole	Rheindahlen	Crayford	Tourville-la-Riviere	Coquelles	Bapaume-les Osiers	Korolevo Cave	Therdonne	Veldwezelt- Hezerwater (VLL)	Veldwezelt-Hezerwater (VLB)
Marine Oxygen Isotope Stage (MOIS)		8	8	8	8/7	8/7	7	7	7	7/6	7/6	7/6	6	6/5	6/5
Presence of Levallois (Yes/No)		Y	Y	N	Y	Y	Y	N?	Y	N	Y	Y	Y	N	Y
Laminar Count (n=)				18					50		103		73	33	11
Levallois dominant?				N				N		N				N	
Elongated core exploitation (Yes/No)		N	N	Y	N	N	N	Y	Y	N	Y		N	Y	Y
Percussion Strategy (Hard/Soft)		H	H	H	H	H	H	H	H	H	H	H	H	H	H
Bipolar or unipolar exploitation? (Both/Bi/Uni)		U	B	Bi		Bi	Bi	Bi	Bi	U	Bi	B	B	B	B
Tech. Behaviour (shading= present)	De-cortification/modification	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Platform creation			■	■	■	■	■	■	■	■	■	■	■	■
	Exploitation surface preparation		■								■	■	■	■	■
	Cresting/Semi-cresting	■	■	■			■				■			■	
	Natural ridge utilisation				■		■	■	■	■					
	Volume management technique (Semi-rotating; Frontal; Full-rotating; Unknown)	Sr	U	Sr	U	U	U	U	U	Sr	U	U	Fr	Fr	Fr
	Rejuvenation													■	■
	Platform maintenance			■											
	Standardised morphology									■	■	■	■		
	Retouched laminar products			■							■			■	■

Table 1. *An overview of European contexts which feature laminar industries* (for references see-appendix).

The production of laminar material is not dictated by raw material morphology and type, with a variety of raw materials utilised. In almost all examples (with the exception of Saint-Valery-sur-Somme), Levalloisian technology is present and is the dominant component of the assemblage. Throughout the Middle Pleistocene there is an increase in the number of behaviours associated with laminar technology. Later examples appear more standardised, feature more retouch, and greater standardisation of the platform, suggesting increased proceduralisation. See Table 1 for an overview of European evidence.

		Qesem Cave	Hummal (7c)	Hummal (7a)	Tabun	Abu Sif	Hummal (6c)	Rosh Ein Mor	Misliya Cave	Hummal (6b)	Hayonim (Lower E and F)	Douara	Hummal (6a)	Djruchula Cave	Tsona Cave	Koudaro Cave	'Ain Difla
Marine Oxygen Isotope Stage		9/8	8	8/7	8/7	8/7	8/7	7	7	7	7/6	7/6	7/6	7/6	7/6	7/6	6
Presence of Levallois (Yes/No)		N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Laminar count (n=)		684	23	4	76		51	20	458	316		64	6				42
Levallois dominant? (Yes/No)		N	N	N	Y	Y	N	Y	N	N	N	Y	N	N			Y
Elongated core exploitation (Yes/No)		N	N	N	Y	Y	N		N	N		N	N				N
Percussion Strategy (Hard/Soft)		H	H	H	H	H	H	H	H	H	H/S	H/S	H	H	H	H	H
Bipolar or unipolar exploitation? (Both/Bi/Uni)		B	B	B	B		B	U	B	B	B	B	B	B	B	U	B
Tech. Behaviour (shading= present)	De-cortification/modification	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
	Platform preparation		■	■	■	■	■	■	■	■		■	■	■	■		■
	Exploitation surface preparation											■		■			
	Cresting/Semi-cresting	■		■	■	■	■	■	■	■	■		■	■		■	■
	Natural ridge utilisation	■															
	Volume management technique (Multiple; Semi-rotating; Frontal; Facial; Full-rotating; Unknown)	Sr	M	U	Sr	U	M	Sr	U	M	M	U	M	Sr	U	U	Sr
	Rejuvenation	■	■	■			■			■	■	■	■				
	Platform maintenance		■	■			■			■			■	■			
	Standardised morphology	■				■	■	■	■	■				■			
	Retouched laminar products	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■

Table 2. *An overview of contexts in Western Asia which feature laminar industries* (for references see-appendix).

In Western Asia there are at least twenty contexts to feature laminar technology. There are many others, such as Nadaouyieh Ain Askar, Aarida Sud A and Ain Juwal; however, these are poorly contextualised or dated. Chronologically, these date from 350,000 BP up until 150,000 BP, and are considerably different to the European evidence. Behaviours including standardisation, cresting, rejuvenation and retouch are present throughout, and are unparalleled in nature throughout the Middle Pleistocene. They also occur in bulk (n = <684) and are present in a variety of environments and altitudes, in a variety of laminar and Levallois dominant sites. In all but one example, they co-exist with the Levalloisian system of reduction. See Table 2 for an overview of laminar products in Western Asia.

