Late Neolithic pottery productions in Syria. Evidence from Tell Halula (Euphrates valley): A technological approach

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Abstract - The pottery production from Tell Halula, dating from the late Neolithic period, reveals the economic and social complexity of this community in the middle Euphrates valley. Throughout the study of pottery assemblages in the context of field work projects carried out from 1996 to 2007, we combined traditional morpho-stylistic analysis with technological ones. In this paper, we present the current situation of the research on the final stage of the Halaf culture, commonly known as Late Halaf. The results are focussed on manufacturing techniques, with the aim to identify several pottery productions and variability patterns.

1. Introduction
Like many other concepts, the Late Halaf culture, a term originating from an artificial terminology used to define the Neolithic communities who lived in northern Syria, southern Anatolia, and northern Iraq during the 6th millennium cal BC, arose from an emerging local substrate (Cruells and Nieuwenhuyse 2004; Nieuwenhuyse 2007). The environmental framework reveals, for the entire span of the 7th and 6th millennia cal BC, a climatic optimum with minor fluctuations around 5000 cal BC (calibrated with Oxcal V.3.5 and calibration curve INTCAL98 1, sigma ranges in Gérard and Thiessen 2002). Recent multi-disciplinary studies have revealed more information about these agro-pastoralist communities who lived between 5500-5300 cal BC in semi-sedentary settlements, and who developed a particular material culture, as well as several economic and social competences (Campbell 2007). The symbiosis of these strategies forged the future complex communities of the Chalcolithic period in the Near East (Akkermans and Schwartz 2003; Frangipane 2007).

These groups were characterised by an opportunistic settlement pattern, sealing practices, specific funerary rituals, and painted pottery showing geometric and animal designs. Archaeological remains such as their pottery productions give us a way to approach the economic and social practices of these farming communities and a way to reconstruct, to a certain extent, their production system and social organisation (Davidson 1977; Campbell 1992; Cruells 2001, 2006, 2009; Wilkinson 2003).

2. Archaeological context: Tell Halula
Tell Halula is located on the right bank of the middle Euphrates river valley, in the region of Djerabus, Northern Syria. The site is situated between two small seasonal wadis, which are becoming a single wadi flowing into the Thisrin Dam. The site, which is 360 m by 300 m and 11 m high, includes two elevations with anthropic deposits and has been excavated from 1989 until the present by a team from the Autonomous University of Barcelona led by Dr. Miquel Molist (Molist 1996, 2001; Molist et al. in press) (Fig. 1).

The archaeological sequence includes strata from a Pre-Ceramic Neolithic B until the complete Ceramic Neolithic levels (Pre-Halaf and Halaf), covering a timeline from 7900 to 5300 cal BC. Late Halaf (HLVII) layers are located in sectors 30, 32, 36, 38, 39, and 49, dating to 5550-5300 cal BC. The pottery assemblages ascribed to this period are found in several archaeological contexts, principally ash levels, external areas, domestic areas, and an important group of pits situated at the top of the tell (Cruells 2005).

Remains dating back to the Late Halaf period were recovered from various test pits at the site. A first trench opened on the south western slopes in 1996 and 1999 (sectors 30 and 32) yielded a series of stratified open areas occupied during the Late Halaf periods. The recent stratigraphic sequence and related information comes from the new trench opened in 2006 and 2007 in what is also termed sector 30, with an extension known as sector 49. This trench confirms an uninterrupted sequence from...
Late Pre-Halaf to Late Halaf, but not always at the same place (Gómez 2011). At this point, we must emphasise the mobility pattern of these groups, which did not always settle on formerly occupied layers, but around them (Akkermans and Schwartz 2003). This enables a differentiated settlement pattern to be documented for each site. The sample presented in this paper constitutes a ceramic assemblage unequally dispersed around the site, as both secondary material, mainly in pits and holes, and external floors related to open areas which constitute a succession of architectural levels formed by rectangular buildings with stone foundations. Halula Late Halaf ceramic assemblages include a large variety of wares. There are fine wares, plain or decorated, as well as simple and burnished coarse wares, either with mineral or plant inclusions (although only a few sherds of the latter). This group also shows incised or impressed decoration.

