From sherds to potters: the contribution of techno-morphological approaches to understanding the British Neolithic

Hélène Pioffet, Vincent Ard

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Od střepů k hrnčířům
Příspěvek techno-morfologického přístupu k chápání britského neolitu

Hélène Pioffet – Vincent Ard

The British Neolithic transition, occurring around 4000 BC, at least one millennium after the continental part of Northwest Europe, is still subject to important debate these days. Various studies suggest that the Neolithic start involved farming immigrants from various parts of the Continent. However, ceramics of the Early Neolithic of Britain became increasingly distinct from their Continental roots, particularly in the Southwest and Southeast of England. We recently completed two important projects, one on Early Neolithic British and Irish pottery and the other on Peterborough Ware, integrating a new way of considering these early productions through a technological approach and the observation of various steps of the chaîne opératoire. This paper is the opportunity to present preliminary results which shed a new light on the evolution of pottery wares during the fourth millennium BC in Southern Britain. It specifically highlights strong connections between Early Neolithic and Middle Neolithic pottery, in terms of style, but above in terms of manufacturing techniques.

Early Neolithic – Middle Neolithic – chaîne opératoire – pottery – manufacturing techniques – decorative grammar – British islands

Přechod k neolitu v Británii, který se odehrál kolem 4000 BC, nejméně o jedno tisíciletí později než v kontinentální části severozápadní Evropy, je v současnosti stále předmětem důležitých diskusí. Různé studie připouštějí myšlenku, že začátek neolitu byl spojený se zemědělci – imigranty z různých částí kontinentální Evropy. Keramika britského časného neolitu se nicméně s časem stále více odlišovala od svých kontinentálních kořenů, a to zejména na jihozápadě a jihovýchodě Anglie. V nedávné době se podařilo uskutečnit dva projekty: jeden zaměřený na časně neolitickou britskou a irskou keramiku, druhý zacílený na keramickou tradici Peterborough. Technologickým přístupem a studiem jednotlivých kroků chaîne opératoire oba projekty přispěly k novému pohledu na tyto časné tradice. Tento článek je příležitostí prezentovat předběžné výsledky, které vrhají nové světlo na vývoj keramických tradicí v průběhu čtvrtého tisíciletí BC v jižní Británii. Zdůrazňuje výraznou souvislost mezi časně neolitickou a středoneolitickou keramikou co do stylu a hlavně výrobních technik.

časný neolit – střední neolit – chaîne opératoire – keramika – výrobní techniky – gramatika výzdoby – Britské ostrovy

1. Introduction

From the beginning of the 4th millennium BC onwards, a shift in subsistence economy spread throughout Britain and Ireland. During the same period, on the Continent, the transition to Neolithic economy seems to be completed, approximately a millennium earlier, everywhere but in Northern Europe. The beginning of this millennium shows distinct transformations on miscellaneous aspects of culture such as the development of fortified

enclosures (numerous in Northern France and Southern Belgium), the increase of trade, particularly through exploitation of flint mines, and above all an outburst of various cultural and material traditions. Nevertheless, the shift to the Neolithic is far more gradual in the Northern part of Europe with a very slow adoption of an agricultural economy by hunter-gatherers. The slow shift to the Neolithic economy in Britain is the very core of this paper, with help of a strong cultural landmark: pottery wares.

In previous research, stylistic studies were made on pottery productions, allowing confrontations with continental material that would help identifying contacts accounting for the transition. Yet this method rapidly reaches its limits when applied alone. Here, a new approach had to be found to highlight links or, on the contrary, breaches between continental and insular productions. This new approach integrated stylistic characters observations (carried out with an accurate analysis grid) as well as technical characters relying on a *chaîne opératoire* analysis. Indeed these analyses encompass the potters' knowledge and know-how, but can also reflect their social and cultural environment (*Roux – Courty 2007*; *Roux 2010*). The technical traits studied here can therefore be understood as the action of man on matter (*Lemonnier 1983*). This work questioned new elements of this major transition, particularly regarding cognitive movements and transfers from the continent to Britain.

Numerous discussions dealt with the fact that the beginning of the Neolithic could be divided into two phases: an *Earlier Neolithic*, spreading from c. 4000 cal BC to c. 3700 cal BC, and an *Early Neolithic* spreading from c. 3700 cal BC to c. 3300 cal BC (*Whittle 1977*). This Ph.D. project reassessed a division between two phases during which different situations are observed. During the first phase, the results obtained shed a new light on two wide areas appearing in the first centuries of the Neolithic (between c. 4000 and 3700/3650 cal BC), on the Atlantic façade and western Channel on the one hand, and on the North Sea façade and eastern Channel on the other hand. These areas showed that transition modalities were divergent from one area to the other. Later, pottery productions seem to find a regional basis, developing elaborate decorative patterns, probably used as a means of recognition. Interestingly, these productions seem to rely on the same stylistic codes that are used in the recognition process afterwards, highlighting the gradual emphasis on know-how transmission, through more and more significant exchange network. Hence one can legitimately wonder what the impacts of pottery are, in terms of cultural identity development.

The following presentation aims to give an insight into this second phase, taking the example of East Anglian and South East pottery (*fig. 1*). It is indeed from this second phase that the techno-morphological characteristics of pottery start to clearly be developed and make more sense in terms of an outburst of cultural identity.

2. East Anglian pottery: an insight in the Early Neolithic cultural identity

Relying on our research work, a regional synthesis combining and comparing these data can be suggested, although the similarities between pottery materials have already pointed out (*Garrow – Lucy – Gibson 2006*). In both cases, pits revealed successive fills containing archaeological material. The point in selecting these two sites is all the more interesting as they are very much alike in type and the material represented is more or less the same.

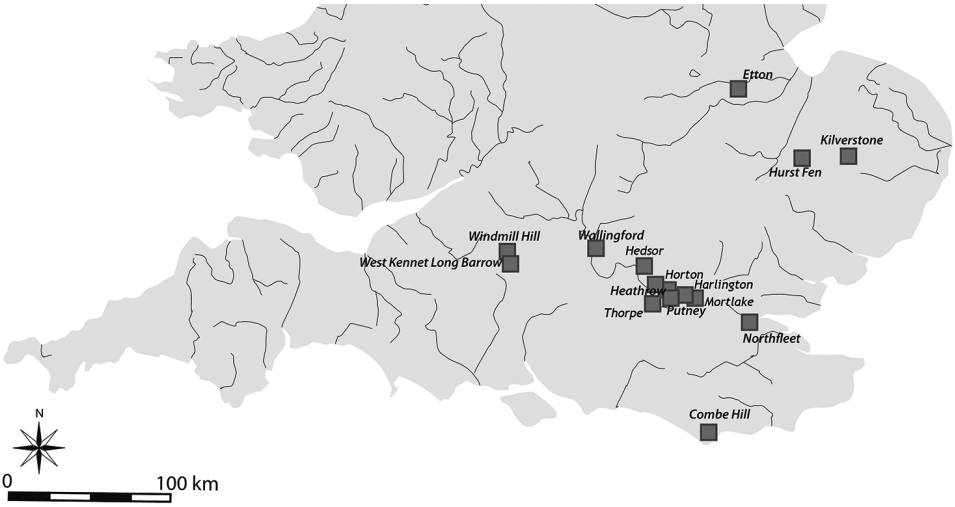

Fig. 1. Distribution map of sites mentioned in the text.

The archaeological contexts are identical as the material comes from fills of clustered pits. On both sites, chrono-stratigraphic relations are rather arduous to understand, unless some pits recut others. Only absolute dating is then useful to better understand the site history.

2.1. Kilverstone

The site of Kilverstone, located in the Breckland Forest Soils, encompasses several occupations from the Early Neolithic to Modern periods. The excavation (*Garrow – Lucy – Gibson 2006*) followed survey and test pits that had uncovered pit clusters and a knapping area (*Garrow 2000*). According to the authors, some clues suggest rapid pit filling. Firstly, material is trapped in the filling layer, coming from a primary deposit. Moreover, refitting between material from pits belonging to the same clusters and pits cuttings made the authors think of pit filling up in short time lapse. Yet, if unique fillings may be clues for a short-time use of each pit, it seems a little more problematic to assess the lifespan of pits. Material in the pit fills provided dating, that could, most of the time, be associated to pottery. A model was put forward (*Whittle – Healy – Bayliss 2011*) for pit usage between 3725–3525 cal BC and 3625–3320 cal BC (95% confidence).

Pottery from areas A and E were studied integrally. This came from 141 pits, corresponding to 144 different contexts, the majority of which contained only one fill. Pits with pottery were located in area A (within clusters S, T, U, W, X, Y, AA and BB), and in area E (within clusters A to R). Kilverstone Early Neolithic pottery material was studied integrally. The entire collection had already been studied (*Knight 2006*), yet it showed great potential, particularly for technological observations, that are presented here (*tab. 1*).

Kilverstone pottery was studied according to a specific methodology integrating aesthetical and technological observations. This paper illustrates how these two types of observations are interconnected, first by looking at the process of *chaînes opératoires*, leading to the identification of specific assemblages.

Site	Sherds quantity	Minimum number of individuals
Kilverstone	2392	215
Hurst Fen	754	138

Tab. 1. Material selected on Kilverstone and Hurst Fen.

2.2. Hurst Fen

Hurst Fen (*Clark 1960*) is located on Mildenhall parish, Suffolk, about twenty kilometres South West of Kilverstone site. It is situated 2 kilometres from the closest river, the Lark river. It was discovered in 1954 by Lady G. Briscoe, who labelled it as part of the East Anglian group. Following this discovery, Clark ran several excavation campaigns in 1954, 1957 and 1958.