In Africa, there are fifteen known examples of laminar technology occurring as early as 545,000 BP (some 200,000 years before its earliest appearances in the Middle East and Europe, and the proliferation of the Levallois technique c. 300,000 BP). It can be seen throughout the Middle Pleistocene, and throughout all three regions of Africa (North, Central and South). Again, Levalloisian technology is associated with all but one of the archaeological sites and, like other regions, the use of varying local non-elongated raw material demonstrates how raw material does not dictate the use of laminar production. Furthermore, similarly to other regions, laminar technology occurs in a variety of environments and interglacial/glacial conditions. Many of the behaviours associated with laminar technology such as platform maintenance, rejuvenation, and exploitation of surface preparation are absent, similarly to Europe. See Table 3 for an overview of sites featuring laminar technology.

The origins of the laminar technique: the construction of laminar technology

To understand the origins of this technique, two fundamental ideas need to be explained - 1) why does this technological strategy occur? and 2) how does this strategy become widespread? To truly understand this technique, a spatio-temporal chronology can allow a better insight into the distribution of sites over space and time. By plotting such sites over time and by region, interesting points are raised (see Figure 3). It is evident that the earliest occurrences are situated within Africa, almost 75,000 years before the use of laminar technology elsewhere. This absence of laminar technology may be substantially larger given a preference for a later date at Kathu Pan (Wilkins & Chazan 2012) and poor confidence in the dating of Asfet (see Beyin 2013). Following 350,000 BP onwards, there is a significance increase in the number of sites, right throughout until the end of the Middle Pleistocene. By cross-referencing the data with palaeoclimatological data (benthic 18-Oxygen records in Lisiecki & Raymo 2005), it is further emphasised how laminar technology is produced in a variety of climates. Further dating in the Levantine Mousterian, at such sites as Abu Sif, Hummal and the Djruchula-Koudaro complex, and African sites such as Bundu Farm will further refine this chronology.

The earliest occurrences of laminar technology in Central and South Africa satisfy many archaeologists' view of an origin, a single point in space and time where laminar technology was produced. However, given the absence of data between c.450-350,000 BP there is a distinct lack of continuity in the archaeological record. Furthermore, given that the earliest occurrences total seventy-five laminar products (Hoggard 2013), and the increase in the number of laminar products after 350,000 BP (sites featuring up to six-hundred-and-eighty-four), it is the author's view that (at least) two different origins can be theorised.

		Site											
		Kapthurin Formation	Kathu Pan	Asfet	Wonderwerk Cave (MU4)	Bundu Farm	Biesiesput	Wonderwerk Cave (MU3)	Gademotta	Twin Rivers Kopje	Wonderwerk Cave (MU2)	Rooidam 1	Pinnacle Point
Marine Oxygen Isotope Stage		14/13	12/11	12/11	10/9	9/8/7	8	8	8	8/7	7/6	6	6
Presence of Levallois (Yes/No)		N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Laminar count (n=)		19											50
Levallois dominant? (Yes/No)		N	Y	Y		Y							N?
Elongated core exploitation (Yes/No)		N	N	N	N	N			N	N		N	
Percussion Strategy (Hard/Soft)		H	H	H	H	H	H	H	H	H	H	H	H/S
Bipolar or unipolar exploitation? (Both/Bi/Uni)		U	B	B	U	B	B	Bi	B	B	B	Bi	B
Tech. Behaviour (shading= present)	De-cortification/modification	■	■	■	■	■				■	■	■	■
	Platform preparation	■		■	■		■	■		■	■		■
	Exploitation surface preparation												
	Cresting/Semi-cresting	■		■		■		■		■	■	■	■
	Natural ridge utilisation	■	■			■							
	Volume management technique(Multiple; Semi-rotating; Frontal; Facial; Full-rotating; Unknown)	Sr	U	Sr	Fr	U	U	U	U	Sr	U	U	Fr/Sr
	Rejuvenation												■
	Platform maintenance												
	Standardised morphology												■
	Retouched laminar products		■						■				■
Number of procedures		5	4	4	3	4	2	3	2	4	4	3	7
Extended or Non-extended system? (<50% of procedures – non-extended) (50%> of procedures – extended)		E?	N	N	N	N	N	N	N	N	N	N	E

Table 3. *An overview of contexts in Africa which feature laminar industries* (for references-see appendix).

The first occurrences of laminar technology, before 350,000 BP, can be seen as innovations, centred around Central and South Africa, whether as an act of 'Competence Transfer' (Slimak, 2008), the realisation that tasks undertaken by flake technology can be completed to similar efficiency with laminar technology, or as an extension from parallel flaking systems of core reduction. Its absence elsewhere, may be accounted for by a lack of "extended" networks (Gamble 1999) within Lower Palaeolithic societies. The transfer of information, in this case a reduction scheme, may not be wide-ranging given the weak nature of "extended" networks and the nature of social structures in the Lower Palaeolithic, i.e. small group numbers and local hominid networks. Their occurrence after 350,000 BP coincides with the widespread use of Levalloisian technological strategies (Boeda 1994; Geneste 1988; White & Pettitt 1995); this cannot be ignored given their coexistence with laminar strategies in 86% of all examples. This may accompany the wider social, cognitive and behavioural changes in Europe (see White and Ashton 2003 for the 'Neanderthalisation' of Europe) and Western Asia, accompanied by the deeply rooted modern behavioural package in Africa (McBrearty & Brooks 2000; White *et al.* 2011).

