Transmission of lithic and ceramic technical know-how in the Early Neolithic of central-western Europe: Shedding Light on the Social Mechanisms underlying Cultural Transition

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Abstract:

Research on the European Neolithisation agrees that a process of colonisation throughout the sixth millennium BC underlies the spread of agricultural ways of life on the continent. From central to central-western Europe, this colonisation path is characterised by one single cultural entity, the so-called Linear Pottery Culture (LBK). At the transition between the sixth and fifth millennia BC, the LBK breaks apart into a mosaic of "post-LBK" cultural groups through mechanisms that are not entirely understood. To contribute to a better understanding of the social processes underlying this transition, here we conduct an integrated analysis of the lithic and ceramic technical sub-systems attributed to the LBK and post-LBK in Middle Belgium, a region with unrivalled material evidence. We use the technical gestures carried out by the early farmers to produce their lithic tool blanks and ceramics as proxies to shed light on (i) the modalities of technical know-how intergenerational transmission, (ii) the possible exogenous influences within the technical system, (iii) the trajectories of the social groups involved in the LBK-BQY/VSG transition. Our results reveal that several overlapping mechanisms were at work during this cultural transition. While lithic and ceramic general technical trends are clearly transmitted from one period to another attesting to a clear filiation between the LBK and post-LBK, both the lithic and ceramic detailed sequences of technical gestures tend to hybridize after the transition. This reveals close and prolonged interactions between groups of producers from different learning network, most likely stemming from population inputs during the cultural transition.

Key words: European Neolithisation, lithic industry, ceramic production, learning networks, cultural transition, migrations, socio-economic behaviours

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There are no ethical issues regarding the achievement of this research.

1. Introduction

It is generally accepted that the Neolithic transition in continental Europe during the 6th millennium BC occurred through a rapid process of colonisation from Transdanubia (Hungary) to Normandy, characterised archaeologically by the so-called Linear Pottery Culture (or *Linearbandkeramik*, abbreviated LBK). Studies on the LBK have led to a homogenous perception of this cultural entity, on the basis of its architecture, funerary practices and material culture. A. Coudart speaks of a "broad and

long-lasting civilisation: the first and, possibly, the last entirely European 'identity'" (Coudart, 2010, p. 218). LBK communities were organised in villages undergoing regular cycles of scission after reaching certain demographic thresholds (Dubouloz, 2012). However, at the transition between the sixth and fifth millennia BC, the LBK breaks apart into a mosaic of cultural groups through mechanisms that are of yet not entirely understood: the emergence of these "post-LBK" groups marks a period of fragmentation and decline of the LBK system leading to the end of the Early Neolithic in temperate Europe. Within these post-LBK cultural groups, LBK village organisation is maintained, but new architectural standards are adopted, new territories are settled, and several indications suggest a demographic rise (Bedault, 2009; Dubouloz, 2008). The ensuing Middle Neolithic is then characterised by a change of paradigm, with the appearance of social hierarchies and the disappearance of the village-level organisation as known throughout the Early Neolithic. Throughout continental Europe, the post-LBK cultural groups thus mark a period of transition, an "in-between" between the Early Neolithic and the Middle Neolithic (Demoule, 2010).

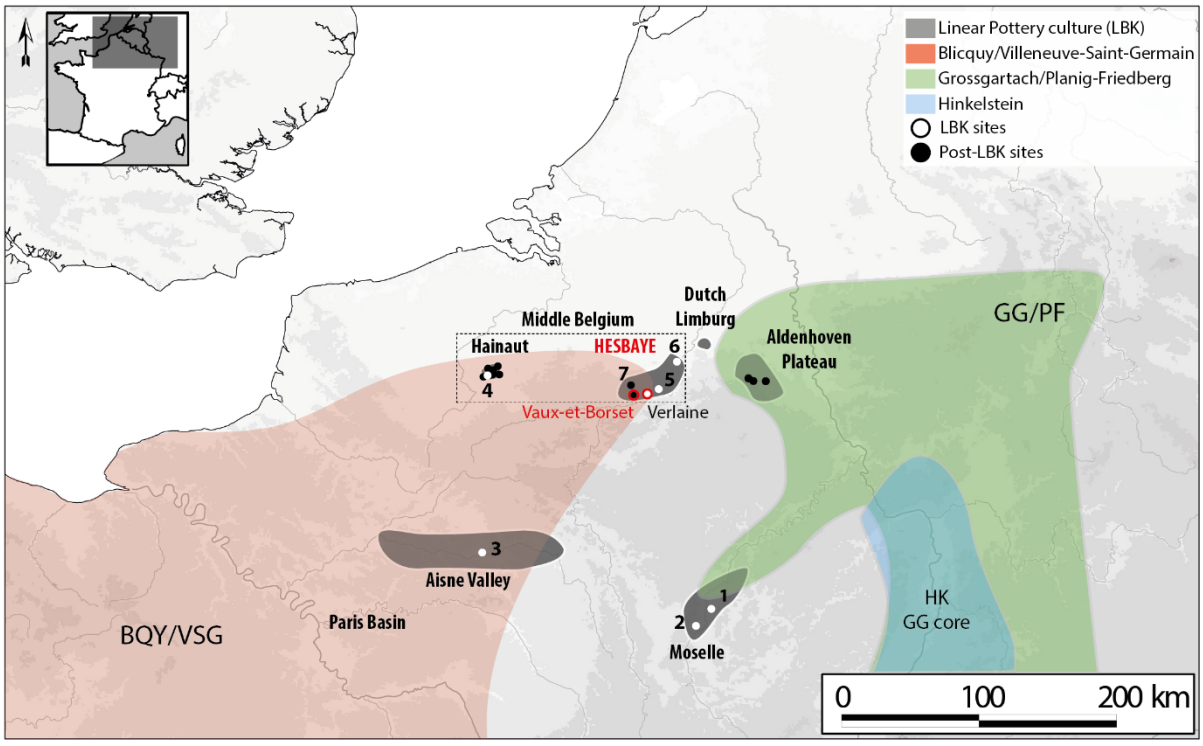


Fig. 1 General map of the archaeological context under study: Middle Belgium and surroundings areas mentioned in the text. Verlaine and Vaux-et-Borset sites (Hesbaye) are the key sites of the study. 1: Ennery; 2: Metz "Nord"; 3: Cuiry-lès-Chaudardes; 4: Aubechies; 5: Fehxe-le-Haut-Clocher; 6: Rosmeer and 7: Darion

To contribute to a better understanding of the social mechanisms underlying this transition, in the framework of the present article, we conduct an integrated analysis of the lithic and ceramic technical sub-systems attributed to the LBK and post-LBK in Middle Belgium, a region with unrivalled material evidence (fig. 1). This region, with a post-LBK period characterised by the Blicquy/Villeneuve-Saint-Germain culture (BQY/VSG), comprises manifold settlement sites attributed to the Early Neolithic. These extensively excavated sites have yielded abundant archaeological material. The Neolithisation of Middle Belgium has been the subject of intense debate since the 1980s, largely sparked by the chronological and cultural connection between the LBK and the post-LBK (see for example: Constantin & Ilett, 1998; Dubouloz, 2003; Ilett & Meunier 2013). The *Mission Archéologique du ministère des Affaires étrangères français en Hainaut et en Moyenne Belgique* has contributed to these debates, in particular through the research conducted in the Verlaine and Vaux-et-Borset sites in Hesbaye (Constantin & Burnez-Lanotte, 2008).

The general chronological succession between the LBK and the BQY/VSG being now established (Constantin et al., 2010), our studies have then focused on the socio-cultural dynamics that form the connection between these two entities. Three scenarios have been so far proposed to explain the transition between the LBK culture and post-LBK groups:

(i) *an endogenous process linked to profound socio-cultural mutations in LBK populations*. Several authors have suggested that the transition between the LBK culture and post-LBK groups stemmed from socio-economic transformations in LBK communities, and that these gave then rise to a reconstruction of regional identities (Constantin, 2013; Constantin et al., 2010; Constantin & Ilett, 1998);

(ii) *a syncretic process, relating to the integration of Neolithic populations from contemporaneous cultural entities, or traits thereof*. This hypothesis is essentially based on the idea of a Mediterranean influx into LBK communities (Constantin & Vachard, 2004; Hamon, 2008; Hauzeur & Van Berg, 2005; Lichardus-Itten, 1986);

(iii) *a syncretic process, relating to the final stage of integration of hunter-gatherer populations into Danubian Neolithic populations*. This premise is essentially founded on the presence of two specific types of ceramic ware in an LBK context, one known as La Hoguette, the other as Limburg, whose origin is still the matter of an intense debate (e.g., Jeunesse, 2002; Manen & Mazurié de Keroualin, 2003).

These scenarios, which are not necessarily mutually exclusive of one another, thus oppose two processes of evolution; an endogenous one, where LBK and BQY/VSG would be part of a single Danubian tradition; and an exogeneous one in which the emergence of the BQY/VSG would arise from inter-cultural interactions. To unravel these scenarios and grasp the continuous or discontinuous nature of the connection between the LBK and the post-LBK cultures in middle Belgium, here we reconstruct the technical gestures and know-how implemented for the production of both lithic tool blanks and ceramic ware at the Early Neolithic villages of Verlaine and Vaux-et-Borset. This heuristic approach to

understanding the mechanisms of historical transition (Müller, 2016), the synchronic and diachronic appraisal of lithic and ceramic technical traditions aims to (i) examine the modes of intergenerational transmission of technical know-how, (ii) identify possible exogenous influences within the technical system, (iii) track the social groups involved in the LBK-BQY/VSG transition.

2. Material and method

2.1. Vaux-et-Borset and Verlaine: two key sites for the beginning of the Neolithic in Belgium

The line of thought presented here is based on the technological study of the lithic and ceramic assemblages discovered at the Early Neolithic sites of Verlaine and Vaux-et-Borset, both of which are located in the east of Belgium (in the geophysical region of Hesbaye). These sites are among the best documented for the period (Burnez-Lanotte et al., 1993, 2001; Constantin & Burnez-Lanotte, 2008) in this densely populated region during the early Neolithic (e.g., Jadin, 2003). They also both have been the subject of detailed technological analyses of lithic and ceramic assemblages (Allard, 2005a, 2005b, 2007; Allard & Burnez-Lanotte, 2006; Burnez-Lanotte & Allard, 2003; Caspar & Burnez-Lanotte, 1994, 1997, 1998, 2003; Denis, 2017; Denis & Burnez-Lanotte, 2020; Gomart, 2014; van Doosselaere et al., 2013, 2016), enabling to conduct an unprecedented crossover study of the evolving dynamics of the technical systems.

The excavation sections 'Gibour' and 'À La Croix Marie-Jeanne' (Villers-le-Bouillet) at the Vaux-et-Borset site revealed two adjoining villages, dating from the earliest Neolithic in Hesbaye: one belonging to the Linear Pottery Culture, the other to the post-LBK. The two settlements are spatially exclusive of one another (fig. 2), and a minimum distance of 40 m separates the closest structures from each occupation. The presence of the LBK is demonstrated by structures belonging to two building categories: an enclosure and a village. The enclosing system is solely demarcated by a ditch with an irregular oval layout, with an estimated perimeter of 810 m, and marks the boundaries of an area of 4.5 ha. Most of the LBK settlement is inside the enclosure. It consists of at least five houses and their construction trenches, as well as an ensemble of 16 intersecting silos, and 35 pits predominantly spread out inside the enclosed area. In the current state of research (seriation of the ceramic assemblages in progress), the settlement is attributed to the second half of the late LBK for the Meuse basin (i.e. LBK B of Blouet et al., 2013; Modderman IIb, IIc of Modderman, 1970) and to the final LBK (Modderman IId). The adjoining post-LBK occupation extends over two sectors, of which almost 13,000 m^2 have been explored: one on the ridge and on the upper part of the southern side of the 'Gibour' site (some ten metres west of the LBK settlement), the other some hundred metres west of the 'À la Croix Marie-Jeanne' site. Due to intense erosion of the ridge in particular, no habitation plan could be unearthed.