The Hurst Fen excavation being rather ancient, little information could be exploited from it. The site was excavated through a large window, opened on a region containing pit clusters as well as a ditch running through the site from North West to South East. 200 pits were exposed (in comparison to the 226 pits from Kilverstone). *Clark* (*1960*) interpreted these pit clusters as means to store cereals, in relation to different households. A more recent explanation by *Pollard* (*1999*) proposes the central cluster as he works of an initial community, while the surrounding clusters would be linked to later installations. It could therefore be interpreted as long-term clustering. Hurst Fen raises the same interpretation issues as Kilverstone regarding the contexts, specifically the first and second deposits and the pit lifespan. Very little information is given regarding the various fills contained in the pits. The author suggested that several pits could be in use at the same time. The excavation uncovered a large amount of archaeological material. The pottery sample selected comes from 31 pits, among which 24 are located in the northern part of the site.

Only a sample of the Hurst Fen collection was studied (*tab. 1*), and comes from 31 of 200 pits excavated on the site, 24 of which were located in the northern part of the site. A corpus of 754 sherds, i.e. 138 MNI were studied. The choice was made to sample the collection as the remaining material was too fragmentary to be studied.

2.3. The Mildenhall style

A great morpho-stylistic homogeneity was noticed between these two East Anglian ensembles. Numerous common characteristics were recorded. This style comprises for one part vessels with prominent curves, for another part vessels with sharp carinations or shallow carinations, and for a last part vessels with simple profiles.

Even though chronological elements are rather difficult to obtain, the presence of all these characteristics in both Kilverstone and Hurst Fen assemblages suggest similar production on both sites.

The decorative patterns study on both ensembles first highlight a great number of similarities: decorations cover identical zones on the vessels, i.e. the rim, exterior neck and under maximal diameter. Yet the position variability is greater in the Kilverstone ensemble. This observation pairs with the greater variability of patterns in this ensemble, even though the same basis can be found on both ensembles. Therefore, one can assume that the decorative grammar is far more developed on the Kilverstone ensemble (*fig. 2*).

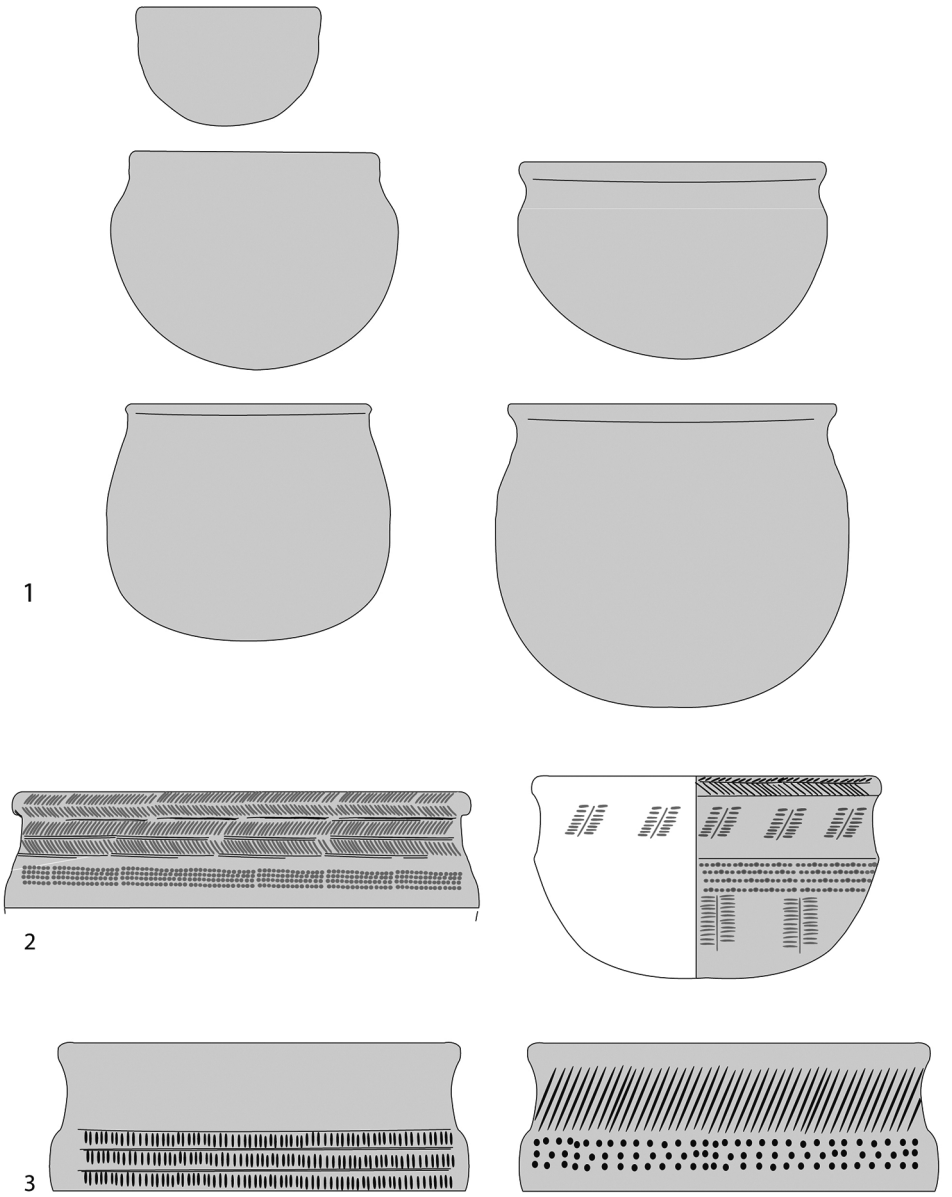

Fig. 2. Synthesis of both East Anglian corpora. 1: common profiles. 2: decorations observed on Kilverstone pottery. 3: decorations observed on Hurst Fen pottery.

It was moreover shown that these vessels with more complex decorative grammar (*Pioffet 2014*) were only located on one part of the site. The development of those specific types of decoration seems therefore to be a major discrimination point between the two sites.

3. Methodology

The study methodology specificity is that it attempted to analyze in an integrated approach the structure of *chaînes opératoires* whilst working with highly fragmented material.

The first studies on the subject of *chaînes opératoires* come from the model developed by *Leroi-Gourhan* (*1965*) for lithic studies, in reaction to studies of material initially focused on mere classifications. In lithic and pottery studies, the idea was therefore to look more accurately at *chaînes opératoires*. Yet this approach raises issues, as the number of definitions is rather important (*Desrosiers 1991*). Moreover the notion of *chaîne opératoire* can apply not only to pottery and lithics but also to other fields of investigations (*Balfet 1991*). In all definitions formulated, a convergence point can be highlighted: one is always confronted with raw material processed into a finished product (*Desrosiers 1991*). Leroi-Gourhan asserted that "*the technique is both movement and tool, organized in a chain following a specific rule that gives to the process its stability but also its flexibility*" (*1964*, 164). According to him, a *chaîne opératoire* is made of technical facts, for which operations, articulated chain links, aim at a precise target. Those links are meaningful only when taken as a whole (*Balfet 1975*). The study of a *chaîne opératoire* thus consists in studying all stages that compose its links. Yet this task can be arduous when it comes to studying archaeological material. Reconstructing full *chaînes opératoires* is not manageable with such fragmentary archaeological material, considering the preservation state of material as well as the lack of information regarding some specific stages of *chaînes opératoires*, that would be available when working on ethno-archaeological projects (such as conception stages, raw clay full preparation, firing complete management, etc.). Still, some stages were available for study, allowing to tackle the potters' technical knowledge and background, and to pinpoint exchanges, transfers, adaptations or else modifications of techniques from one production to another. These stages are the preparation of fabric, the construction of vessels (comprising a first forming stage of the vessel and a second shaping, almost reaching the final shape of the vessel), the surface treatments performed on the pottery, the decoration techniques applied and finally the firing stage.

The input of such a study is therefore highly conditioned by the material preservation state as most of the time, only upper parts of vessels are available for study.

4. Investigating the *chaînes opératoires*

4.1. Preparation of fabric

The preparation of fabric at Kilverstone consisted in macroscopic observations regarding temper addition. Some observations had already been provided, based on thin-sectioning (*Sibbesson 2011*). Yet a macroscopic study can bring information regarding the potter's work and preparation of raw clay (*tab. 2*). Fabrics tend to show similar preparation, particularly concerning the type of temper and its size (most of the time in a range of 0.2 to 4mm) mixed with the matrix. Nonetheless, the quantity of temper varies; the most frequently observed fabric (72 individuals) comprised a frequency of 20% of temper. According to *Matthew – Woods – Olivier* (*1991*) descriptive guideline, it appears that potters would not show great care in sorting inclusions as the range of temper is rather wide.

Site	Fabric number	Matrix structure	Temper type	Inclusions frequency (%)	Inclusions size (mm)
Kilverstone	1	layered	flint, quartz, mica	7	2–4
	2	layered	flint, quartz, mica	15	0.2–4
	3	even	flint, mica	7	2–4
	4	layered	flint, shell, sand	7	0.2–4
	5	layered	flint, shell, sand	20	0.2–4
	6	even	flint, shell	7	0.2–4
	7	layered	shell	7	2–4
	8	even	sand	10	0.2–0.4
Hurst Fen	1	even	flint, small gravel	7–10	0.5–4

Tab. 2. Fabrics characteristics recorded on Kilverstone and Hurst Fen corpora.

Only one fabric was observed among the Hurst Fen sample (*tab. 2*). This type of fabric bears flint inclusions as well as small gravel (which size does not exceed 4 mm). It has to be noted that flint addition seems to have a cultural function; it is indeed present in the Kilverstone and the Hurst Fen ensembles.