Using macroscopic observations, this assemblage was initially divided into four main categories: fine painted wares, fine unpainted wares, coarse mineral wares, and coarse vegetal tempered wares. The assemblage also shows modifications in technology, vessel shape, and decorative style. As in earlier periods (Cruells and Nieuwenhuyse 2004; Nieuwenhuyse 2007), fine wares were made of well-levigated clay, fired mostly in oxidising conditions, and commonly having a light or white slip on the exterior surface.

3. From intuitive typology to a pottery classification

Generally, there are no unitary criteria that can be employed to arrange a comprehensive typology of published Halaf pottery from the middle Euphrates valley. It is also very difficult, on the basis of the published material, to differentiate the individual uses of cooking and storage wares. Materials from stratigraphic contexts discovered during recent excavations do not allow a detailed typology with varieties and variants to be drawn up, because they are extremely scarce and discontinuous throughout the region. However, prioritising the technological approach, a sufficient number of samples were found to provide an idea of the most typical shapes in different local sequences.

The assemblage presented in this paper consists of 21,164 sherds, minimum number of individuals (mni) 16,688, which were first classified according to their macroscopic characteristics, manufacture techniques, and main surface treatments. Secondly, a morphological and stylistic typology was established for each technological group using the descriptions of the main inflected points. Although the number of reconstructed vessels is not large, 8 basic typologies have been identified (Fig. 2).

A morphological classification was conducted for each type of ware. The rim was the first morphological feature used to sort the sherds. This first selection separated closed vessels from open ones. In some cases we could calculate the maximum diameter, and, where possible, the volume. Variabilities in the lip, rim slope, and neck height were used to identify different morphological types and enabled us to clarify the typological corpus. Dishes and lids (group VI), straight sided bowls (group II), concave sided bowls (group III), sinuous sided bowls (group I), jars with short or high neck (group IX), simple open and closed bowls (groups III and VII), and closed bowls with short neck (group VIII) are...
Figure 2. Typological chart of Late Halaf ware at the Tell Halula site. Note that Group V, corresponding to *Champagne Vase*, is a form not identified at Halula.
the predominant shapes. Moreover, metric variants led to the distinction of several subgroups according to the different inflection points of the sherds. On the basis of the analysed material, it was quite easy to distinguish a common base typology for these types of vessels, but the technological parameters are almost all different.

This work reveals that 76% of the sherds that are part of the assemblage are open types, and 24% are closed shapes. Diagnostically the most common sherds are lips, dominating the assemblage, with diameters measuring 150-200 mm and bases measuring 100-150 mm in diameter, and with a wall thickness ranging from 5 to 10 mm. The most documented shapes are small containers, such as bowls; 22% are Iva bowls with a concave profile; 18% belong to the Ia and Iib groups, and to closed forms, especially VIIa. We have also identified two types of dishes, VIb (38%) and VI (13%).

The large and medium sized containers comprise pots and jars. The VIIIc is the most common pot shape, although other pots also appear. The IXd jar shape is the most frequently documented, making up 50% of the sample, followed by the IXe shape or bowl rim jar, and shape IXb.

4. Technological variability

When we studied this assemblage from the technological point of view, we combined data pertaining to manufacture traces and the results of physical and chemical analyses (part of them still in progress) with the aim of identifying not only the main pottery traditions, but also several fashioning and finishing techniques related to different potters’ abilities.

Among the basic set of operations which transformed the raw material into a finished product, we have registered several main stages: manufacture and paste preparation, fashioning, finishing (including decoration), and firing (Fig. 3). In this operation chain, Halaf pottery productions generally appear as fine walled vessels with relatively complex shapes, for which a great level of skill must have been required. These pots were constructed using several methods, sometimes in combination: coiling, paddling, pinching, and shaping. In some sherds we found traces of rotation kinetic energy (RKE). It is also possible that baskets were used as a form of "tournette", or as a stable base upon which pots could be made and dried before they could be used over a flame. This technique is suggestive of identifiable cultural traditions (Roux 2003a; Roux and Courty 2005).