Nevertheless, the characteristics of some structures suggesting lateral pit complexes, as well as refits, indicate the possible presence of at least five buildings (Burnez-Lanotte et al., 1993, 2005).

Fig. 2 Vaux-et-Borset site map with representation of the determined housing units. North-Western part corresponds to the Blicquy/Villeneuve-Saint-Germain village; South-Eastern part refers to the enclosed LBK village. According to Denis & Burnez-Lanotte, 2020 modified, DTP/CAD: C. Swijsen and S. Denis.

The 'Le Petit Paradis' site in the Verlaine municipality of the Hesbaye region is located on a plateau of loess, 300 m east of the Yerne river. It has been explored over a surface of 15,600 m^2, although the total occupation area is estimated at 3 or 4 ha (fig. 3). The pit containing thousands of pieces of flint knapping waste and hundreds of blade cores, initially discovered by E. Vanderhoeft, is in fact part of a classic village. This village is made up of 140 structures, in addition to between six and fourteen buildings, depending on the scenario, organised in parallel lines in an NNE/SSE orientation (Burnez-Lanotte, 2010). Twenty-one smaller debitage clusters have been uncovered in addition to the initial discovery (st 千). Although the southern, eastern and western limits of the village have been identified, the occupation seems to extend further to the north (Allard & Burnez-Lanotte, 2008). The Verlaine occupation lies in a region rich in Early Neolithic sites. At least twenty LBK sites are known in a 3 km radius. The chalk substratum in the Campanian levels of the Nouvelles assises contains abundant flint. Apart from Verlaine, debitage clusters were found in five other occupations, including the famous Dommartin site, which, according to the literature, comprises at least 19 clusters (Allard, 2005a, pp. 124–125). The seriation of the ceramic decorations from Verlaine is still in progress. Nevertheless, a first periodisation of different motifs and decorative themes in nine of the pits (structures 1, 2, 56, 10,23, 29, 34, 61 and 62) places site occupation in the IIc and the beginning of the IId phases, according to the

Dutch Limburg chronological sequence, that is, the recent stage of the LBK (Modderman, 1970). These nine structures seem to form a chronologically homogenous ensemble (Allard & Burnez-Lanotte, 2008).

Fig. 3 Verlaine site map with representation of the determined housing units and the debitage concentrations. According to Burnez-Lanotte, 2010, DTP/CAD: P. Allard

2.2. Methods

2.2.1. General objectives of the method

Here, our ambition is to decipher the transition mechanisms between the LBK and BQY/VSG, focusing on the transmission of the technical know-how carried out for the production of blanks for lithic tools

and the creation of ceramic ware. “Technical behaviours are transmitted by observation and are reinforced and stabilized by effective repetition. In this way, the acquisition conditions lend a certain inertia to technical skills, through the respect of common standards and habits. This justifies the term ‘technical tradition,’ ‘the sum of shared and transmitted choices’ […].” (Pelegrin, 1985, p. 83). These traditions are identified through the technological analysis of production, based on the methodological concept of *chaîne opératoire* (Leroi-Gourhan, 1964), in which technical actions are divided into distinct steps, which are sometimes subdivided into sequences and operations (Balfet, 1991), or technical processes (Inizan et al., 1995; Pelegrin, 1995). This division provides for a strategic and rigorous understanding of the technical gesture along two lines of interpretation: method and technique. As defined by Jacques Tixier (Tixier, 1967), method describes the design (order and combination) of the different actions between themselves, while technique describes the mode of action in contact with the physical matter. Thus, the characterisation of methods and techniques highlights the “strategic operations” (Lemonnier, 1976, 1980) that structure the *chaînes opératoires*. In contrast, certain gestures may prove to have no technical basis, either for the completion of the manufacturing process or for the functional character of the produced object. Consequently, these actions or technical processes carry a strong identity signature. Defining these *chaînes opératoires* and their variability, in the absence of functional constraints, leads to the identification of “ways of doing” (e.g., Roux, 2010), for which multiple the multiplication of detailed observations enables us to set aside possible technical convergences when carrying out comparisons on a large scale (Gosselain, 2018), and thus to identify the social groups in charge of production. Defining these *chaînes opératoires* diachronically then makes it possible to assess continuity or discontinuity in the transmission of technical know-how between generations. When temporal or spatial continuity in technical practices is identified, i.e. transmission of technical know-how from generation to generation among a community of practice, “ways of doing” can be defined as “technical traditions”.

Changes within the technical system generally occur in the wake of a redefinition of the producers’ identity, whether these changes take place within the confines of a single community, or result from interactions between different communities. As techniques reflect deeply anchored facets of producers’ identities, evidence for discontinuity or, on the contrary, continuity, is always very consequential with regard to socio-cultural dynamics. Through the detailed reconstruction of the technical gestures and the tools associated with the manufacture of flint blades and pottery, our objective is thus to explore these dynamics and track the spatial trajectories of the early farming communities in central-western Europe. Tracking these movements will add elements to the discussion extending beyond the geographical region of Hesbaye (fig. 1).

2.2.2. The lithic industry

In the scope of this study, the analysis of lithic techniques focuses on blade production. Acquiring the skills necessary for the production of blades entails long and sustained training (Pelegrin, 1991, 2007), in order to obtain a certain technical consistency. In the absence of systematic refitting, apart from the Verlaine cluster, the blades themselves, representing the materialisation of the aims of production, form the basis of our study.

Early Neolithic LBK and BQY/VSG sites are very much alike in terms of the technical setting for the production of tool blanks (e.g., Allard & Bostyn, 2006). The *chaîne opératoire* for blade production is well documented by studies carried out by us at an earlier date (Allard, 2005a; Denis, 2017) and the description of the diacritical sketches of the studied blades. To shape the block, one or two crests need to be create haping begins with hard percussion, then crests are generally formed though indirect percussion (punch technique). This technique is also used for blade debitage, and carried out according to a unipolar pattern. Intervening from the base serves to correct accidents or to maintain convexities, as well as to create neo-crests. Debitage is rotating or semi-rotating. The objective of production is for the most part a small blade of about ten centimetres in length, with a trapezoidal cross-section of 18-20 mm width, and a thickness of 4-6 mm (fig. 4, a).

The morphological or qualitative constraints imposed by the raw material have to be evaluated before a possible technical response can be identified. For our survey area, the clastic properties of the materials used are globally comparable. It is the origin of the materials, however, that greatly helps to determine the peregrinations of the technical groups in question. As there is no reference collection for the raw materials found in Hesbaye, they are traditionally considered to consist of fine and granular flints (Allard, 2005a). The first derive from the Campanian, the latter from local Maastrichtian levels. Although few outcrops have been recorded to date, we consider these flints to be of local to regional origin, as we cannot systematically determine the distance to the extracted deposits (0-30 km). Potential deposits of Campanian and Maastrichtian flint outcrop in secondary positions near the Vaux-et-Borset site (Caspar & Burnez-Lanotte, 1994). They are chiefly used for the production of flakes, and their morpho-dimensional characteristics could render them inadequate for blade production, which would suggest a more distant origin for the blocks selected for blade making. The Verlaine outcrops are local (Allard, 2005). Given the absence of a regional rock reference collection, the origin of certain raw materials, and Maastrichtian flint in particular, remains open to question. The variability of the latter in the assemblages could suggest diversified origins that cannot be evaluated for the time being. Two other raw materials are mentioned in this study: Ghlin flint and tertiary Bartonian flint. Ghlin flint comes from the Mons Basin (Hainaut). The deposits have not yet been precisely located, but the most recent indications point to a probable origin near Baudour (Collin, 2016, 2019; Leblois, 2000), ca. 100 km

from Vaux-et-Borset. Bartonian flint originates from the Paris Basin, 250 km to the southeast (Allard et al., 2005; Blanchet et al., 1989).

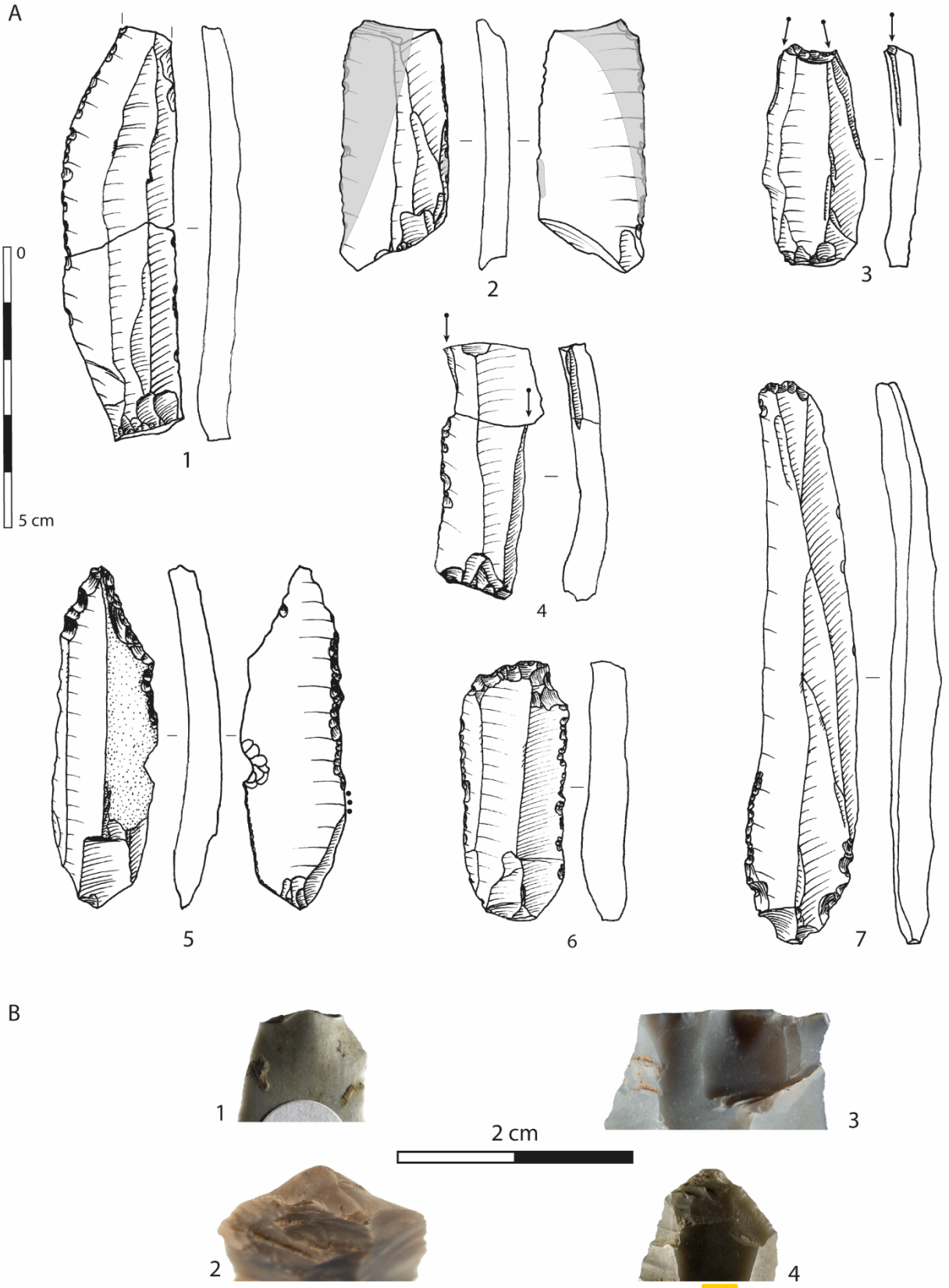


Fig. 4 Vaux-et-Borset blades. a, drawings showing the characteristics of seated laminar blanks in the danubian Early Neolithic of North-Western Europe, drawings: S. Denis. Campanian flint (1 to 3),

Bartonian flint (4 and 6), Ghlin flint (5 and 7). Retouched blade (1), sickle (2), burins (3 and 4), borer (5), scrapers (6 and 7). b, pictures of discrete characters visible through proximal blade parts analysis, photos: ©Unamur/Save-dva. Campanian flint (2 and 3), Ghlin flint (1), other (4). Morphological dihedral butt (1) versus flat butt (2), the first is linked to preparation of striking platform by small flakes versus no preparation. Overhangs very well prepared with a stone (4) or backed overhang prepared with punch (3). Important difference of butt dimensions: wide (3) and thick (2), narrow (4) and thin (1 and 4).