4.2. Construction phase

Several individuals in the Kilverstone corpus bear key-elements to understand vessels construction. Two of these were selected to illustrate these key-elements. Firstly, vessel 120 comprises first forming clues with presence of jointed elements, i.e. flat-sectioned coils (*fig. 3*). The inflexion second shaping was probably made with modeling, as illustrated with fingerprints on internal surface. The rim secondary shaping consists of clay addition beneath the rim and, secondly, above. Very little care was taken during the rim equalizing phase. The surface state bears unveiled inclusions, possibly due to wet-handed smoothing.

Vessel 180 is rather badly executed (*fig. 4*). Joint elements of even size show internally-beveled coiled structure. The inflexion second shape seems to be modeled from the inside. As well as for vessel 120, inclusions were revealed on the surface, suggesting wet-handed smoothing. Finally, fluting is visible on external surface, and tends to show poor quality polishing.

In the manner of observations performed on the two previous vessels, *chaînes opératoires* fragments were recorded and can be arranged in various groups (*fig. 5*; *6*). On well-enough preserved fragments of vessels, three main groups can be identified, starting with the primary forming construction techniques. The first group consists of internally-beveled coils; the second shaping of bases and bellies being unfortunately unavailable. Yet the second shaping of inflexions can be made either by modeling, modeling and clay addition on internal surface to reinforce the inflexion or by clay addition on the exterior surface. Rim secondary shaping techniques are variable: internal folding, external folding without or with clay addition, or else by clay addition on top and beneath the rim sketch.

The second group corresponds to vessels firstly forming with flat-sectioned coils. Here again, inflexion shaping varies between modeling only or with clay addition on internal surface. The same techniques as for the first group are applied to make rim shapes.

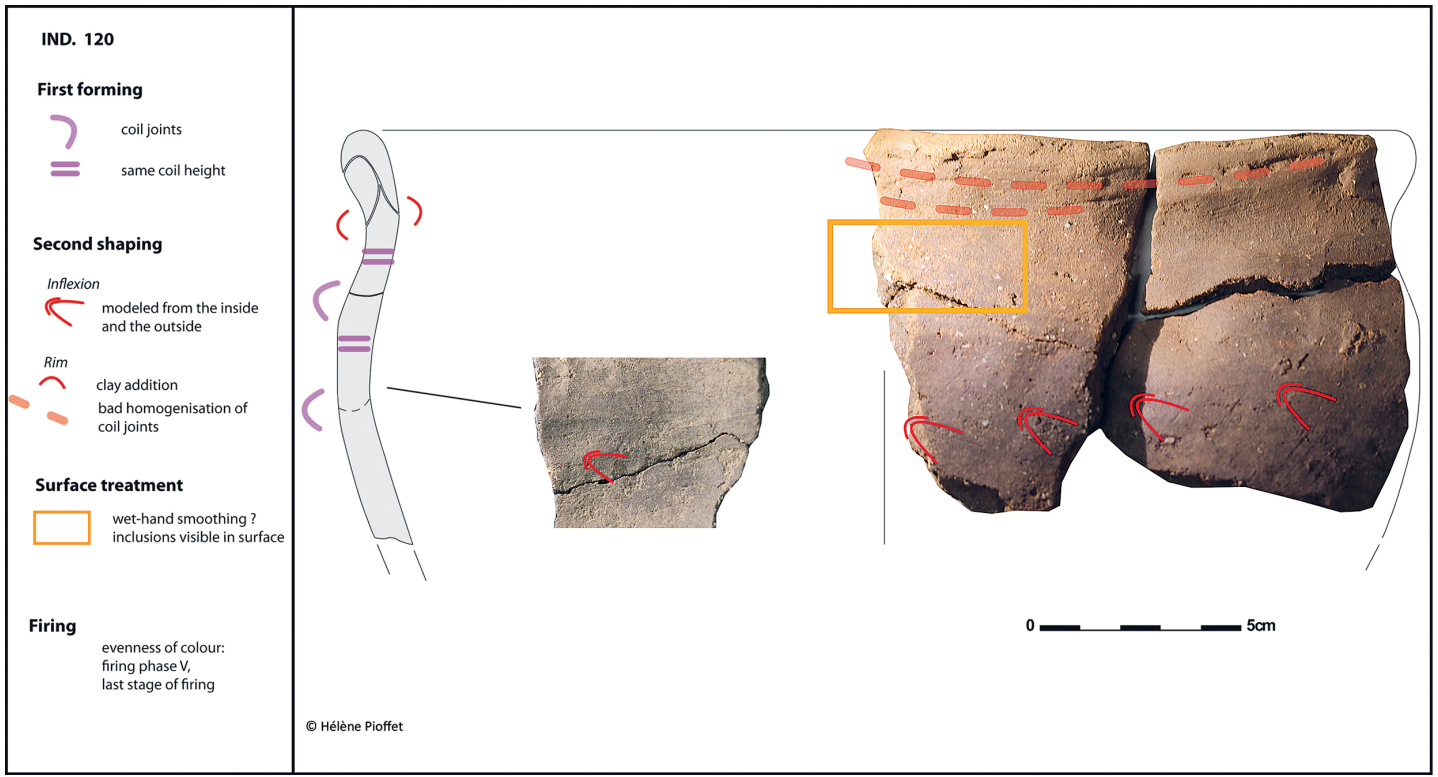

Fig. 3. Description of technical elements on vessel 120.

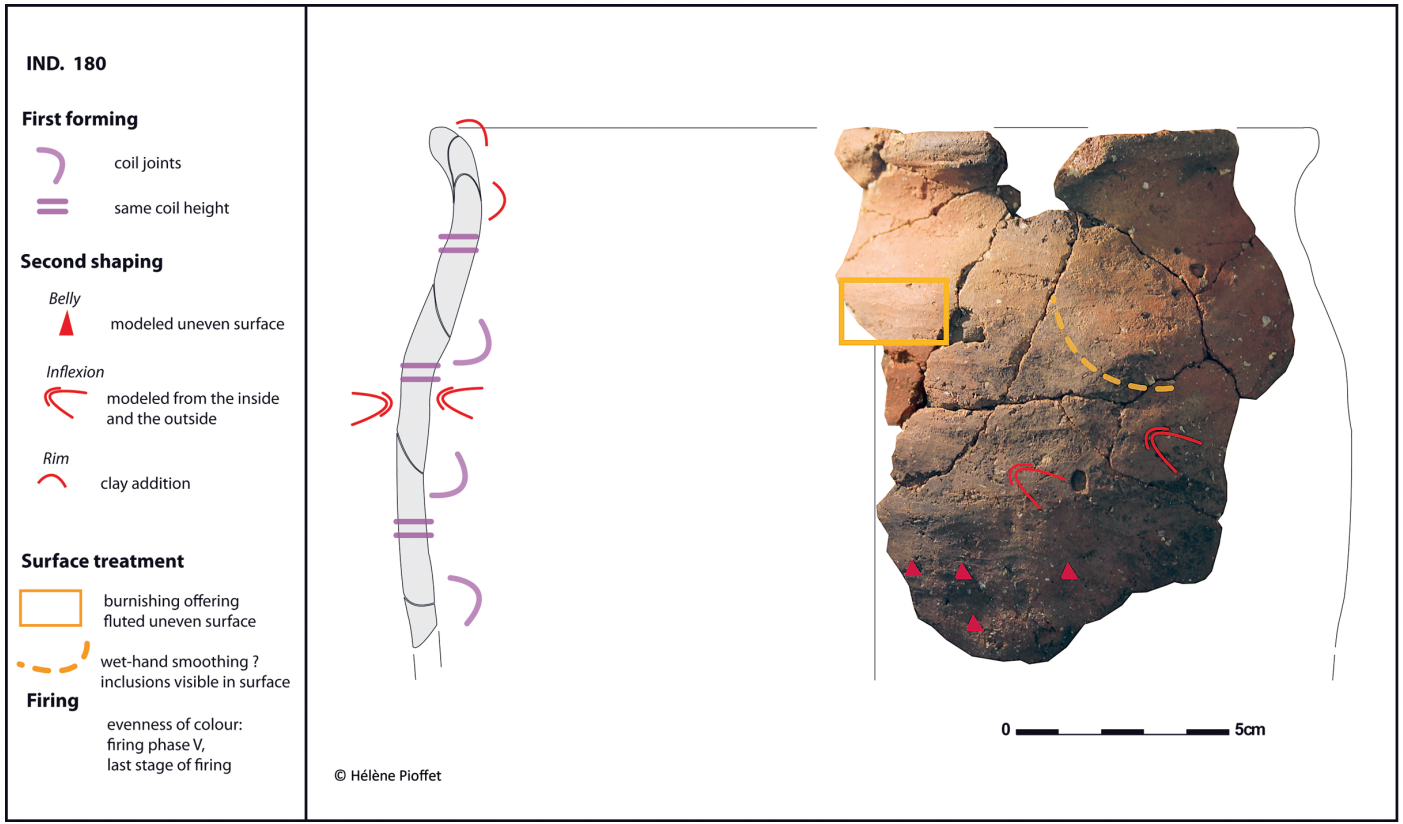

Fig. 4. Description of technical elements on vessel 180.