5. Petrographic approach

A preliminary mineralogical and petrographic study of the materials at the site has been carried out. Samples were collected in an effort to determine the geological variability of clay sources in the Euphrates region and to redefine the compositional matching of clays to paste groups from previous provenance analyses (X. Clop, work in progress). Geological clays were collected and processed. The preliminary results show that clays in the region were compositionally heterogeneous, and that the clay sources for most of the sampled plain pottery can be traced to locations near the site.

Petrography shows vacuole texture and a low temper content (<5%) in cream coloured core samples, but a clastic texture and higher temper content (10-30%) in brown and red sherds. From a mineralogical point of view, three distinct groups have been observed: the main group made of calcite, quartz, feldspar (phyllosilicates - hematites - gehlenite - hornblende); a second one made of quartz - feldspar (phyllosilicates - hematites - dolomite) and a third one made of quartz, feldspar, calcite, and gehlenite (augite - phyllosilicates - hematites - dolomite), with added biotite.

The dominant wares were made of fine clay that, on the whole, shows non-plastic, small, mineral inclusions only. In addition to the clay fabric, it is important to consider the way in which the clays were fired. The general appearance of the sherds indicates that the potters had probably used kiln types where oxygen could be highly controlled. To date, such kilns have not been well-documented in reliable
contexts in Syria, and the few examples come from Iraq, at the Yarim Tepe site (Munchaev and Merpert, 1973; Merpert and Munchaev 1993a; 1993b). In general, there is a predominance of incomplete oxidation, in fine pastes with mineral inclusions, and an incomplete reduction in coarse pastes with mineral and vegetable temper. Most of the pieces (65%) have their surfaces finished with a slip, followed by smoothing, brushing and burnishing treatments.

The results have implications for the understanding of the nature of plain and coarse ceramic vessels, the vessels, these make it possible to identify a variety of finishes for each type, but also to infer the relationship between sherd and type of finishing strategy (Roux 2007). The orientation of the traces may also indicate the presence of specific patterns of production, especially if these are repeated in several sequences.

The establishment of manufacturing sequences was mostly based on the analysis and evaluation of complete vessels. This procedure has its limitations, since the majority of pieces recovered complete correspond to small containers, mainly bowls and plates; we managed to obtain the complete shape only in 17 cases.

The manufacturing sequence shows that all pots (except Id) rose from the base. In the case of globular shapes, it is possible that the difficulty of modelling a spherical body resulted in a more streamlined sub-spherical profile when the level of skill involved was limited. The bowls and vessels such as dishes also seem to have been moulded from the base. The lip is often enhanced by superimposing a strip at the edge as a decorative solution. The bowls and plates seem to be suitable containers for food service and consumption, although in the case of the former, their use as cooking pots cannot be ruled out.

Most pieces appear modelled with more or less large colombines (in small containers these have 0.2 cm frequency tapes, while for mid-sized containers this proportion can vary from 1 to 2.5 cm, with interspaces created during the homogenisation process). Small and medium-sized contain- ers show differentiated edges with a deliberate aperture to the exterior made by applying a final strip.

In medium-sized pots, the join between the upper and lower part that indicates that the body and the neck were modelled in different stages is more easily recognisable. In general, this area shows a high rate of breakage, showing that it is one of the weaker areas of the vessel, which therefore was easier to break by indirect impact. Thus, it is possible to infer a multi-stage manufacturing procedure for these.

For closed shapes, we documented different treatments on the inner and outer surfaces. Inside closed shapes, we found an intentional reduction in wall thickness and a regularisation of the inner face. The outside of closed shapes usually shows a simple smooth finish, and this application seems not to be corresponding to any specific technical or morphological criteria other than the intention to make pots with a small investment of time. Also, this element could be indicative of manufacture by an inexperienced potter (Bernbeck 1999).

Table 1. Main manufacturing techniques at Tell Halula by category (fine ware FW, fine painted ware FPW, coarse organic-tempered ware COW, and coarse mineral ware CMW). RKE stands for ‘rotative kinetic energy’.