Defining technical traditions also involves evaluating the knappers' level of know-how. To determine knappers' shared norms and practices, the objectives or intentions of production have to be perfectly established. The faulty pieces left by apprentice knappers can represent technical variability, created by the imperfect execution of the technical gesture.

Finally, non-essential processes and technical gestures bearing strong identifiability are confined to the platforms and the preparation of blade detachment. They attest to the variability of technical gestures and tools that differentiate distinct groups of producers (Denis & Burnez-Lanotte, 2020). In the absence of exhaustive refits, notably at Vaux-et-Borset, the proximal parts of blades are the best vector for characterising these technical lithic traditions (fig. 4, b).

Our study is based on the detailed examination of a sample consisting of 398 pieces from Verlaine (tab. 1), corresponding to the proximal parts of a selection of blades found inside five different pits (124, 130, 131, 61 and 62). The studied objects were found in both domestic waste and debitage concentrations. The whole set of blades from Vaux-et-Borset, 1,941 pieces, was also studied (Denis & Burnez-Lanotte, 2020). They come from the LBK area (755 artefacts) and the BQY/VSG section (1,186 artefacts) of the site. The LBK lithic industry under consideration refers exclusively to the recent/final stage of the LBK.

Verlaine	debitage concentration			domestic waste			total
Features	Campanian	Maastrichtian	undeter.	Campanian	Maastrichtian	undeter.	
124	26	-	-	8	-	1	**35**
130	39	-	-	22	-	-	**61**
131	79	-	-	150	1	2	**232**
130-131	12	-	-	17	-	-	**29**
61	-	-	-	2	20	-	**22**
62	-	-	-	3	14	2	**19**
total	**156**	**0**	**0**	**202**	**35**	**5**	**398**

Table 1 Number of lithic artefacts studied in Verlaine according to their context of discovery and their raw material

2.2.3. Ceramics

The spatial organisation of pores and mineral inclusions, as well as surface topography, are subject to the type of pressure applied to clay during shaping. As a result, the systematic examination of these characteristics on archaeological ceramics yields coherent and reproducible indications on the technical

gestures carried out during the manufacture process (Pierret et al., 1996). Several ethnographic and experimental works based on such premises demonstrate a direct link between certain technical gestures (e.g., rolling, beating, pinching) and specific configurations left on outer and inner pottery surfaces (e.g., Livingstone Smith, 2001). The macroscopic examination of ceramics concentrates on (1) the organisation of pores and mineral inclusions, as well as correlating discontinuities in the radial and equatorial sections; (2) topographical surface characteristics; (3) variations in the thickness and texture of the walls, and (4) fractures and fissures networks. The interpretations of these technical traces and methods of shaping are based on several archaeological, experimental and ethnographical works of reference (e.g., Gelbert, 2003; Livingstone Smith, 2001; Rye, 1981; Shepard, 1976).

This method of study was applied to 652 vases from Verlaine. Here, the results obtained at Verlaine are put into perspective by comparing them to those from seven other LBK sites (Gomart, 2014). For reasons of accessibility to materials, the ceramic assemblage from the LBK village of Vaux-et-Borset had to be excluded from this first integrated analysis. We could however use the results of the thorough technological analysis carried out by B. van Doosselaere on 268 BQY/VSG recipients (van Doosselaere et al., 2013, 2016).

3. Results

3.1. The LBK lithic and ceramic technical sub-systems

3.1.1. The lithic industry

A recent study, on which the present paper is based, describes the most pertinent technical criteria for distinguishing the different ways of doing in Early Neolithic blade production in Hesbaye (Denis & Burnez-Lanotte, 2020).

During the LBK, one way of doing clearly dominates the assemblages of Vaux-et-Borset and Verlaine (MF1) (fig. 5). It is similar on both sites and has been identified on two of the extracted materials, i.e., Campanian and Maastrichtian flint, although the latter was clearly less prevalent. The first material is, incidentally, exclusively found in the Verlaine debitage concentrations (Allard, 2005). Tables 2 and 3 compare the descriptive criteria of this way of doing at Verlaine and Vaux-et-Borset. On the latter site, we excluded the pieces on which we could not determine the percussion technique employed in the preparation of the overhang. The descriptive criteria were, in point of fact, not completely compatible with all of the MF1 (Denis & Bunez-Lanotte, 2020). As compatibility is decidedly more pronounced in Verlaine, the pieces from that site were included in the description of that way of doing. These technical characteristics are extremely similar between the two LBK sites. Blade overhangs are preferentially

prepared with small punch strokes. The butts are quite massive, and smooth and flat butts clearly dominate the assemblages, especially at Verlaine. They attest to the absence of specific striking platform preparation. Four-faceted blades are a little more prevalent at Vaux-et-Borset than at Verlaine. But it is the blades with a trapezoidal section that seem to have been the intended result at both sites (about 60% of the blanks). The operative code conveys the order in which removals were detached. On the blades with a trapezoidal section, the quantity of 123/321 and 212' codes is similar. The non-prevalence of 212' codes suggests that knappers did not looked for, did not know of, or did not master, the specific organisation that results in the repeated fashioning of blades with a regular trapezoidal section (with regard to strategies cf. Pelegrin in Astruc et al., 2007; Binder, 1991; Binder & Gassin, 1988). The most obvious difference between the two sites concerns the larger quantity of regular and very regular blades at Verlaine, which suggests a better level of technical know-how. This superior level of know-how has already been brought to the fore (Allard, 2012) and is explained by the particular character of the site, with its surplus production of blades (Allard, 2007). The nature of techniques on the Verlaine site is remarkably homogenous, particularly between domestic waste and debitage concentrations, as already underlined by P. Allard and L. Burnez-Lanotte (Allard, 2005b; Burnez-Lanotte & Allard 2013). This homogeneity is shared with the site of Vaux-et-Borset.

		Verlaine_LBK_Way of Doing n° 1									
Raw material		Campanian et Maastrichtian									
Total nb of pieces and %		357 pieces, around 90% of total									
overhang preparation		punch				no preparation				unspecified tool	
nb and %		204	**57**			91	**26**			62	**17**
butt surface (mm2)		44,7									
butt types		flat		concave		morphol. dihedral		"true" dihedron		other	
nb and %		300	**84**	26	**7**	13	**4**			19	**5**
sections	2 facets (nb and %)	43				**22**					
	3 facets (nb and %)	124				**62**					
	4 facets (nb and %)	32				**16**					
	total	*199*				***100***					
operating codes	123 (nb and %)	51				**46**					
	212' (nb and %)	59				**54**					
	total	*110*				***100***					
regularity	very and regular (nb and %)	261				**74**					
	little and irregular (nb and %)	91				**26**					
	total	*352*				***100***					

Table 2 Description and quantification of all the characteristics of the lithic way of doing no. 1 (*beta* technical tradition) identified on the blades of Verlaine

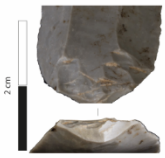
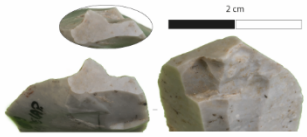
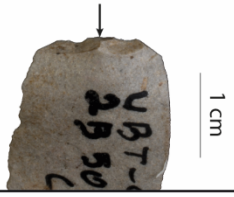
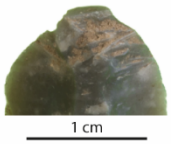
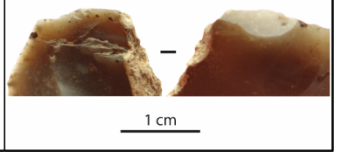
		Vaux-et-Borset_LBK_Way of Doing n° 1									
Raw material		Campanian, Maastrichtian									
Total nb of pieces and %		269 pieces, 78 % of proximal parts									
overhang preparation		punch					no preparation				
nb and %		176		**65**			93		**35**		
butt surface (mm2)		44,16									
butts types		flat		concave		morpho. di.		true dihedron		others	
nb and %		209	**78**	10	**4**	17	**6**	3	**1**	30	**11**
sections	2 facets (nb and %)	37					**22**				
	3 facets (nb and %)	99					**59**				
	4 facets (nb and %)	31					**19**				
	total	*167*					***100***				
operating codes	123 (nb and %)	55					**48**				
	212' (nb and %)	60					**52**				
	total	*115*					***100***				
regularity	very and regular (nb and %)	168					**62**				
	little and irregular (nb and %)	101					**38**				
	total	*269*					***100***				

Table 3 Description and quantification of all the characteristics of the lithic way of doing no. 1 (*beta* technical tradition) identified on the LBK blades of Vaux-et-Borset

Yet, in the same way as what was observed at Vaux-et-Borset (Denis & Burnez-Lanotte, op. cit, MF4), the overhang of some pieces at Verlaine could have been subject to preparation with another type of tool, such as a stone hammer rather than a punch. The analysis of half of the 16 identified pieces at Verlaine is more uncertain. The paucity of the Verlaine corpus is not conducive to statistically reliable descriptions and comparisons. Just like at Vaux-et-Borset, the butts of these blades - which were prepared for detachment with a stone tool - are smaller than those observed on the MF1 blades. Still, they are slightly larger at Verlaine (38.5 mm2) than they are at Vaux-et-Borset (21.9 mm2). The nature of the butts reflects the preparation methods applied to the striking platforms, and is comparable to those of MF1, although the blades could be a little less regular, keeping in mind the quantitative limitations imposed by this ensemble. These few blades from Verlaine will be labelled MF6 while awaiting a discussion on their status.