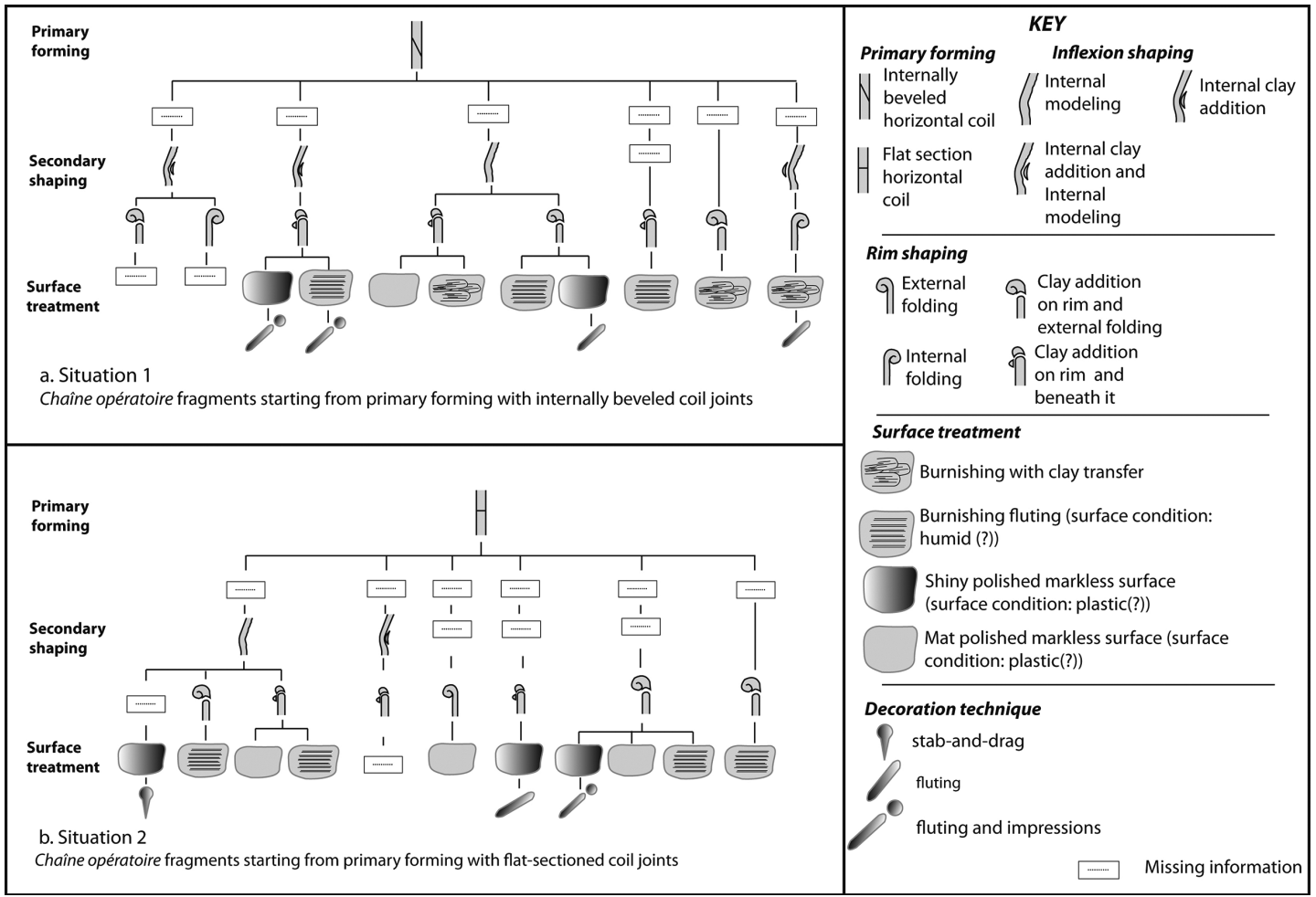

Fig. 5. Groups based on *chaînes opératoires* fragments observed on Kilverstone pottery (situations 1 and 2).

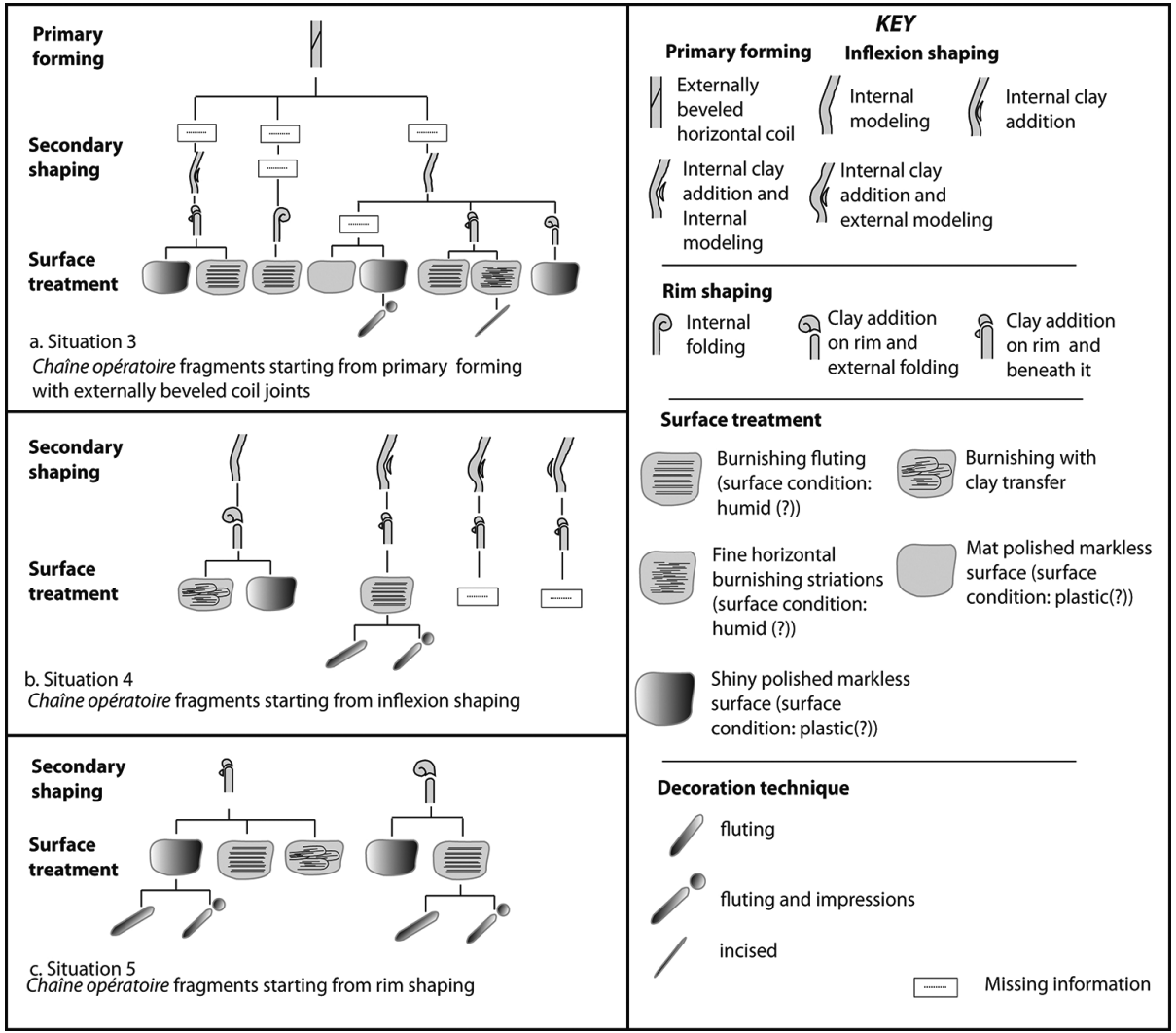

Fig. 6. Groups based on *chaînes opératoires* fragments observed on Kilverstone pottery (situations 3, 4 and 5).