<table>
<thead>
<tr>
<th>Balls of clay %</th>
<th>Flat slabs %</th>
<th>Colombine/coils %</th>
<th>mould %</th>
<th>RKE %</th>
<th>Mixed %</th>
</tr>
</thead>
<tbody>
<tr>
<td>FW 2.44</td>
<td>5.77</td>
<td>40.65</td>
<td>54.27</td>
<td>3.77</td>
<td>42.75</td>
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<td>FPW 1.25</td>
<td>2.48</td>
<td>42.41</td>
<td>39.66</td>
<td>0.48</td>
<td>25.44</td>
</tr>
<tr>
<td>COW 3.01</td>
<td>0.76</td>
<td>26.55</td>
<td>28.19</td>
<td>0.21</td>
<td>24.17</td>
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<td>CMW 8.4</td>
<td>3.03</td>
<td>30.33</td>
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<td>0.09</td>
<td>40.25</td>
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</table>
There are different techniques to complete the surface treatment of walls that reduce stress and increase thermal conductivity, improving the performance of vessels for culinary uses (Hein et al. 2008). The burnishing treatment, the compaction of the surface, or friction and pressure produce a glossy finish and also reduce porosity, thus increasing the resistance and the waterproof qualities of the pot; we documented these features in the coarse ware assemblages.

Except for large closed vessels, it seems that the decision to employ one type of finishing technique rather than another did not depend on the modelling option, but it rather shows a clear relationship with the typological groups. This suggests that for medium-sized vessels, more regular patterns of execution were needed in the manufacturing process, which could be associated with a higher level of skill in the craft production.

The great diversity in finishing treatments makes us think that the products are the work of several artisans. While modelling and smoothing show a pattern of homogeneous conduct, bases and exterior surface treatments show great diversity of skills, particularly notable in small containers. At this point, we should consider the extent to which all of these productions derive from a common pool of knowledge, and to what degree we can speak of variable technical traditions.

7. Volumetric approach

The study was conducted using MicroStation validated by Potutility (a program from the Arcane project), which, unlike other available programs, produced a reasonably reliable table of values concerning the volume of each complete profile recovered.

Prior to the volumetric study, we took into account various parameters associated with archaeological evidence. As shown in the graph (Fig. 2), we have recovered more profiles associated with small vessels than with large ones. These larger containers appear on site, but are very fragmented, and it is very difficult to infer the entire typology. Thus, this sample is mainly made up of bowls, plates, and drinking cups associated to domestic use (Table 2).

The technical-morphological features of the small containers indicate that they were intended for individual consumption of liquids or semi-solid foods. The medium/large pieces are ideal containers for the storage and transportation of liquid provisions (small-rimmed jars) or solid provisions (wide-rimmed jars). Dish-covers or collar-rimmed jars have a depression on the inside of their necks which acts as a closing device. Large bowls, the majority of which are open pots, could have been used to transfer provisions.

8. Decorative motifs

It has been demonstrated that Halaf pottery decoration was highly structured (Steinberg and Kamili 1984). The choices governing the motifs used appear to be based around decisions such as the location on the vessel's interior/exterior, or the type of pottery being decorated, in a harmonic conceptualisation and always related to surface treatment. Pictorial decoration is present in 47% of the productions, which are monochrome, applied over a finished surface (slip application in 65%, followed by smoothing, brushing, and burnishing treatments). We found black, red and brown as the predominant colours, with the additional presence of polychrome vessels (8%) that combine black and red occasionally with white.

The decorative style emphasises the use of bounded design motifs (Wobst 2004). With few exceptions, the motifs were attached to the horizontal, structural lines that divided the empty vessel surface. Figurative motifs are painted along the interior rim in open shapes and on the middle wall in closed ones. The decorative motifs on the top of the vessels, on the outer and inner lips, are mainly geometric motifs (89%), floral (4%), and zoomorphic motifs, as well as horizontal representations of bucrania (7%). The geometric motifs include various stepped patterns, meanders, and variations on the basic themes of crosshatching and zigzag. In general, we did not find a sharp break in decorative patterns between periods. This seems to indicate a lasting tradition of repeating the same pattern designs within the same context (Fig. 4).