The examined LBK collections are thus dominated to a large extent by one way of doing (MF1), identified at both Verlaine (n=357) and Vaux-et-Borset (n=269). Some very rare pieces could tend to stand out in that a stone tool was used in preparation for detachment. We have labelled them MF4 (n=32) at Vaux-et-Borset and MF6 (n=16) at Verlaine (fig. 5). The predominance of MF1 on both sites suggests its wide transmission, which enables us to interpret this way of doing as a technical tradition (that we term Tradition *beta*). The distribution area of this technical tradition could be much wider. Indeed, in view of the of the present data, it could also be identified on local materials (Deramaix, 1990, flint drawings A) in the Hainaut Province in Belgium (Allard, 2005a, fig. 133). It is however difficult to quantify in this context, as it seems to coexist with another way of doing, characteristic of the Paris Basin (Allard, 2005a). The most easterly LBK sites of the Aldenhoven Plateau and Dutch Limburg could also represent an industry with a comparable way of doing (Allard, 2005a; de Grooth, 1987; Zimmermann, 1995). Some facetted striking platforms are mentioned in the Dutch Limburg area (de

411 Grooth, 2007). A fine technological analysis of these assemblages is however needed to understand if
412 they result from specific maintenance or if they occur because of a possible coexistence of several ways
413 of doing.
414

Ways of doing things	Main Technical Criteria	LBK	BQY/VSG	Illustration
Alpha tradition=MF2	striking platforms prepared by small flakes; butts morphologically dihedral or flat, often concave; punch laid in the concavity; preparation of overhangs with a stone tool; good knowledge of the specific arrangements for obtaining blades with regular trapezoidal cross-section		Vaux-et-Borset	
Bêta tradition=MF1	flat striking platforms, without specific preparation; flat butts, wide and thick; preparation of overhangs with a punch; blades with a more irregular tendency; no knowledge of the specific arrangements	Verlaine and Vaux-et-Borset	Vaux-et-Borset (and Darion)	
MF3	striking platforms prepared by small flakes in order to obtain a dihedron; dihedral butts; punch laid on the dihedron; tool to prepare overhangs needs to be better define; very good knowledge of the specific arrangements for blades with regular trapezoidal cross-section; unidirectional		Vaux-et-Borset	
MF4	flat striking platforms, without specific preparation; flat butts of medium dimensions; preparation of overhangs with a stone hammer; no knowledge of the specific arrangements	Vaux-et-Borset		
MF5	mostly flat striking platforms but frequently flakes are removed; flat butts of small dimensions; preparation of overhangs with a stone tool; good knowledge of the specific arrangements for blades with regular trapezoidal cross-section		Vaux-et-Borset	
MF6	flat striking platforms, without specific preparation; flat butts, wide and thick; preparation of overhangs with a stone hammer; no knowledge of the specific arrangements	Verlaine		

415
416 **Fig. 5** Synthesis of the lithic ways of doing and technical traditions highlighted in Verlaine and Vaux-
417 et-Borset
418
419 3.1.2. Ceramic production
420
421 A total of 652 vases from the ceramic assemblage of Verlaine were examined, and the manufacturing
422 *chaîne opératoires* was identified for 315 of them (Gomart, 2014). Four ways of doing were
423 differentiated, one of which is clearly predominant (VPP1), while three others are less prevalent (VPP
424 2, 3 and 4) (fig. 6).

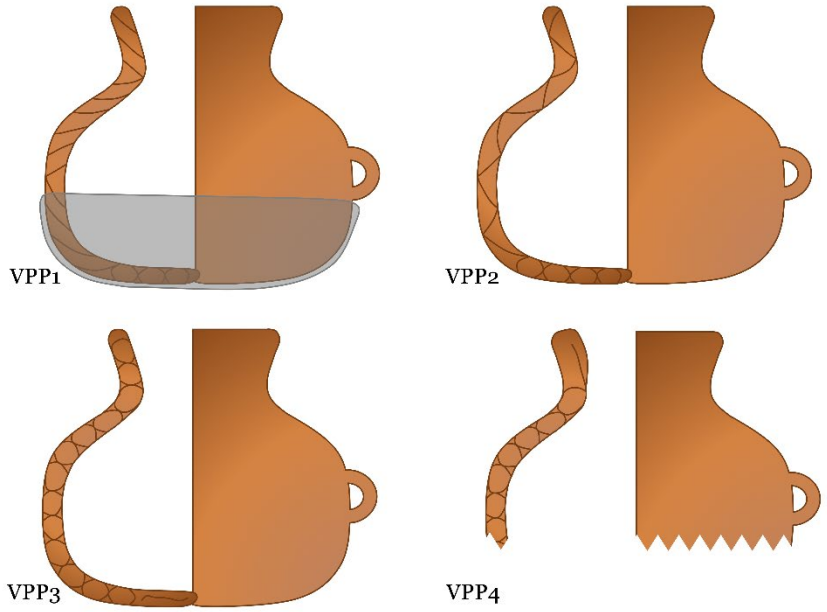


Fig. 6 Schematic representation of the four ceramic ways of doing identified in Verlaine

The first (VPP1, n=281) is characterised by roughing-out the recipients' base by means of the spiralled coil technique, and ensuing shaping by stretching out the rough-out against a support. In the radial section, the body, neck and rim show regularly spaced oblique voids, with variable orientation depending on the tilt of the wall. When the wall opens out, the orientation of the voids is internal. If, on the contrary, the wall closes in, orientation is external. This configuration indicates a roughing-out of the body, the neck and the rim through the use of elongated coils, where the direction of overlapping depends on the orientation of the walls. This way of doing is attested, always in low proportions, at other LBK sites (named Tradition 3 at the scale of the western LBK in Gomart, 2014): in the Hesbaye Region, Rosmeer (early/middle LBK) and Fehxe-le-Haut-Clocher (late and final LBK), in Hainaut at Aubechies (late and final LBK) and in the Aisne valley, in Cuiry-lès-Chaudardes (late and final LBK). The second way of doing (VPP2, n=10) includes vessels with a base shaped using a spiralled coil. The body, neck and rim are shaped from coils, with an alternating internal and external orientation (Z or S configuration). In between those voids, inclusions and pores show a vertical orientation. This type of configuration could either attest to a roughing-out of the body, neck and rim through the superimposition of thin coils (followed by stretching during shaping), or a roughing-out through alternating interior and exterior compression of the coils. This way of doing has been identified in important proportions at other LBK sites (named Tradition 4 at the scale of the western LBK in Gomart 2014): in the Hesbaye Region at Rosmeer and Fehxe-le-Haut-Clocher, and in Hainaut at Aubechies. The third way of doing (VPP3,

n=17) includes vessels with bases shaped from a circular clay slab, possibly formed through modelling, around which thin, superimposed and only slightly deformed coils are adjoined. The body, neck and rim of the vessels associated with the VPP3 technical tradition show regularly spaced voids, and a subcircular organisation of the inclusions and pores (O or C configuration), suggesting roughing-out of the body, neck and rim by superimposing thin and only slightly deformed coils. This way of doing has also been identified at the earliest known site of Rosmeer, in the Hesbaye Region (named Tradition 5 at the scale of the western LBK in Gomart, 2014). The fourth way of doing (VPP4, n=7) includes vessels without preserved base. Their body and neck are characterised by a subcircular orientation of inclusions and pores (O or C configuration) in radial section, indicating shaping with superimposed, thin, and only slightly deformed coils. The rim of these vases, meanwhile, was formed with a stretched coil so as to obtain a wide band of clay, that is then folded up. This way of doing can be found at the Cuiry-lès-Chaudardes site in the Aisne Valley (named Tradition 6 at the scale of the western LBK in Gomart, 2014). As the four ceramic ways of doing identified at Verlaine occur on other LBK sites attributed to different LBK chronological phases and located in different settlement areas, they can be defined as technical traditions transmitted in space and time.

3.2. The BQY/VSG lithic and ceramic sub-systems

3.2.1. The lithic industry

Blade production in the BQY/VSG sector at Vaux-et-Borset indicates the coexistence of four ways of doing (Denis & Burnez-Lanotte, 2020).

A strong correlation could be demonstrated between the absence of preparation of the striking platforms and the use of a punch for the preparation of overhangs, the main criterion for identifying way of doing no. 1 (MF1; n=173 pieces; fig. 5). Knappers composing this learning network primarily exploited Campanian flint from the Hesbaye Region. The second way of doing is defined by striking platform preparation through the removal of small, centimetric flakes, serving as concavities in which the punch can then be positioned (concave butts or ineffective dihedrals). A stone tool is used in the preparation of the overhangs (MF2; n=118 pieces; fig. 5). This way of doing has been identified on exogenous flint, namely Ghlin and tertiary Bartonian flint. A third way of doing (MF3; n=23 pieces; fig. 5), only found on blades in Maastrichtian flint, also shows the removal of smaller flakes on the striking platform. Here, however, the intention is the creation of dihedrals for positioning the punch (intentional dihedral).
This technical mode helps to remove overhangs. The tool used to prepare the rare conspicuous overhangs has not been formally identified, due to the rarity of samples. The last way of doing (MF5; n=53 pieces; fig. 5) was applied to some blades in Campanian flint from Hesbaye. However, striking platform treatment is ambiguous. While plain and flat butts are dominant, the proportion of blades with plain

concave butts, ineffective dihedrals and intentional dihedrals is decidedly more significant than for the first way of doing (MF1). This suggests a coexistence of different modes, that is, an inferior mastery of the processes of striking platform preparation, or their reinterpretation. Overhangs are prepared with a stone tool. Furthermore, the blades are markedly more regular, which is in keeping with the clearly smaller dimensions of the butts than for MF1. Finally, an examination of the operational codes demonstrates that knappers mastered the knowledge and were capable of implementing specific debitage procedures to produce blades with a regular and trapezoidal section in the manner of knappers using MF2 and MF3. This is not the case for knappers from the first group (MF1).

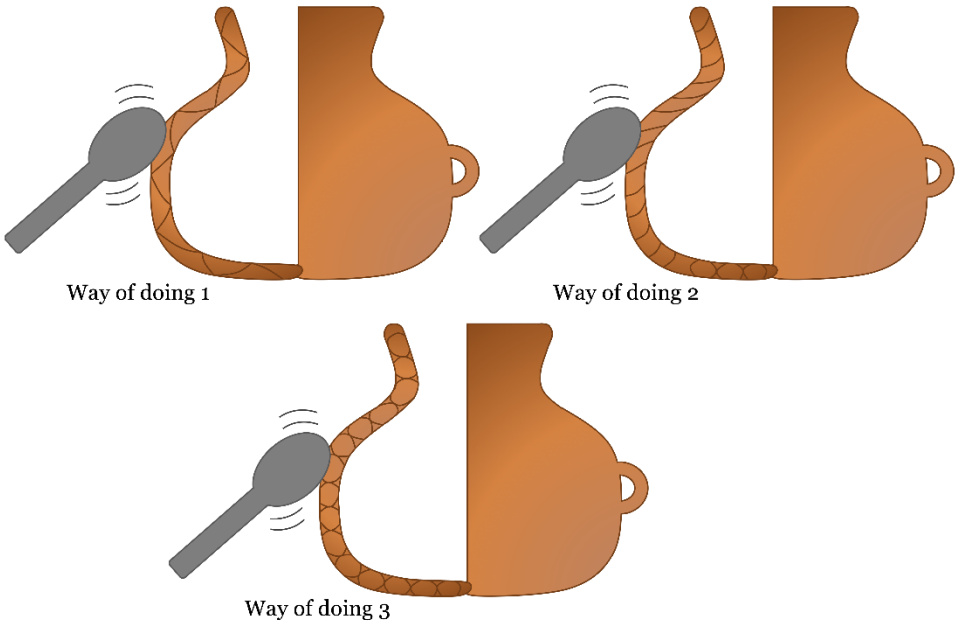
Thus, the BQY/VSG sector at Vaux-et-Borset shows a diversity of ways of doing, with four identified variations. The first is similar to the one described with relation to the LBK in Hesbaye. It was interpreted as a technical tradition in its own right, and has been labelled *beta tradition* (Denis & Burnez-Lanotte, 2020). The second one (MF2) is characteristic of Hainaut Province and the Paris Basin and, in the current state of research, it is exclusive to those regions (Bostyn, 1994; Bostyn et al., 2019; Denis, 2017). Its roots can be identified in the LBK (Allard, 2005a), so MF2 can also be interpreted as a technical tradition in its own right (*alpha tradition* after Denis & Burnez-Lanotte, 2020). The dihedral butts, specific to MF3, were previously identified in a Grossgartach and Planing-Friedberg/North Rhine context (Denis, 2020; Denis et al., 2019). The ubiquitous characteristics of MF3, stemming from both *alpha* and *beta* traditions, highlight its hybrid nature (Denis & Burnez-Lanotte, 2020).