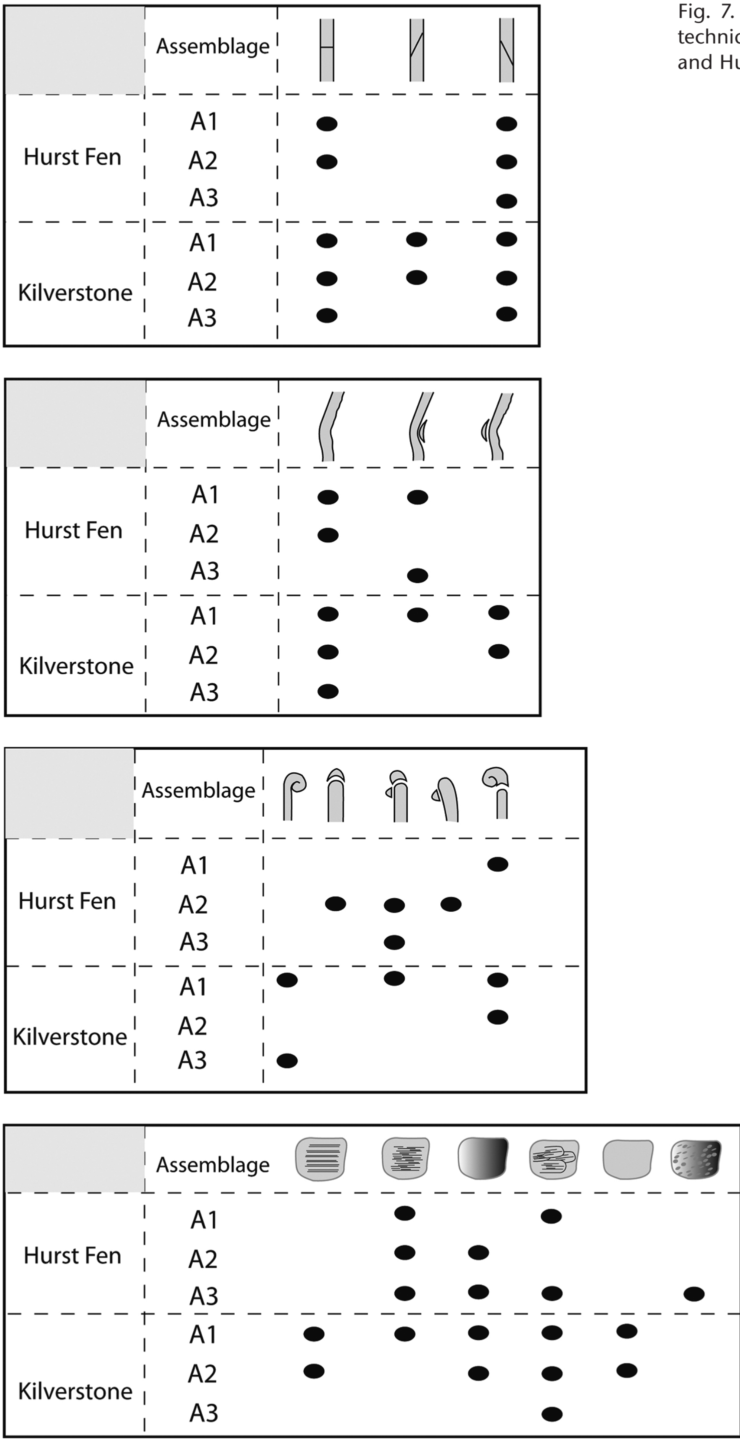

Fig. 7. Comparisons between techniques used in Kilverstone and Hurst Fen.

The third group is based on externally-beveled coiled vessels, showing same second shaping techniques as before.

The other groups, depending on less well preserved vessels, only show *chaînes opératoires* fragments from the second shaping stage (either from inflexion, on rim shaping). The same techniques are here again displayed.

Vessels in the Hurst Fen ensemble bear variable technical elements. Some constructing techniques were noticed, such as first forming built with flat-sectioned or internally-beveled coils, inflexion shaping with external reinforcement, modelling or yet with help surface treatment. Necks were built with flat-sectioned or internally-beveled coils. Rims were shaped by adding clay on the edge or below the edge, and folding outwards, completed with a final burnishing.

Constructing techniques seem to be, on both corpora, predominantly internally beveled coils, or flat-sectioned coils (*fig. 7: a.*). Yet external bevels appear to be present only in Kilverstone assemblages. Moreover inflexions second shapes can be done with help of different techniques: modeling, internal reinforcement and external reinforcement (only used on Kilverstone assemblages; *fig. 7: b.*), the most recurrent one being the modeling. Rim secondary shaping is performed with various techniques, of which only two are shared between the two corpora: clay addition on top and beneath it, and clay addition followed by external folding (*fig. 7: c.*). It is to be noted that some techniques absent in Kilverstone are practiced on Hurst Fen pottery: sole clay addition beneath the rim edge technique.

4.3. Surface treatment

All assemblages presented above for Kilverstone show the same types of treatments: either fine horizontal burnishing striations, burnished clay with clay transfers on the surface, burnishing fluting, mat surface without marks, or finally polished surfaces. These various treatments, the most frequent of which are the burnished conditions, bring different types of information. Firstly the surface conditions tend to show very little care taken into finishing, leaving marks on surfaces. Then, it seems that different tools were used: shallow striations and mat surfaces suggest hand-smoothing, whereas fluting and deeper clay transfers support the idea of wooden or bone tools. Finally, as *Martineau* (*2010*) demonstrated it, surface treatments are applied during the drying first stages of the vessels, and depending on when the gesture is performed, the resulting marks will differ, even of made by the same tool. Therefore, if we consider the use of the potters' hand, our personal experience has shown that mat surface might be possibly the result of a wet hand on rather fresh surface, unveiling small inclusions with the action of capillarity, while striations are drawn when the pot surface has already started to dry. Considering the use of hard tools (wood or bone), the clay transfer implies that the surface is still fairly soft, while the fluting happens later in the drying process. Yet the difference between burnishing and polishing (as exposed by *Martineau 2010*) lies, not in the choice of tools, but rather in an ill-chosen moment in the drying process that leaves marks on the surface (burnishing).

Some contrasts are also visible on surface treatments applied between the assemblages of both corpora (*fig. 7: d.*).The most frequent surface condition on Hurst Fen material is a burnishing with clay transfer, present on all assemblages but one. On the opposite, some surface conditions are scarce, even nonexistent. The burnishing with shallow striations, particularly well represented on Hurst Fen material, is hardly present on Kilverstone pot-

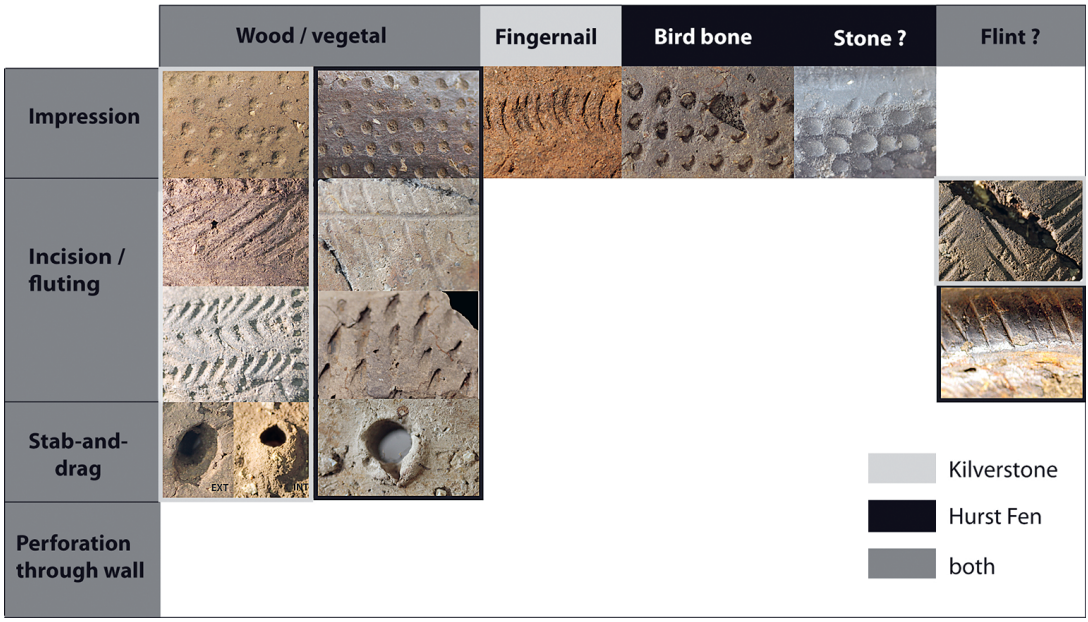

Fig. 8. Comparisons between decorative techniques used in Kilverstone and Hurst Fen.

tery. Moreover, the polished surface unveiling small inclusions, illustrating the use of the wet-hand technique, is only recorded for Hurst Fen pottery. An interesting consideration can be brought thanks to surface conditions. All techniques recorded, on both corpora, tend to show little care when it comes to work surfaces and make them even. Only one technique out of six corresponds to polishing without any marks left, this cannot be interpreted as a lack of skill (both polished and unpolished pottery having been made by potters with identical knowledge). It can rather be an indicator of the function that the pot is firstly destined to: most probably, not fit for neither display nor ritual use, and intended for storage or cooking tasks.

4.4. Decoration techniques

Decorations of the Mildenhall style were deeply studied, particularly by Isobel Smith (see for instance *Smith 1956*). Considering once again *chaînes opératoires*, it is interesting to know whether some particular decorative techniques are related to previous stages in the pottery making. Thus, the most frequently used techniques on Kilverstone pottery, i.e. fluting and fluting associated with impressions seem to be related with neither the vessel first forming techniques, nor the inflexion shaping. Rather, it was noted that it is probably related to rim shaping techniques, as these two decorative techniques appear on vessels that have rims made with clay addition on top and beneath the rim. Moreover these two techniques are also preferably applied on polished surfaces rather than burnished ones.

The different techniques used on the vessels, i.e. stab and drag, fingernails, perforations, incisions, fluting and finally impressions have different spatial distribution on the site. For

instance, it was noted that incisions associated with fluting are typically located, in the western part of area E (in clusters B, F, I, J and K); equally, the technique combining incisions, fluting and round impressions, used for more elaborate patterns, is typically located on the northern part of area E. This supports other observations previously made (*Pioffet 2014*, 260), concerning the distribution of decoration motifs: the more complicated patterns are located on the northern part of area E, while the less complicated patterns are located in the southern part of area A.

Mildenhall patterns show variability; it was already exposed in previous research (see for instance *Smith 1956*; *Clark 1960*), and most recently compared between Kilverstone and Hurst Fen (*Pioffet 2014*). It appears that decoration techniques are shared between both corpora, stating the differences in the degree of pattern complexity (*fig. 8*).

Nonetheless, the techniques used are similar between the two corpora, so are the types of tools. They consist of most basic equipment: vegetal tools (wooden sticks?), and possibly sharp tools such as flint. Exceptions have yet to be underlined: stone and bird bone impressions seem to be applied only on Hurst Fen pottery.

4.5. Firing

Observations on firing (according to colour observations *Martineau – Petrequin 1999*) tend to show a higher quantity of homogeneously fired vessels on both sites (from surfaces to core; phase V). This allows to think that firing is generally mastered, and that external aspect and colours (brownish range of colours) are looked for. There does not seem to be any specific distribution depending on groups or pit clusters.