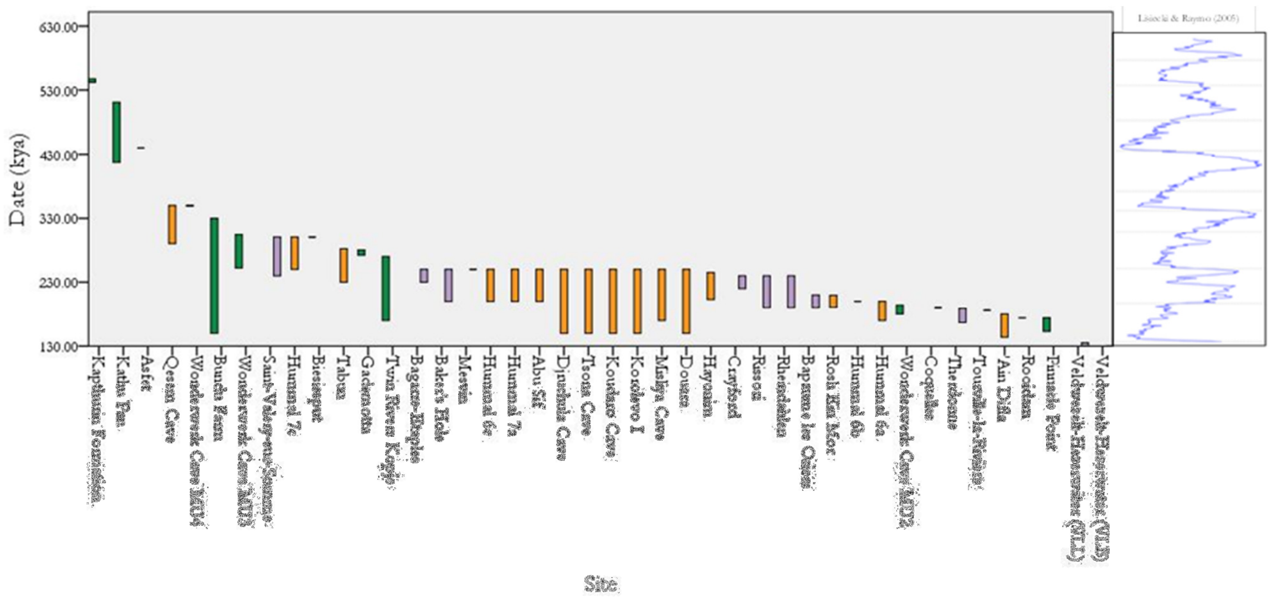

Figure 3. *A spatio-temporal graph plotting the different occurrences of laminar technology over time alongside climatic Benthic 18-Oxygen* (Lisiecki & Raymo 2005); different colours signify regions (see appendix for dates for these sites).

In their adoption, systems of "expedient" and "curated" technologies (Binford 1973; Binford 1979; Nelson 1991) can be theorised with sites in Europe and Africa representing expedient tools: unretouched and unstandardised artefacts, low in quantity, featuring few laminar behaviours and are from local, varying raw material. Laminar products in Western Asia represent a more curated system where artefacts featured a higher percentage of retouch and standardisation, a greater number of laminar behaviours, are substantial in number, and made from more selective homogeneous material sourced further from the contexts.

One final question remains in their origin and significance: why this strategy? Many examples are produced on a variety of raw materials (both heterogeneous and homogeneous), irrespective of size and type, and feature little decortification with natural ridges and longitudinal convexities exploited. These challenge and contrast many of the assumptions of laminar technology such as the criteria for raw material needed (Bar-Yosef & Kuhn 1999; Eren *et al.* 2008; Hayden *et al.* 1996). It is the author's view that laminar technology is advantageous in the standardisation of constant thickness, blank shape and cutting edge morphology in comparison to other Middle Pleistocene technologies. This is being further explored throughout the author's doctoral research.

Conclusion

Since the review of laminar production by Bar-Yosef & Kuhn (1999), there has been a substantial amount of data that has been published which can credibly contextualise laminar (volumetric) technology within the Middle Pleistocene. The days of laminar products being solely Upper Palaeolithic are over, and this article has highlighted the truly enormous amount of information on laminar technology now available. With such, the origins and significance of laminar technology can be theorised and this article provides an overview into its manifestations. Many questions are left unanswered, such as: 1) why do Levalloisian and laminar technologies occur concurrently on most sites? 2) do Levalloisian and laminar strategies represent different on-site behaviours? 3) why do laminar technological strategies become not as widespread as Levalloisian technology, given its proliferation in the Upper Palaeolithic? The PhD research by the author aims to provide answers for these questions and contextualise further the role of laminar production in the Middle Pleistocene through an analysis of the European data in much more detail.

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Appendix

References for the European data are as follows:

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References for the Africa data are as follows:

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