3.2.2. Ceramic production

In the ceramic assemblage from the BQY-VSG sector of Vaux-et-Borset, 556 recipients were examined, 268 of which could be linked to a manufacturing *chaîne opératoire* (van Doosselaere et al., 2013, 2016). Three ways of doing were identified (fig. 7). Present in almost equal proportions in the pits of the site, these can be considered as contemporaneous. The first way of doing (n°1, n=86) is characterised by a roughing-out of the recipients' base, body and rim by assembling coils, with alternately internal and external orientation (Z or S configuration), suggesting alternating internal and external compression during assembly. They were then shaped using the beating technique. This way of doing has of yet not been identified as such in an LBK context, but the roughing-out operations (S or Z coils) are similar to those on several vessels from the Rosmeer and Fexhe-le-Haut Clocher sites in Hesbaye, as well as from Aubechies in the Hainaut region (Gomart, 2014). The shaping (beating technique) resembles the Ennery 'Le Breuil-Projet Alloin' assemblage in the Moselle region, where the use of this technique has been identified on much of the ceramic assemblage, and to a lesser degree, the assemblages of Cuiry-lès-Chaudardes, Rosmeer, Fexhe-le-Haut-Clocher and Metz-Nord (Gomart, 2014). The second way of doing (n°2, n=57) includes ceramics with bases formed from spiralled coils, and with bodies shaped from externally and obliquely overlapping and compressed coils. The recipients are then shaped using

520 the beating technique. It is possible to establish a link between the roughing-out operations of this second
521 way of doing at Vaux-et-Borset and the technical tradition associated with the 'standard' so-called
522 Limburg ware found in LBK contexts, the forms and technical traits of which differ from typical LBK
523 pottery (see Tradition 7 in Gomart, 2014; Gomart & Burnez-Lanotte 2012). This Limburg tradition is
524 attested at the Rosmeer and Fehxe-le-Haut-Clocher sites in Hesbaye, the Aubechies site in Hainaut, and
525 at Cuiry-lès-Chaudardes in the Aisne Valley. The technique of shaping through beating corresponds to
526 the one from the LBK site at Ennery in the Moselle region. The third way of doing (n°3, n=28) comprises
527 vases with bases, bodies and necks consisting of superimposed thin and only slightly deformed coils.
528 These vessels are then shaped out using the beating technique. The roughing-out operations are
529 comparable to those of the LBK sites of Rosmeer and Fexhe-le-Clocher in Hesbaye, and Cuiry-lès-
530 Chaudardes in the Aisne Valley. The three ceramic ways of doing identified in the BQY-VSG sector of
531 Vaux-et-Borset relate to technical practices identified during the LBK in different settlement areas, and
532 can in this respect, be considered as technical traditions, even if the detailed sequences of technical
533 gestures seem to slightly change between the LBK to the post-LBK.

534



535

536 **Fig. 7** Schematic representation of the three ceramic ways of doing identified in the BYQ-VSG sector
537 of Vaux-et-Borset
538

4. Discussion

4.1. Lithic and ceramic production: comparable production structures?

Bringing to light different technical traditions in the lithic and ceramic industries during the transition between the LBK and BQY/VSG in the Hesbaye region reveals similitudes, as well as dissimilarities between the two technical subsystems. During the LBK, the lithic industries show marked homogeneity with a strong local technical identity specific to the Hesbaye region and predominant at both Verlaine and Vaux-et-Borset (MF1). Ceramic production is also relatively homogeneous at the scale of the site (VPP1 being largely dominant in the Verlaine corpus), but is characterised by greater diversity at the scale of the whole settlement area (the prevalent way of doing at Verlaine does not predominate the whole Hesbaye region). The BQY/VSG sees an important diversification of technical practices within the two technical subsystems at the scale of the site. Indeed, no less than four lithic technical traditions have been identified at Vaux-et-Borset, two of which are clearly predominant, and three ceramic technical traditions, all of which are present in significant proportions.

In general, the lithic and ceramic subsystems thus seem to follow a broadly similar trend, with a diversification of practical techniques during the BQY/VSG. The fact that lithic and ceramic technical groups do not quite overlap can, however, lead to the supposition that the two subsystems are indicative of two distinct production contexts, with a probable repartition of labour within the LBK and BQY/VSG communities. This observation is important, as it allows for a dynamic reading of the LBK-BQY/VSG transition, where the socio-economic practices of several social groups have to be considered.

4.2. New keys for understanding the transition mechanisms between the LBK and post-LBK in the Hesbaye region

The exploration of the structures of technical traditions during the LBK-BQY/VSG transition reveals a close proximity in the functioning of the ceramic and lithic subsystems. Three mechanisms seem to coexist during the transition: filiation, migration and syncretism.

4.2.1. Continuity of population in the Hesbaye region between the LBK and BQY/VSG

A direct local filiation between the LBK and BQY/VSG was identified for the two technical subsystems. With regard to the lithic industry, the *beta* technical tradition (corresponding to the way of doing no. 1) is virtually exclusive to the LBK and strongly rooted in the Hesbaye territory (Allard, 2005a; Denis & Burnez-Lanotte, 2020). It persists throughout the transition period, as it can be identified in significant proportions at the BQY/VSG site at Vaux-et-Borset. It is also prevalent at the neighbouring site of Darion (Denis, 2017).

With regard to ceramics, it is possible to establish parallels between the roughing-out associated with the technical traditions identified at Vaux-et-Borset, and those implemented at Verlaine: the VPP2 technical tradition at Verlaine thus echoes the roughing-out operations of the vessels' body associated with tradition no. 1 at Vaux-et-Borset. The same is true for technical traditions 1 and 3 of Vaux-et-Borset, with roughing-out operations reflecting the shaping methods of recipients' body for the VPP3 and VPP4 traditions at Verlaine. The three technical traditions identified at Vaux-et-Borset were discovered at two other sites in the Hesbaye region that represent a large part of the LBK sequence of the area, namely at Rosmeer and Fexhe-le-Haut-Clocher.

This permanence in local technical practices between the LBK and BQY/VSG in the Hesbaye region attests to the indubitable continuity of population in this settlement area.

4.2.2. A transition marked by exogenous influences originating from other Danubian settlement areas

Alongside the continuity observed in the Hesbaye region, exogenous influences also seem to have profoundly marked the transition between the LBK and BQY/VSG, for both of the examined technical subsystems. Concerning lithic industries, the *alpha* technical tradition (or way of doing no 2 is the direct result of the migration of a small group from Hainaut to the Hesbaye region, comprising knappers with a very high level of expertise (Denis, 2014, 2017; Denis & Burnez-Lanotte 2020). The analysis of siliceous raw materials pinpoints the origin and circulation of the flint, and contributes to determine knappers' movements, or lack thereof. Furthermore, the matching macro-features method, employed in the study of the circulation of tertiary Bartonian flint (Denis, 2019), seems to confirm that this migration took place in the middle stage of the BQY/VSG culture, to which the Hesbaye sites have been attributed. The second trend illustrates links with eastern populations associated with the Grossgartach/Planig-Friedberg groups from the Aachen/Cologne area (Denis, 2020; Denis & Burnez-Lanotte 2020; Denis et al., 2021). In the current state of research, however, we do not have an exact understanding of the relations between the two communities.

In the case of ceramics, exogenous influences can also be assumed, particularly with regard to the shaping of the vessels. In the BQY/VSG sector of Vaux-et-Borset, most of the pottery was shaped using the beating technique. This technique is rarely identified in LBK assemblages in the Hesbaye region, Hainaut or the Aisne valley but was identified on a large majority of vessels from the LBK site of Ennery, in the Moselle region in eastern France (Gomart, 2014). It should also be noted that roughing-out operations associated with traditions 1 and 3 at Vaux-et-Borset reflect practices identified in Hesbaye, but they are also found in the Hainaut region at Aubechies, as well as in the Aisne valley at

Cuiry-lès-Chaudardes. More data would be required in order to outline the exact zones of influence marked by the identified technical gestures.

Ultimately, the BQY/VSG lithic and ceramic subsystems display remarkably similar dynamics, with possible influences from both the East (Moselle and northern Rhine) and the West (Hainaut and Aisne valley) (fig. 1). The presence in Hesbaye during the BQY/VSG of ways of doing identified in other settlement regions, and whose exact trajectories and rhythms have yet to be grasped, suggests that an intensification of population movements within the Danube sphere itself played an important part in the LBK-BQY/VSG transition.

4.2.3. Technical hybridisations and social syncretism

Finally, forms of syncretism could also be detected within the two technical systems. With regard to the lithic industries, this syncretic phenomenon can be observed during the BQY/VSG through way of doing no. 5, which incorporates criteria from both ways of doing no. 1 and 2 identified at the same site. Knowing that, as emphasised above, the two groups of knappers (the local one and the one from Hainaut) undoubtedly came together at some point, we proposed that way of doing no. 5 is the result of an hybridisation of the technical practices employed by these two groups (Denis & Burnez-Lanotte, 2020).

For ceramics, at Vaux-et-Borset, the systematic association of typically LBK roughing-out operations from Hesbaye region (as well as from Hainaut and the Aisne valley) with shaping operations from the Moselle LBK, points to the existence of hybridisation mechanisms of technical practices during the LBK-BQY/VSG transition. This suggests prolonged and intertwined interactions between pottery producers from distinct learning networks. It may be noted that beating is a very "visible" technique when used for shaping and is not difficult to implement: in the context of prolonged interactions between producers, it might be more easily borrowed and adopted than less visible techniques and procedures that are more deeply rooted in motor habits, such as the direction in which the coils are placed, or their degree of elongation.

In addition, the very high prevalence of technical tradition no. 2 at Vaux-et-Borset, typical of the ‘standard’ Limburg ware in LBK context (Gomart, 2014), is intriguing in in many ways. The Limburg ware clearly comes from a different learning network from that of producers of typical LBK ware, yet it is evidently linked, in our view, to the LBK sphere (Constantin et al., 2010; Gomart, 2014; Gomart & Burnez-Lanotte, 2012). The fact that, up until now, no site has revealed a ceramic assemblage composed exclusively of Limburg ware in a reliable context, and that these ceramics maintain homogenous stylistic characteristic in the whole western LBK expansion zone tends, in our view, to refute the hypothesis of production by hunter-gatherer groups (Constantin et al., 2010). Limburg ware is nearly always found in

contexts associated with the collective sphere, and imitated by producers of typical LBK ceramics. It thus seems to constitute a specific functional category, and to carry strong cultural significance for the LBK communities. The local origin of the clay used to form Limburg pots, as well as the marked uniformity of the technical gestures associated with their production throughout the whole western LBK chronological sequence, across vast territories including Belgium, the Netherlands and north-eastern France (which stand in opposition to the diversity of technical practices associated with typically LBK assemblages) may suggest that Limburg ware was produced and disseminated by itinerant artisans. These artisans would have formed an integral part of LBK communities, although their social role might have differed from those held by the producers of domestic ware (Gomart, 2014).