5. Looking at technological assemblages

The pottery presented above actually gathered techniques starting from the first forming stages, allowing to tackle techniques still available and visible. Yet this does not suffice to identify the presence of different productions: the variable second shaping, surface treatments as well as decoration techniques are almost equally represented in each group, not necessarily highlighting know-how homogeneity or heterogeneity. Hence, assemblages were suggested, this time based on the most recurrent technical traits between vessels.

5.1. Description of assemblages

Three assemblages were recorded among the Kilverstone corpus (*fig. 9*). The main elements used to identify these assemblages are vessel construction and surface treatment. The first assemblage corresponds to a neck first forming and second shaping made with internal beveled, external beveled or flat-sectioned coils, rim shaping with clay addition on and beneath the rim, inflexion shaping with internal modeling with internal reinforcement and external modeling. Finally surface treatments are recorded: burnishing and polishing.

The second assemblage is marked with neck first forming and second shaping with internal beveled, external beveled or flat-sectioned coils, inflexion second shaping with internal modeling, rim shaping with clay addition on the rim and external folding, surface treatment with burnishing and polishing.

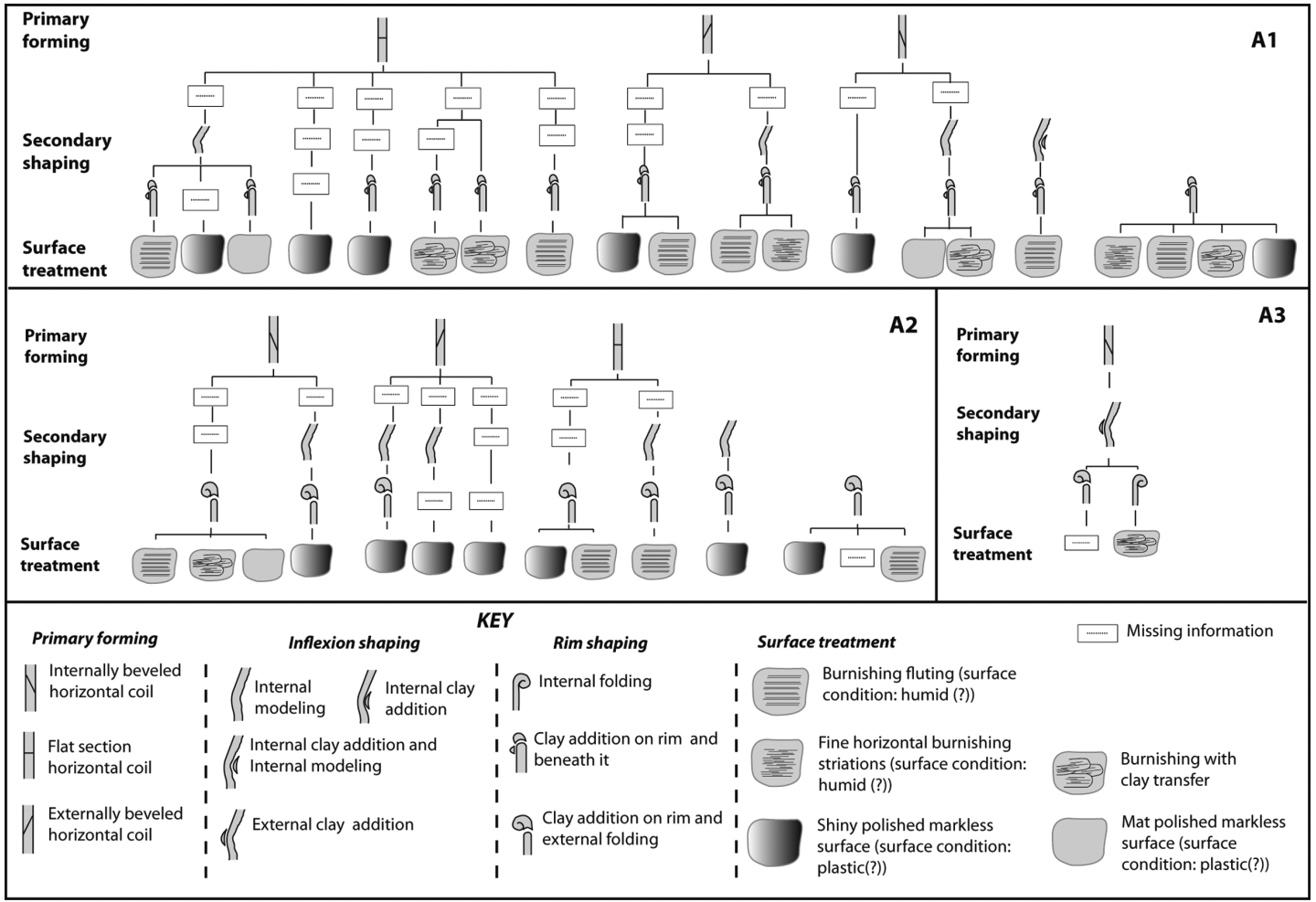

Fig. 9. Composition of technical assemblages of Kilverstone pottery.

The third assemblage, far more modest, corresponds to vessels made with first forming and second shaping with internal-beveled coiling, inflexion second shaping with internal or external reinforcement and modeling, rim shaping with internal folding and finally surface treatment with burnishing.

These three technical assemblages show main variations regarding rim shaping technique, suggesting a fairly close common background between them. But they also reveal various productions.

If it is hard to assume relative chronology between these assemblages on the Kilverstone site, specific distribution can be noted for each of them. First of all, they are predominantly present in area E: only 9% of assemblage A1 is present in area A, 4% of assemblage A2 and none of assemblage A3. Moreover two zones in area E can be distinguished, thanks to assemblages A1 and A2: on the one hand, assemblage A1 is present at 53% in southeastern part of area E (cluster K to R). On the other hand, assemblage A2 is present at 71% in the western part of area E (cluster B to I, and N). These observations may lead to an interpretation regarding the evolution of techniques available on Kilverstone, as some pit clusters comprise variable quantity of assemblages A1 and A2. Two hypotheses are conceivable here: either the pit clusters are used during consecutive phases and the same population applied different rim shaping techniques determining the assemblages, during different periods of production; or the pit clusters are used during the same period, in which case different populations apply slightly different techniques.

Three assemblages were recorded among the Hurst Fen ensemble. The first assemblage comprises inflexion shaping made with external reinforcement, rim shaping made with clay addition on the edge and completed with an external folding and burnishing. The second assemblage is composed of wall or neck building with help of flat-sectioned or internally-beveled coil, rim shaping with clay addition under the rim alone and sometimes also on the edge, or burnishing the surface. The inflexion is then shaped by modelling and burnishing. The last assemblage is represented by an inflexion shaping made with external reinforcement, a neck building made with internally beveled coils, a rim shape made with clay addition under the rim and the edge, and finally surface burnishing.

These productions must be confronted to aesthetical observations though to understand the connections with the common aesthetical background.

5.2. Confrontation with aesthetical assemblages

Confronting aesthetical and technological assemblages underlines the importance of technological traits from Kilverstone assemblages 1 and 2, particularly among assemblage a. (*fig. 9*). The link between technical assemblages 1 and 2 and aesthetical assemblage a. corresponds to techniques of rim shaping, i.e. clay addition on top and beneath the rim, or clay addition on the rim followed by internal folding.

Even though the aesthetical and technological variability is undeniable, it is to be noted that a vessel type (composing the assemblage a.) prevails, with complex shape and prominent curve, is omnipresent in pit fills. This is all the more intriguing as, for this type of context, with an unsettled lifespan, one could expect more variability regarding aesthetical and technical matters. This consideration is supported by a highly homogeneous fabric preparation (flint addition and / or crushed shell addition), as well as firing predominantly stopped at phase V.

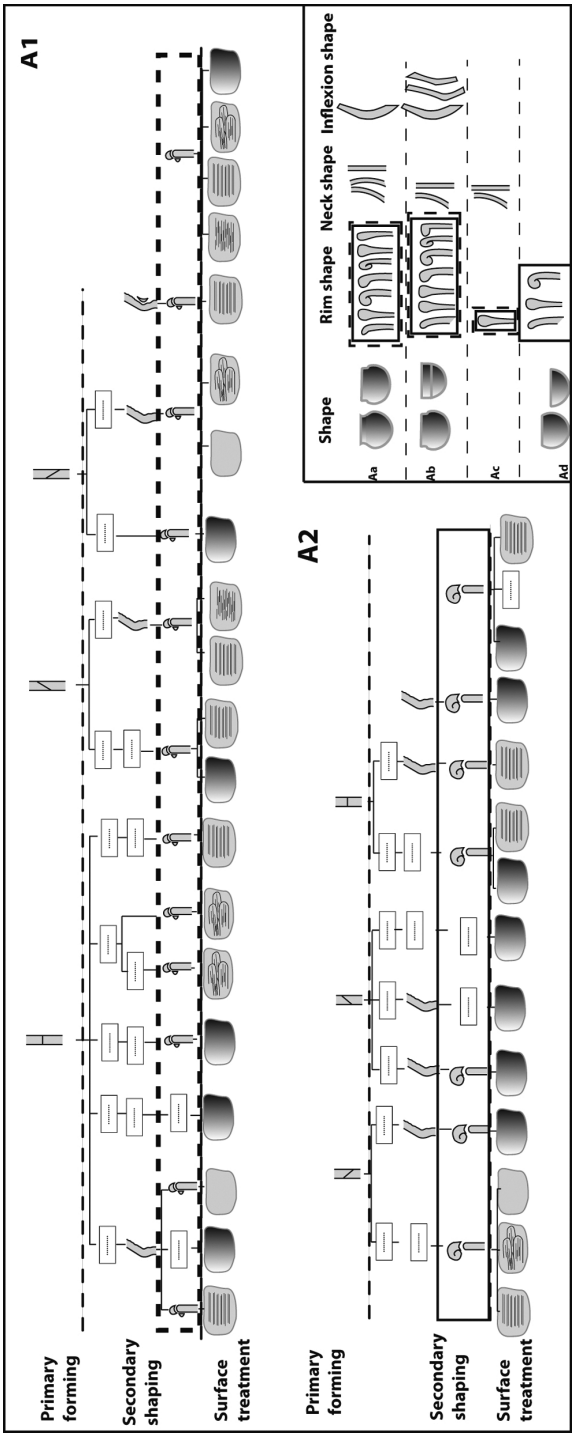

Fig. 10. Techniques observed in aesthetical assemblages of Kilverstone pottery.