The use of tradition no. 2 at Vaux-et-Borset could suggest that the learning network behind the production of Limburg ware during the LBK remained active after the transition towards the BQY/VSG. The producers and the productions themselves would nevertheless have lost their specific cultural and social roles. It is indeed highly probable that for the Neolithic communities in question, a cultural transition would be accompanied by profound transformations in the cultural and social meaning attributed to specific categories of artefacts (Raczky et al., 2010). It is thus possible to suppose that producers from the Limburg learning network, having lost their status as itinerant craftsmen and now making pottery for domestic use, could have established themselves locally in BGY/VSG villages. This new local anchoring would entail prolonged interactions with the descendants of the typical LBK style pottery learning networks, giving rise to important technical and stylistic transfers between producer groups. This scenario of interaction would also explain the spread of bone temper among BQY/VSG assemblages (while it was nearly exclusively used on Limburg ware in LBK contexts), but also the fashioning of large-sized vases with everted walls and the use of impressed or incised herringbone decorative patterns which were hitherto characteristic of Limburg ware.

The different processes of technical hybridisation identified among lithic and ceramic productions could not have emerged without close and prolonged interaction between producers from different learning networks (Roux et al., 2017). The presence of these phenomena at Vaux-et-Borset - in the form of way of doing no. 5 with regard to the lithic industry and the use of the beating technique for the production of the whole pottery assemblage - reinforces our postulate that the western and eastern influences identified in the two technical subsystems during BQY/VSG are indeed the result of exogenous populations inputs at the turn of the fifth millennium that integrated the communities already established in the Hesbaye region, leading to social syncretism visible in the technical system. Another mechanism of social syncretism is represented in the massive employment of technical tradition no. 2 in the BQY/VSG sector of Vaux-et-Borset, formerly associated with Limburg ware, and which suggests a local settling of producers hitherto in charge of making the said Limburg ware. This was probably accompanied by the loss of their specific societal role, as well as that of the status of their production.

Conclusion

Our premise was aimed at testing the validity of the three models of historical transition proposed to explain the shift from the LBK to the post-LBK in the Hesbaye region:
(i) an endogenous process linked to profound socio-cultural mutations within LBK populations;
(ii) a syncretic process, relating to the integration of Neolithic populations from contemporaneous cultural entities;
(iii) a syncretic process, relating to the final stage of integration of hunter-gatherer populations.
Our results reveal several overlapping mechanisms were at work in the Hesbaye region during the transition between the LBK and BQY/VSG. In fact, the ceramic and lithic sub-systems attest to a combination of filiation, migration, and societal syncretism. The technical continuity observed between the LBK and BQY/VSG in the ceramics and lithic industries, which attests to continuity in the peopling of the Hesbaye region, is accompanied by migrations and phenomena of syncretism between groups from different geographical origins, albeit with similar cultural affiliation. The interactions that could be identified in the lithic subsystem seem indeed to be indicative of exchanges between LBK, and later post-LBK, communities from different regions (the Hainaut region or the Paris Basin). In the same vein, the south-eastern influx into the ceramic subsystem stems from the Danubian cultural sphere. These interactions between communities seem to be linked to an intensification of population movements within the Danubian cultural sphere during the transition between the LBK and BQY/VSG. In view of the current state of research, however, neither the lithic nor ceramic subsystem from the Hesbaye region reveals indications of influx from contemporaneous non-Danubian cultural entities (e.g., Cardial, epi-Cardial), nor of the integration of hunter-gatherer populations into BQY/VSG communities.

It is important to underline that profound socio-economic mutations are also perceptible in the lithic technical subsystem, through the massive development of simple productions during the BQY/VSG, particularly in the Hesbaye region (e.g., Caspar & Burnez-Lanotte, 2008; Denis, 2017). These productions, manufactured on a domestic scale, indicate the appearance of a new group of producers (Denis 2017) that is independent from the group of blade producers who tends to adopt diverse forms of specialised organisation (Bostyn et al., 2019; Denis, 2019b). The local settling of Limburg ware producers during the BQY/VSG, probably accompanied by a loss of their specific social role and of the status of their production, is probably part of the same type of socio-economic upheaval.

This combination of complex phenomena seems to mainly reflect processes specific to the Danubian sphere, although their exact rhythms have yet to be understood. Data retrieved from lithic and ceramic industries point to population movements, but these do not appear to be synchronous. In the present state of the data, the supposed interactions between ceramic communities of practice are identified during the

LBK and seem to only give rise to technical hybridisations during the BQY/VSG. By contrast, the LBK lithic industries are characterised by strong technical homogeneity, with no evidence of transfers between communities of practice. It is only from the BQY/VSG that the lithic subsystem provides evidence of interactions and manifests technical transformations and hybridisations. As shown above, we cannot exclude the possibility that this assessment may only be the reflection of the current state of research. Technological analyses relating to ceramic apprenticeships have so far concentrated on the LBK of the Paris Basin, Belgium and Eastern France, whereas for lithic industries, it is rather the post-LBK assemblages from Belgium and the Rhineland that have been the main focus. Yet this observation may also reflect differing social dynamics depending on the technical subsystem, linked to a gendered distribution of technical labour (see e.g., Bickle, 2020; Masclans Latorre et al., 2020; Masclans et al., 2021). It is thus tempting to assume that the intensity of influxes (without visible hybridisation) observed in the ceramic subsystem during the LBK could be the reflection of a strong mobility of women, for instance in the case of matrimonial movements (as suggested by a number of bioarchaeological studies: e.g., Bentley et al., 2002; Price et al., 2001) - women settling where they marry with their own ceramic technical traditions (Gomart et al., 2015, 2017). In parallel, the more local anchoring of lithic technical traditions during the LBK could reflect this patrilocal functioning. The intensification of exchanges and population movements during the BQY/VSG, stemming from changes in social and economic paradigms, would reshape LBK social core structure and give rise to new types of interactions between individuals at the level of the whole society.

The detailed reconstruction of lithic and ceramic technical know-how during the transition between the LBK and BQY/VSG in the Hesbaye region thus reveals groups of producers whose spatial trajectories and socio-economic behaviours seem to change profoundly at the turn of the sixth and fifth millennia BC. This study shows the potential of integrated technological approaches for enhancing our understanding of the relations of identity between these two cultural entities and for building robust transition scenarios taking into account, in a systemic perspective, the cultural, social and economic dynamics that led to the fragmentation and disintegration of the LBK system.

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References List

Allard, P. (2005a). *L'industrie lithique des populations rubanées du nord-est de la France et de la Belgique*. Rahden: M. Leidorf.

Allard, P. (2005b). Surplus production of flint blades in the early Neolithic of western Europe: new evidence from Belgium. *European Journal of Archaeology*, *8*(3), 205–223. https://doi.org/10.1177/1461957105076058

Allard, P. (2007). An economy of surplus production in the Early Neolithic of Hesbaye (Belgium): Bandkeramik blade debitage at Verlaine 'Petit Paradis.' In P. Allard, F. Bostyn, F. Giligny, & J. Lech (Eds.), *Flint mining in the Prehistoric Europe, interpreting the archaeological records* (BAR Publishing., pp. 31–40). Oxford.

Allard, P. (2012). Détection de spécialistes de la taille de la pierre au Rubané. *Bulletin de la Société préhistorique française*, *109*(2), 267–278. https://doi.org/10.3406/bspf.2012.14107

Allard, P., & Bostyn, F. (2006). Genèse et évolution des industries lithiques danubiennes du Bassin parisien. In *Contribution des matériaux lithiques dans la chronologie du Néolithique ancien et moyen en France et dans les régions limitrophes*. Session de l'EAA (Lyon, septembre 2004), Oxford, Archaeopress (BAR International Series), p. 28-52.

798 Allard, P., Bostyn, F., & Fabre, J. (2005). Origine et circulation du silex durant le Néolithique en
799 Picardie. Des premières approches ponctuelles à une systématique régionale. *Revue*
800 *archéologique de Picardie*, *22*(1), 49–74. https://doi.org/10.3406/pica.2005.2721
801 Allard, P., & Burnez-Lanotte, L. (2006). Surplus production in the Belgian Linearbandkeramik : blade
802 debitage at Verlaine "Petit Paradis" (Verlaine, Hesbaye, Belgium). In G. Körlin & G.
803 Weisgerber (Eds.), *Stone Age - Mining Age: VIII International Flint Symposium, Bochum 13 -*
804 *17 September 1999, Deutsches Bergbau-Museum Bochum* (pp. 37–54). Bochum: Deutsches
805 Bergbau-Museum.
806 Allard, P., & Burnez-Lanotte, L. (2008). An economy of surplus production in the early Neolithic of
807 Hesbaye (Belgium) : Bandkeramik blade debitage at Verlaine "Petit Paradis." In P. Allard, F.
808 Bostyn, F. Giligny, & J. Lech (Eds.), *Flint mining in prehistoric Europe: interpreting the*
809 *archaeological records* (pp. 31–39). Oxford: Archaeopress.
810 Astruc, L., Gratuze, B., Pelegrin, J., & Akkermans, P. (2007). From production to use: a parcel of
811 obsidian bladelets at Sabi Abyad IIii. In L. Astruc, D. Binder, & F. Briois (Eds.), *Systèmes*
812 *techniques et communautés du Néolithique précéramique au Proche-Orient* (pp. 327–341).
813 Presented at the 5ème Colloque International, Fréjus, 29 fév.-5 mars 2004, Antibes: Association
814 pour la Promotion et la Diffusion des Connaissances Archéologiques.
815 Balfet, H. (1991). *Observer l'action technique : des chaînes opératoires, pour quoi faire?* (éditions du
816 Centre National de la Recherche Scientifique.). Paris.
817 Bedault, L. (2009). First reflexions on the exploitation of animals in Villeneuve-Saint-Germain society
818 at the end of the early Neolithic in the Paris Basin (France). In D. Hofmann & P. Bickle (Eds.),
819 *Creating communities: new advances in Central European neolithic research* (pp. 111–131).
820 Oxford : Oakville, CT: Oxbow Books ; David Brown Book Co.
821 Bentley R. A.; Price T. D., Lüning J., Gronenborn D., Wahl J., Fullagar P.D. (2002). Prehistoric
822 Migration in Europe: Strontium Isotope Analysis of Early Neolithic Skeletons. *Current*
823 *Anthropology*,43(5), 799-804. https://doi.org/10.1086/344373
824 Bickle, P. (2020). Thinking Gender Differently: New Approaches to Identity Difference in the Central
825 European Neolithic. *Cambridge Archaeological Journal*, *30*(2), 201–218.
826 https://doi.org/10.1017/S0959774319000453
827 Binder, D. (1991). Facteurs de variabilité des outillages lithiques chasséens dans le sud-est de la France.
828 In A. Beeching, J.-C. Blanchet, & D. Binder (Eds.), *Identité du Chasséen: actes du colloque*
829 *international de Nemours, 17-18-19 mai 1989* (pp. 261–272). Nemours: Edition de
830 l'Association pour la promotion de la recherche archéologique en Ile-de-France.
831 Binder, D., & Gassin, B. (1988). Le débitage laminaire chasséen après chauffe : technologie et traces
832 d'utilisation. In S. Beyries (Ed.), *Industries lithiques: tracéologie et technologie* (pp. 93–125).
833 Oxford, B.A.R.

Blanchet, J.-C., Plateaux, M., & Pommepuy, C. (1989). *Matières premières et sociétés protohistorique dans le Nord de la France* (Action Thématique Programmée « Archéologie métropolitaine », rapport d'activité). Direction des Antiquités de Picardie.

Blouet, V., Klag, T., Petitdidier, M.-P., Thomashausen, L., Ilett, M., & Constantin, C. (2013). Synchronisation des séquences du Rubané de Lorraine et du Bassin parisien. *Bulletin de la Société préhistorique française*, *110*(3), 513–537.

Bostyn, F. (1994). *Caractérisation des productions et de la diffusion des industries lithiques du groupe néolithique du Villeneuve-Saint-Germain* (Thèse de doctorat). Paris X, Nanterre.

Bostyn, F., Charraud, François, & Denis, Solène. (2019). Variabilités techniques, évolutions et aires d'influence des centres de productions laminaires au sein de la culture de Blicquy/Villeneuve-Saint-Germain. In *Préhistoire de l'Europe du Nord-Ouest : mobilité, climats et identités culturelles. 28e congrès préhistorique de France* (Vol. 3, pp. 43–56). Amiens: Société préhistorique française.

Burnez-Lanotte, L. (2010). Acquérir, transformer, échanger ou consommer les matériaux siliceux au Rubané : problématiques et approche contextuelle du site de Verlaine "Petit Paradis" (Hesbaye, Belgique). In *Le Néolithique ancien de Belgique. Sites du Hainaut et de Hesbaye* (pp. 175–204). Amay.

Burnez-Lanotte, L., & Allard, P. (2003). Blade debitage in the Belgian Linerbandkeramik : the production at Harduémont (Verlaine, Hesbaye). In L. Burnez-Lanotte (Ed.), *Production and management of lithic materials in the European Linearbandkeramik* (pp. 59–64). Oxford, Archaeopress.

Burnez-Lanotte, L., & Allard, P. (2013). Stratigraphic Relationships, Chronological and Spatial Correlation of Activities : one Domestic Unit in the Blade Producer Settlement of Verlaine « Petit Paradis » (Hesbaye, Belgium). In C. Hamon, P. Allard, & M. Ilett (Eds.), *The domestic space in LBK settlements* (pp. 141–154). Rahden/Westf: VML, Verlag Marie Leidorf.

Burnez-Lanotte, L., Caspar, J.-P., & Constantin, C. (1993). I Introduction. In J.-P. Caspar, C. Constantin, A. Hauzeur, & L. Burnez-Lanotte (Eds.), *Nouveaux éléments dans le groupe du Blicquy en Belgique : le site de Vaux-et-Borset "Gibour" et "A la Croix Marie-Jeanne"* (Vol. 1, pp. 67–79).

Burnez-Lanotte, L., Caspar, J.-P., & Constantin, C. (2001). Rapports chronologiques et culturels entre Rubané et Groupe de Blicquy à Vaux-et-Borset (Hesbaye, Belgique). *Bulletin de la Société préhistorique française*, *98*(1), 53–76.

Burnez-Lanotte, L., Caspar, J.-P., & Vanguestaine, M. (2005). Technologie des anneaux en schiste dans le groupe de Blicquy/ Villeneuve-Saint-Germain à Vaux-et-Borset (Hesbaye, Belgique): interférences de sous-systèmes techniques. *Bulletin de la Société préhistorique française*, *102*(3), 551–596.

Caspar, J.-P., & Burnez-Lanotte, L. (1994). III. Le lithique. In J.-P. Caspar, C. Constantin, A. Hauzeur, & L. Burnez-Lanotte (Eds.), *Nouveaux éléments dans le groupe du Blicquy en Belgique : le site de Vaux-et-Borset "Gibour" et "A la Croix Marie-Jeanne"* (Vol. 1, pp. 3–93).

Caspar, J.-P., & Burnez-Lanotte, L. (1997). L'industrie lithique de Vaux-et-Borset (Hesbaye liégeoise) : nouveaux éléments dans le groupe de Blicquy (Belgique). In *Le Néolithique danubien et ses marges entre Rhin et Seine, Actes du 22ème Colloque Interrégional sur le Néolithique* (pp. 411–429). Strasbourg.

Caspar, J.-P., & Burnez-Lanotte, L. (1998). L'industrie lithique du Rubané récent de Hesbaye à Vaux-et-Borset "Gibour" (Villers-le-Bouillet) dans le contexte de la problématique des rapports chrono-culturels entre Rubané et groupe de Blicquy en Hesbaye liégeoise (Belgique). In *Organisation néolithique de l'espace en Europe du Nord-Ouest, Actes du XXIIIe colloque interrégional sur le Néolithique* (pp. 217–236). Bruxelles.

Caspar, J.-P., & Burnez-Lanotte, L. (2003). Gestion des matériaux siliceux dans les premières communautés danubiennes (culture à Céramique Linéaire et groupe de Blicquy/Villeneuve-Saint-Germain) à Vaux-et-Borset (Hesbaye, Belgique). In L. Burnez-Lanotte (Ed.), *Production and management of lithic materials in the European Linearbandkeramik* (pp. 51–58). Oxford, Archaeopress.

Caspar, J.-P., & Burnez-Lanotte, L. (2008). Les industries lithiques des cultures du Rubané et du Blicquy/Villeneuve-Saint-Germain : mises en convergence d'analyses croisées. In L. Burnez-Lanotte, M. Ilett, & P. Allard (Eds.), *Fin des traditions danubiennes dans le Néolithique du Bassin parisien et de la Belgique (5100-4700 av. J.-C.): autour des recherches de Claude Constantin* (pp. 35–56). Paris, Société préhistorique française ; Namur, Presses universitaires de Namur.

Collin, J.-P. (2016). Mining for a week or for centuries: Variable aims of flint extraction sites in the Mons Basin (Province of Hainaut, Belgium) within the lithic economy of the Neolithic. *Journal of Lithic Studies*, *3*(2), 163–179. https://doi.org/10.2218/jls.v3i2.1819

Collin, J.-P. (2019). *De la mine à l'habitat: économie des productions minières du Bassin de Mons au Néolithique. De la fin du 5è millénaire à la fin du 3è millénaire avant notre ère*. UNamur et Université Paris 1-Panthéon Sorbonne, Namur.

Constantin, C. (2013). Précisions sur l'étape finale du Rubané récent du Bassin parisien et la formation du groupe de Villeneuve Saint-Germain. *Bulletin de la Société préhistorique française*, *110*(3), 473–494.

Constantin, C., Allard, P., & Demarez, L. (2010). Le site rubané d'Aubechies "Coron Maton" (Hainaut). Fouilles de 1984 à 2002. In *Le Néolithique ancien de Belgique. Sites du Hainaut et de Hesbaye* (pp. 5–112). Amay.

Constantin, C., & Burnez-Lanotte, L. (2008). La mission archéologique du ministère des Affaires étrangères français en Hainaut et moyenne Belgique…. In *Fin des traditions danubiennes dans*

907 *le Néolithique du Bassin parisien (5100-4700 av. J.-C). Autour des recherches de Claude*
908 *Constantin* (Vol. XLIV, pp. 35–56). Paris, Société préhistorique française, Namur, Presses
909 Universitaires de Namur.
910 Constantin, C., & Ilett, M. (1998). Culture Blicquy-Villeneuve-Saint-Germain, rapports chronologiques
911 avec les cultures rhénanes. In *Actes du 23è colloque interrégional sur le Néolithique* (Vol. 109,
912 pp. 207–216). Bruxelles: Anthropologica et Praehistorica.
913 Constantin, C., & Vachard, D. (2004). Anneaux d'origine méridionale dans le Rubané récent du Bassin
914 parisien. *Bulletin de la Société préhistorique française*, *101*, 75–83.
915 Coudart, A. (2010). La maison néolithique: métaphore matérielle, sociale et mentale des petites sociétés
916 sédentaires. In J.-P. Demoule (Ed.), *La révolution Néolithique dans le monde* (pp. 215–235).
917 CNRS éditions.
918 de Grooth, M. (1987). The Organisation of Flint Tool Manufacture in the Dutch Bandkeramik. *Analecta*
919 *Praehistorica Leidensia*, *20*, 27–52.
920 de Grooth, M. (2007). Flint: procurement and distribution strategies; technological aspects. In P. van de
921 Velde (Ed.), *Excavations at Geleen-Janskamperveld 1990/1991* (pp. 143–172). Leiden: Univ.
922 of Leiden, Faculty of Archaeology.
923 Demoule, J.-P. (Ed.). (2010). *La révolution néolithique dans le monde.* CNRS éditions.
924 Denis, S. (2017). *L'industrie lithique des populations blicquiennes (Néolithique ancien, Belgique):*
925 *organisation des productions et réseaux de diffusion: petits échanges en famille*. Oxford: BAR
926 Publishing.
927 Denis, S. (2019a). Inter-site Relationships at the End of the Early Neolithic in North-western Europe,
928 Bartonian Flint Circulation and Macro-features Matching Method. *Lithic Technology*, *44*(3),
929 132–152. https://doi.org/10.1080/01977261.2019.1613009
930 Denis, S. (2019b). The specialisation of lithic production at the end ofthe Early Neolithic in Belgium;
931 the case of the Blicquian population from Hainaut. *Anthropologica et Præhistorica*, *128/2017*,
932 125–142.
933 Denis, S. (2020). Intercultural contacts between BQY/VSG and GG/PF populations from the
934 Aldenhoven Plateau and surrounding areas. In V. Becker, J.-H. Bunnefeld, A. O'Neill, G.
935 Woltermann, H.-J. Beier, & R. Einicke (Eds.), *Varia neolithica X* (Vol. X, pp. 39–44). Presented
936 at the Go West! Kontakte zwischen Zentral- und Westeuropa, Langenweissbach: Beier & Beran.
937 Denis, S., & Burnez-Lanotte, L. (2020). Diversité technique des débitages laminaires au
938 Néolithique ancien à Vaux-et-Borset (Hesbaye, Belgique) : manières de faire, problèmes
939 d'interprétation et perspectives anthropologiques. *Bulletin de la Société préhistorique française*,
940 *117*(1), 7–46.
941 Denis, S., Burnez-Lanotte, L. & Trampota, F. (2021). Neolithization Processes of East Belgium: Supra-
942 Regional Relationships Between Groups Highlighted by Technological Analysis of Lithic
943 Industry. *Open Archaeology, 7*, 904-922. https://doi.org/10.1515/opar-2020-0180

Denis, S., Gjesfjeld, E., & Moreau, L. (2019). Post-Linear Pottery cultural boundary and repopulation of the German Rhineland: Revisiting the Western contacts hypothesis. *Journal of Archaeological Science: Reports*, *23*, 946–952. https://doi.org/10.1016/j.jasrep.2018.11.037

Deramaix, I. (1990). *Étude du matériel lithique du site rubané de Blicquy-Ormeignies "La Petite Rosière."* Liège: Préhistoire Liégeoise ASBL.

Dubouloz, J. (2003). Datation absolue du premier Néolithique du Bassin parisien: complément et relecture des données RRBP et VSG. *Bulletin de la Société préhistorique française*, *100*(4), 671–689.