Henceforth, if several productions were made and / or deposited on the site, they bear fairly close characters. Technical traits suggest a common cognitive background. Apart from surface conditions, rather variable, it seems that the *chaînes opératoires* may have been close (coiling techniques, inflexions modeling, clay addition on rims). Interestingly, the same *chaînes opératoires* seem to be used indifferently for decorated and undecorated pottery.

Thus, first forming seems to be made either with flat-sectioned, internal or external-beveled coiling, the flat and beveled sections being more frequent. Coil sizes show great stability (between 31 and 40mm, most frequently between 36 and 40mm). Inflexion shaping, may it be on a prominent curve or a sharp carination, most of the time, is made with internal modeling, combined on carinations with a following smoothing stage to mark the angle. Rim shaping is predominantly marked by two techniques: clay addition beneath and on the rim on one side, and clay addition followed by external folding on the other. This confrontation tends to show that there is no link between specific types of vessels and the techniques used to make them, but rather that each assemblage comprises several types of vessels.

Contrary to Kilverstone pottery, no general tendency could be isolated on Hurst Fen pottery when confronting aesthetical and technical assemblages (*fig. 10*). Each aesthetical assemblage is associated to two, maybe three technical assemblages, highlighting the variability among the ensemble; yet one has to bear in mind that only a sample of the ensemble could be studied here. Nonetheless, the pattern does not seem to be so different from that of Kilverstone. It is undeniable that both corpora show shared technical characters, on all aforementioned *chaîne opératoire* stages. Yet at each stage, some specificities can be noticed on each corpus. This tends to show two levels of knowledge: first a common technical background that is spread out regionally, conveying the idea that knowledge is transmitted, and reproduced easily. The second level marks the development of local technical knowledge. Two *scenarii* can be suggested here. Either these variable technical traits are due to an evolution (one corpus being younger than the other one). Or the two corpora are rather contemporaneous, in which case techniques are developed separately. It was suggested by *Gosselain* (*2002*), when working with African potters, that a technological style can be perceived, once all external constraints have been mastered. When looking at those two corpora, this is difficult to determine whether these are deliberately developed styles or whether this is an unconscious way to mark differences of know-how.

6. Roots to the Middle Neolithic pottery?

Stylistic and technical observations showed that Mildenhall ware, although being in a stylistic rupture with the first phase, could be, at the end of the Early Neolithic, direct inspiration for later pottery styles. From the first sight, one can be puzzled by the great similarities displayed by Mildenhall and Middle Neolithic wares, in terms of shapes, surface aspects but above all, decorative patterns. Hence a second project tried to shed a new light on these Middle Neolithic ware characteristics (*Ard – Darvill 2015*; *Ard in press*), and to understand the terms of transition from the previous ware.

6.1. Refreshing the past

6.1.1. Introductive considerations

Contrary to the Early Neolithic, the formerly "Secondary Neolithic" (covering now the Middle and the Late Neolithic) and its most iconic "culture", the Peterborough Ware, received less recent reviews (*Gibson – Kinnes 1997*; *Thomas 1998*; *Ard – Darvill 2015*).

In the "*The Neolithic Cultures of the British Isles*", *Stuart Piggott* (*1954*) exposed the main characteristics of the Peterborough Ware which was considered as a whole "culture", yet using ubiquitous finds for some other elements of the material culture. He exposed for the first time the main characteristics of these singular potteries. Peterborough Wares were described as bearing coarse fabric with abundant temper, especially flint, and surfaces coarsely smoothed. Pots have shapes mostly with round bottoms and complex lip. Mainly located in the upper part of the pot, a wide variety of decoration is known using different techniques: incisions and cord, comb, fingerprints and bone impressions. He eventually identified two sub-styles of Peterborough Ware – Ebbsfleet and Mortlake – mainly on the basis of shapes and decorations. These two sub-styles are still used today.

In her thesis, *Isobel Smith* (*1956*) defined a new sub-style (Fengate) and offered a chronological sequence from Ebbsfleet to Fengate Ware, through the Mortlake Ware, based on the evolution of morphological characteristics of these ceramics. According to her model, Ebbsfleet emerged from the Decorated style of the Early Neolithic in south-east England (Grimston/Lyles Hill styles), probably around the lower Thames valley, then Fengate which was in contact with Beakers prefigured the Collared Urns of the Early Bronze Age.

6.1.2. Browsing Peterborough ware

During this project, 600 sites were identified, compiling a minimum of 2750 vessels attributed to the Peterborough Ware in England and Wales (*Ard – Darvill 2015*). The Impressed Ware found in Scotland and Ireland was set aside. This updated corpus, nearly 7 times as big as that of S. Piggott in 1954, allows us to review Peterborough Ware on solid foundations. This new inventory highlights two specificities: first most of the material come from unsecured or indeterminate contexts. Moreover, as we underlined it for Mildenhall ware, vessels are highly fragmented, if not represented by one sole sherd.

Among all findings, the Mortlake style dominates by 36% while the Ebbsfleet and Fengate styles, in equal proportions, are more than twice as scarce. In almost one third of cases, the authors provide no attribution to a sub-style.

Concerning the geographical distribution, new discoveries reaffirm the major role of the Thames Valley. It should be emphasized, however, that these ceramics are found throughout the eastern half of England, not just in the South, with indisputably regional variations and sub-styles such as Rudston style in Yorkshire. There is clearly no significant difference in terms of distribution between the three sub-styles, with the exception of the Ebbsfleet style that tends to be more represented in Central-Southern England.

The fourteen assemblages selected for this study are located in southern-central and eastern part of England, particularly in Wiltshire (West Kennet and Windmill Hill sites) and along the Thames Valley, especially around London (*Ard – Darvill 2015*). They are mainly settlement sites: three causewayed enclosures which enable us to understand the evolution of technical traditions at the individual site scale over the course of several centuries. In total, the corpus contains 300 vessels. Only seven vessels have a complete profile.

6.2. Scrutinizing the pottery chaînes opératoires

These ceramic assemblages were first studied on the basis of observations regarding the pottery fabric and the manufacturing features available such as joints between assembled components (coils, plates…), potters' fingerprints, marks of finishing techniques or else decorative techniques. Hence the possibility to compare the technical choices and practices associated with the three sub-styles of Peterborough Ware.

6.2.1. Fabrics

Regarding the choice of raw materials selected for fabrics, observations of main inclusions were made macroscopically the, as no time could be dedicated to petrographic analyses. Four main tempers can be distinguished: flint, quartz, shell and grog. The comparison between the three sub-styles' fabrics, on all sites, provides very interesting results. It can first be noted that the inclusions of flint, crushed or as splinters, are largely dominant in Ebbsfleet and Mortlake and are far scarcer in Fengate vessels. However, these Fengate ceramics are characterized by a more diverse range of tempers (grog, shell and many quartz), particularly at Etton, as was already shown by Isobel Smith in other sites (*Smith 1956*; *1965*) and more recently by Rosamund Cleal in the Wessex area (*Cleal 1995*). The use of grog for making Fengate ceramics is attested in 21 sites in total.

Fengate ceramics are also distinguished by a finer paste preparation, with removal of coarse inclusions. Generally speaking, the walls of Fengate Ware are finer than those of Mortlake (8.5 against 9.1 mm), but thicker than Ebbsfleet Ware (6.9 mm).

6.2.2. Manufacturing techniques

As well as for the Early Neolithic production, it is quite challenging to reconstruct the whole *chaîne opératoire*, due to the important vessel fragmentation. Yet some observations could be performed (*fig. 11*) regarding rims shaping methods, rims for which Isobel Smith suggested a profile classification (*Smith 1956*), still useful today. It appears that the various types of rim correspond to construction of the lip by different uses of coiling techniques.

Ebbsfleet vessels, with preserved shaping features in 90% of cases, display walls and rims shaped by coiling, in accordance with the first observations of S. Piggott. The coil that forms the lip of the rim is hemmed inwardly or outwardly with discontinuous digital pressures and sometimes a coil is added to thicken the lip. No shaping methods used to make round bottom could be observed, as it is generally arduous to isolate diagnostic sherds among the assemblages.

Techniques isolated for Mortlake vessels (shaping features preserved in 83% of cases) tend to be similar to those identified on the Ebbsfleet vessels, as the coiling technique is also used for making walls and rims. Horizontal ripples characteristic of this technique have been exploited to highlight decorations in horizontal impression bands on vessels from Wallingford and Heathrow sites (*Smith 1924*; *Grimes – Close-Brooks 1993*). On 20 vessels scanned, a coil was repeatedly added on the inner surface of the lip to form rim. On the walls, we see that the coils are joined by internal or by external oblique junctions. The shaping method used for the base is delicate to identify but it seems to have been done by modelling a clay mass in a concave mould (spotted on Harlington and Hedsor sites).