Dubouloz, J. (2008). Impacts of the Neolithic demographic transition on Linear Pottery Culture settlement. In J.-P. Bocquet-Appel & O. Bar-Yosef (Eds.), *The Neolithic Demographic Transition and Its Consequences* (Springer., pp. 207–235). New York.

Dubouloz, J. (2012). À propos d'implantation, de démographie et de scission villageoises au Néolithique rubané. *Les Nouvelles de l'archéologie*, (127), 30–34. https://doi.org/10.4000/nda.1328

Gelbert, A. (2003). *Traditions céramiques et emprunts techniques dans la vallée du fleuve Sénégal.* Paris: Maison des sciences de l'homme.

Gomart, L. (2014). *Traditions techniques & production céramique au Néolithique ancien: étude de huit sites rubanés du nord est de la France et de Belgique*. Leiden: Sidestone Press.

Gomart, L., & Burnez-Lanotte, L. (2012). Techniques de façonnage, production céramique et identité de potiers: une approche technologique de la céramique de style non Rubané du site du Staberg à Rosmeer (Limbourg, Belgique). *Bulletin de la Société préhistorique française*, *109*(2), 231–250.

Gomart, L., Constantin, C., & Burnez-Lanotte, L. (2017). Ceramic production and village communities during the Early Neolithic in France and Belgium: questions about tempers and forming processes. In L. Burnez-Lanotte (Ed.), *Matières à penser: sélection et traitement des matières premières dans les productions potières du néolithique ancien = Matières à penser : raw materials acquisition and processing in early neolithic pottery productions* (Vol. 11, pp. 111–132). Actes de la table ronde de Namur (Belgique), 29-30 mai 2015, Namur: Société préhistorique française.

Gomart, L., Hachem, L., Hamon, C., Giligny, F., & Ilett, M. (2015). Household integration in Neolithic villages: A new model for the Linear Pottery Culture in west-central Europe. *Journal of Anthropological Archaeology*, *40*, 230–249. https://doi.org/10.1016/j.jaa.2015.08.003

Gosselain, O. P. (2018). Pottery chaînes opératoires as Historical Documents. In *Oxford Research Encyclopedia of African History*. Oxford University Press. https://doi.org/10.1093/acrefore/9780190277734.013.208

Hamon, C. (2008). Meules rubanées, meules blicquiennes : nouvelles réflexions sur les dépôts du Hainaut (Belgique). In *Fin des traditions danubiennes dans le Néolithique du Bassin parisien*

(5100-4700 av. J.-C). Autour des recherches de Claude Constantin (Vol. XLIV, pp. 197–208). Paris: Société préhistorique française et Namur: Presses Universitaires de Namur.

Hauzeur, A., & Van Berg, P.-L. (2005). Südliche Einflüsse in der Blicquy-Villeneuve-Saint-Germain Kultur. In J. Lüning, C. Frirdich, & A. Zimmermann (Eds.), *Die Bandkeramik im 21. Jahrhundert: Symposium in der Abtei Brauweiler bei Köln vom 16.9.-19.9.2002* (pp. 147–177). Rahden/Westf: VML, Verlag Marie Leidorf.

Ilett, M., & Meunier, K. (2013). Avant-propos. *Bulletin de la Société préhistorique française*, *110*(3), 415–420.

Inizan, M.-L., Reduron, M., Roche, H., & Tixier, J. (1995). *Préhistoire de la pierre taillée*. Meudon: CREP.

Jadin, I. (2003). *Trois petits tours et puis s'en vont...La fin de la présence danubienne en Moyenne Belgique* (Etudes et Recherches Archéologiques de l'Université de Liège., Vols. 1-109). Liège.

Jeunesse, C. (2002). Armatures asymétriques, régionalisation, acculturation. Contribution à l'étude des relations entre le Rubané et la composante autochtone dans l'ouest de la sphère danubienne. In M. Otte & J. K. Kozłowski (Eds.), *Préhistoire de la grande plaine du Nord de l'Europe: les échanges entre l'Est et l'Ouest dans les sociétés préhistoriques ; actes du colloque Chaire Francqui Interuniversitaire, Université Liège, le 26 juin 2001 ; précédés de la leçon inaugurale donnée à l'Université de Liège le 6 mars 2001, par le Professeur Janusz K. Kozłowski, tutulaire de la Chaire Francqui Interuniversitaire au titre étranger 2000 - 2001* (pp. 147–165). Liège: Éd. de l'Univ. de Liège.

Leblois, E. (2000). Bilan de cent cinquante années de découvertes archéologiques à Baudour. Première partie : Fouilles, découvertes fortuites et prospections. *Annales du Cercle d'histoire et d'archéologie de Saint-Ghislain et de la région*, *8*, 127–242.

Lemonnier, P. (1976). La description des chaînes opératoires : contribution à l'analyse des systèmes techniques. *Techniques et Culture*, *1*, 100–151.

Lemonnier, P. (1980). *Les salines de l'Ouest: logique technique, logique sociale*. Paris: Editions de la Maison des sciences de l'homme ; Lille: Presses universitaires de Lille.

Leroi-Gourhan, A. (1964). *Le Geste et la Parole, tome 1 Technique et Langage*. Paris: Albin Michel.

Lichardus-Itten, M. (1986). Premières influences méditerranéennes dans le Néolithique du Bassin parisien. In G. Bailloud, J.-P. Demoule, & J. Guilaine (Eds.), *Le Néolithique de la France: hommage à Gérard Bailloud* (pp. 147–159). Paris: Picard.

Livingstone Smith, A. (2001). *Chaîne opératoire de la poterie : références ethnographiques, analyses et reconstitution*. Université libre de bruxelles, Bruxelles.

Manen, C., & Mazurié de Keroualin, K. (2003). Les Concepts « La Hoguette » et « Limbourg » : un bilan des données. In A. Gallay, M. Besse, L.-I. Stahl Gretsch, & P. Curdy (Eds.), *ConstellaSion: hommage à Alain Gallay* (pp. 115–145). Lausanne: Cahiers d'archéologie romande.

Masclans, A., Hamon, C., Jeunesse, C., & Bickle, P. (2021). A sexual division of labour at the start of agriculture? A multi-proxy comparison through grave good stone tool technological and use-wear analysis. *PLOS ONE*, *16*(4), e0249130. https://doi.org/10.1371/journal.pone.0249130

Masclans Latorre, A., Bickle, P., & Hamon, C. (2020). Sexual Inequalities in the Early Neolithic? Exploring Relationships Between Sexes/Genders at the Cemetery of Vedrovice Using Use-Wear Analysis, Diet and Mobility. *Journal of Archaeological Method and Theory*. https://doi.org/10.1007/s10816-020-09453-y

Modderman, P. J. R. (1970). *Linearbandkeramik aus Elsloo und Stein*. Leiden: Publikationen des Instituts für Prähistorie der Universität Leiden.

Müller, C. (2016). Introduction. Penser la transition historique en régime présentiste ? In C. Müller & M. Heintz (Eds.), *Transitions historiques* (pp. 9–20). Paris: Éditions de Boccard.

Pelegrin, J. (1985). Réflexions sur le comportement technique. In M. Otte (Ed.), *La Signification culturelle des industries lithiques: actes du colloque de Liège du 3 au 7 octobre 1984* (pp. 72–88). Oxford: B.A.R.

Pelegrin, J. (1991). Les savoir-faire : une très longue histoire. *Terrain*, (16), 106–113. https://doi.org/10.4000/terrain.3001

Pelegrin, J. (1995). *Technologie lithique: le Châtelperronien de Roc-de-Combe (Lot) et de La Côte (Dordogne)*. Paris: CNRS éditions.

Pelegrin, J. (2007). Réflexions sur la notion de « spécialiste » dans la taille de la pierre au Paléolithique. In R. Desbrosse & H. J. Delporte (Eds.), *Arts et cultures de la préhistoire: hommages à Henri Delporte* (pp. 315–318). Paris: Éd. du Comité des Travaux Historiques et Scientifiques.

Pierret, A., Moran, C. J., & Bresson, L.-M. (1996). Calibration and Visualization of Wall-Thickness and Porosity Distributions of Ceramics Using X-radiography and Image Processing. *Journal of Archaeological Science*, *23*(3), 419–428. https://doi.org/10.1006/jasc.1996.0037

Price, T. D., Bentley, R. A., Lüning, J., Gronenborn, D., & Wahl, J. (2001). Prehistoric human migration in the Linearbandkeramik of Central Europe. *Antiquity*, *75*(289), 593–603. https://doi.org/10.1017/S0003598X00088827

Raczky, P., Sümegi, P., Bartosiewicz, L., Gál, E., Kaczanowska, M., Kozlowski, J., & Anders, A. (2010). Ecological barrier versus mental marginal zone? Problems of the northernmost Körös Culture settlements in the Great Hungarian Plain. In D. Gronenborn & J. Petrasch (Eds.), *Die Neolithisierung Mitteleuropas: Internationale Tagung, Mainz 24. bis 26. Juni 2005 = The Spread of the Neolithic to Central Europe ; International Symposium, Mainz 24 June-26 June 2005* (pp. 147–172). Mainz: Verlag des Römisch-Germanischen Zentralmuseums.

Roux, V. (2010). Lecture anthropologique des assemblages céramiques : fondements et mise en oeuvre de l'analyse technologique. In *Approches de la chaîne opératoire de la céramique : le façonnage* (pp. 4–9). Paris: Maison des Sciences de l'homme.

Roux, V., Bril, B., Cauliez, J., Goujon, A.-L., Lara, C., Manen, C., et al. (2017). Persisting technological boundaries: Social interactions, cognitive correlations and polarization. *Journal of Anthropological Archaeology*, *48*, 320–335. https://doi.org/10.1016/j.jaa.2017.09.004

Rye, O. S. (1981). *Pottery technology: principles and reconstruction*. Washington, D.C: Taraxacum.

Shepard, A. O. (1976). *Ceramics for the archaeologist* (Reprinted.). Washington, D.C: Carnegie Inst.

Tixier, J. (1967). Procédés d'analyse et questions de terminologie concernant l'étude des ensembles industriels du Paléolithique récent et de l'Epipaléolithique dans l'Afrique du Nord-Ouest. In W. W. Bishop & J. Desmond-Clark (Eds.), *Background to evolution in Africa. Proceedings of a Symposium held at Burg Wartenstein Austria* (pp. 771–820). Chicago: University of Chicago Press.

van Doosselaere, B., Burnez-Lanotte, L., Gomart, L., & Livingstone Smith, A. (2013). Analyse technologique de céramiques du Néolithique Ancien de Vaux-et-Borset (Belgique, Hesbaye) : résultats préliminaires. *Notae Praehistoricae*, *33*, 15–26.

van Doosselaere, B., Burnez-Lanotte, L., Gomart, L., & Livingstone Smith, A. (2016). The End of Diversity ? Pottery Technology at the LBK Blicquy/Villeneuve-Saint-Germain Transition in Hesbaye, Belgium. In L. Amkreutz, F. Haack, D. Hofmann, & I. van Wijk (Eds.), *Something out of the ordinary?: Interpreting diversity in the Early Neolithic Linearbandkeramik and beyond* (Cambridge Scholars Publishing., pp. 159–189). Newcastle upon Tyne.

Zimmermann, A. (1995). *Austauschsysteme von Silexartefakten in der Bandkeramik Mitteleuropas: von Andreas Zimmermann*. Bonn: Habelt.