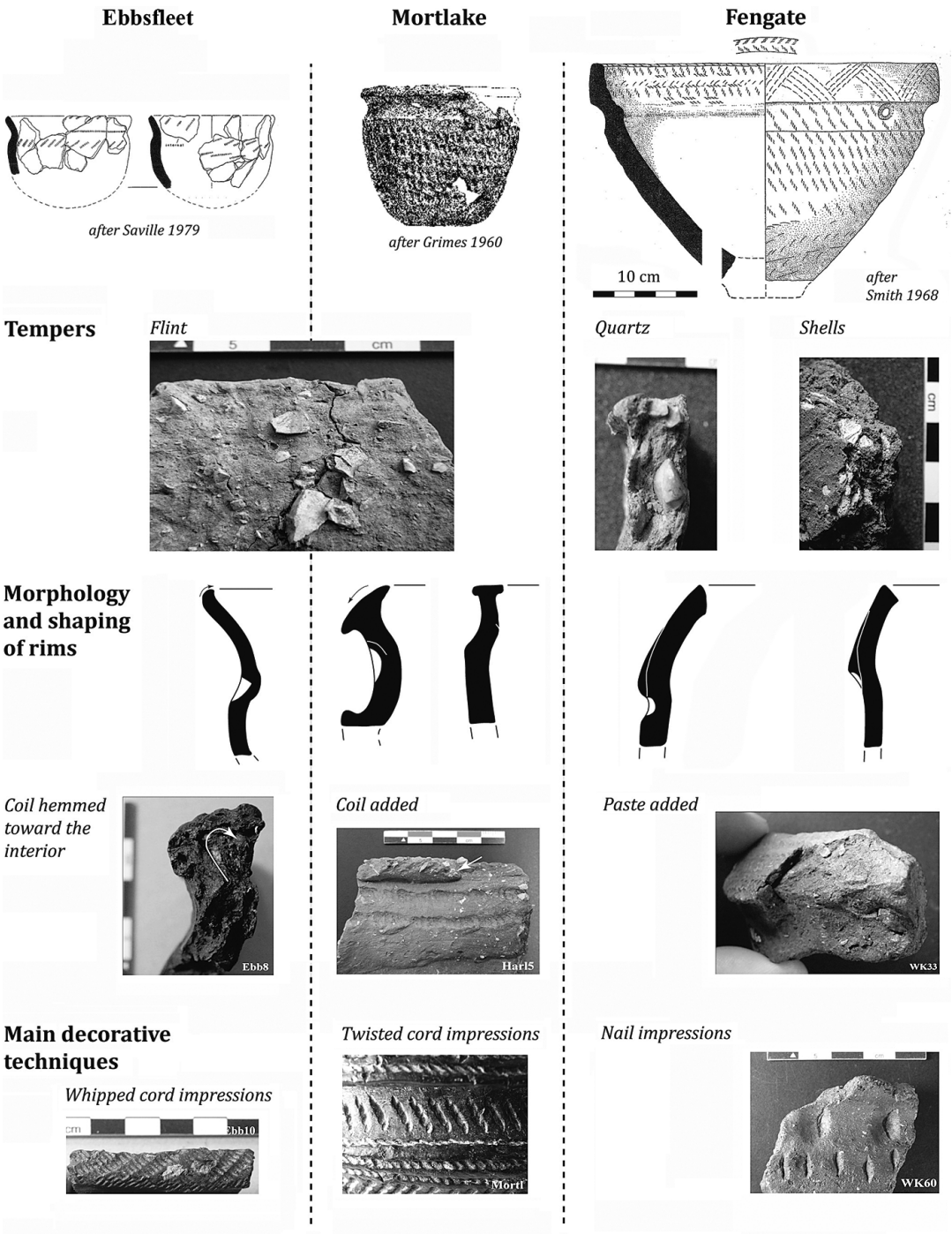

Fig. 11. Techniques used in Peterborough Ware.

Unfortunately, far less data is available for Fengate ware, as vessels are much more fragmented in the studied assemblages. Less than half of the pots (48%) have features of coiling techniques. The coil forming the lip is almost always hemmed inwardly. The outer profile of the rim is thickened adding a small piece of clay to form a small carination typical of rim types F2 and F3, according to the typology of *I. Smith* (*1956*).

Yet it has to be highlighted that the Fengate style is the only one to offer information on the bottom making. The small flat base, diagnostic of this sub-style, is made by turning the pot on a mouth and by adding a small slab of clay on its round bottom. Three pots show marks of this method: one comes from Horton "Manor Farm" and two from the West Kennet long barrow.

6.2.3. Decoration techniques

Without exploring in detail the very complex diversity of decorative motifs and techniques used for Peterborough Ware, it is still appropriate to suggest a comparison between the main decorative techniques used for the three sub-styles, that could emphasize possible technical habits. The first major observation to pinpoint is that 279 over 300 vessels studied are decorated.

It appears that one impression technique is preferred for each sub-style across the complete pot (rim and wall): whipped cord for the Ebbsfleet style, twisted cord for the Mortlake style and fingernail for the Fengate style. While Ebbsfleet bears most of decorations on the rim, especially on the lip, Mortlake shows more decorations distributed throughout the vessel, from the base of the wall to the rim. The Fengate style is a combination of these two configurations with covering decoration patterns and a preference for the rim, even though the high fragmentation tends to alter our perception of the lower part of the wall.

Bird-bone impressions are poorly represented in Ebbsfleet whereas they can be found in all parts of Mortlake vessels. No studied Fengate vessels present this type of decoration. In Wales, the study of Alex Gibson showed that bird-bone decorations are the most common kind of decoration.

Impressions with whipped cord are dominant in Ebbsfleet, less present in Mortlake and absent in Fengate studied vessels. Equally, the twisted cord impressions are found more often in Mortlake than in Ebsfleet and a few in Fengate.

Other decorative techniques – incisions and finger impressions (fingernail and fingertip) – are ubiquitous. Yet the high variety of finger impressions has to be more thoroughly studied, as it can sometimes leave exceptional prints of the potter's finger as shown by Jonathan Cotton.

7. Discussion

The study of the Kilverstone pottery making techniques eventually allows to shed a new light of various issues. First of all, Kilverstone might very well not be a production site but merely a deposition one, and it was shown in the past that these two types of sites cannot be interpreted in the same way (see for instance *Demoule 1994*). The observations described above show that Kilverstone pottery encompasses not one, but at least three dif-

ferent productions (mainly identified with help of technical assemblages). But the techniques recognised in the *chaînes opératoires* fragments are very similar, if not identical. This testifies of a common cognitive background and suggests the idea of one community or maybe a couple, close enough to share a common knowledge.

These observations bring the discussion back on the *scenarii* exposed by *Garrow – Lucy – Gibson* (*2006*, 77). The first scenario consisted of an interpretation of the site as an occupation with a short lifespan of pits, used by different communities. The second one stresses a lengthy occupation, with a permanent settlement, most probably close to the site. The last scenario implies a long-lasting intermittent occupation by different communities. This last scenario was the one favoured by the excavation authors. This study might very well support the long-lasting sporadic occupation by different communities, although they would have to be very close communities, if not the same one to share such a common knowledge. This is all well illustrated by the variable distribution in different regions in area E of assemblages and decorative techniques.

But as it was shown when confronting technological data with Hurst Fen, Kilverstone pottery is clearly well anchored in a regional dynamic, with a common technical background, but still showing site specificities. Kilverstone and the sample from Hurst Fen definitely support the fact that more technical observations should be done on pit sites pottery to shed a new light on occupations interpretation.

It is now appropriate to question the development of such elaborate decorative patterns during the Early Neolithic, in comparison with other regional productions for which decorations remain generally speaking rather scarce. If one looks away towards the East, some similarities can be puzzling. This is the case with the decorative grammar used in the TRB culture. Even more intriguing, is the pottery from the PWC of South Scandinavia that reveals some decorated profiles with perforation lines much like the Mildenhall ones (*Larsson 2010*). Yet it has to be pointed out that the chronology does not favour an East-West influencial movement as the PWC pottery belongs to a slightly later period. Nonetheless, it does not exclude a wave of influence that could be, possibly, initiated in Eastern Britain. Mentioning the TRB culture and the Scandinavian PWC is not really surprising as parallels were already suggested regarding the funerary monuments on the British Eastern façade (see for instance *Whittle 1977* or *Scarre 2004*). These considerations tend to put the emphasis on exchange intensification not only throughout the island but also beyond the seas.

Exchange intensification may also very well account for the diversification of pottery styles during the Middle Neolithic, mainly in terms of profiles and decorative grammar complexification. Yet the various styles presented above seem to be rooted in the Early Neolithic, particularly when looking at the chaînes opératoires that tend to be long-lasting. Here again the question of bonds with the East can be raised. Indeed, styles like the Fengate one show, for instance, striking similarities with the Dutch TRB pottery. This consideration underlines the fact that pottery wares, even when inheriting more or less local technical know-how, ought to be considered more generally in a wide geographical context that could account for stylistic specificities.

In a nutshell, it has to be noted that the pottery from East Anglia illustrates perfectly the end of the Early Neolithic phenomenon of native ceramic style construction, particularly when it comes to developing technical and morphological markers. During the transition to the Middle Neolithic, shapes and decoration patterns appear to be more elabora-

te, while manufacturing techniques seem to remain rather similar to those used during the Early Neolithic. The Ebbsfleet style is in that respect particularly puzzling as it seems to bear a direct legacy of the Mildenhall pottery (in terms of general morphology, rim shape and decorative techniques). Decorative techniques might well be the most significant part of the Peterborough ware and associated sub-styles, yet their origin still raises questions: should we indeed look further East to find explanations?

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