9. Pigment analyses

The pigment analysis was carried out using Particle Induced X-ray Emission (PIXE), which is a powerful yet non-destructive elemental analysis technique used to identify raw materials and their provenance. This instrument allows rapid non-destructive or minimally destructive identification of most of the pigments used in ancient times, and it has greatly increased the amount of pigment identification work carried out by the Archaeometry group at the University of Liège, under the direction of Helena Calvo del Castillo (Gómez et al. 2012) (Fig. 5).

So far, 17 pottery samples have been analysed with the aim of identifying the composition of each pigment, and of making several observations regarding their origin and manipulation process. The results show that in 13 out of the 17 sherds, the black pigment is composed of manganese oxide or manganese phosphate. Manganese oxide is found as a free element in nature (often mixed with iron) and as a component in many minerals. Manganese ions have various colours depending on their oxidation state, and they are usually used as pigments. Black and red pigments are all composed of iron oxides and in few cases charcoal. These results are important because the published pigment analyses for one of the nearby sites, Tell Amarna (Gilbert 2004), situated nearly 40 km north of Halula, also in the Euphrates valley, show a composition consisting primarily of hematite (Fe₂O₃), hematite (alfa), and magnetite (Fe₃O₄), the rare presence of CaCO₃ and charcoal. The results from Tell Amarna emphasised that the main component of pigments used in the dark zones is magnetite, while in Halula magnetite is the main mineral employed for this purpose. Other observations made in Tell Amarna are that the paler zones are made with mixtures of magnetite and hematite, and the bright character of some samples is not the consequence of the use of different pigments, but of polishing. Thus, continuing this study and increasing the number of samples appears necessary in order to formulate further questions.
### Table 2. Volumetric results of complete vessels from Tell Halula. Note that values indicate raw densities.

<table>
<thead>
<tr>
<th>Id Number</th>
<th>Typology</th>
<th>Volume (litres)</th>
<th>Water</th>
<th>Oil</th>
<th>Wine</th>
<th>Wheat</th>
<th>Barley</th>
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10. Preliminary considerations
This study has enabled us to identify several pottery traditions at the Tell Halula site. These are interpreted as the result of different production and distribution systems, involving production at local and regional levels, well documented in nearby sites, such as Tell Amarna (Cruells 1998; 2004), Shams ed-Din (Al-Radi and Seeden 1980; Seeden 1982) and Tell Masaikh (Robert et al. 2008). Thus, in further works, attesting the complex relations that the local populations of the middle Euphrates valley may have

![Figure 4. Some painted sherds from Tell Halula.](image)

![Figure 5. Composition of black pigment.](image)
maintained with groups living in neighbouring regions appears as a very important endeavour.

The Late Halaf pottery from the Euphrates region shows an ‘apparent’ homogeneity, although this disappears when we examine the technological aspects, such as the manufacturing and production features of the pieces. In this context, the pottery in the Euphrates area is considered to be the result of local developments, with obvious contact with surrounding communities.

Such variability could be attributed to manufacturing techniques, individual knowledge, functional purposes, and site formation processes. It was concluded that several ceramic production practices existed within the population of Halula, which transmitted technological knowledge through the manipulation of pottery. The presence and abundance of these pottery types, especially the painted productions, in different archaeological contexts indicate that pottery production was increasing, and some shapes appear to be the work of specialist manufacturers. The use of special tools and standardised techniques supports this idea (Roux and Matarrasa 1999; Roux 2003b).

At the same time, during the Late Halaf period, we report an increase in complex shapes, such as the bow rim jar, or jars with arched necks and a flat base. Also, some middle Halaf shapes increase in number, such as shallow open bowls and bowls with a globular carination, and others, known as cream bowls, appear with less frequency and become careened shapes that show us a clear continuity with regards to previous pieces (Cruells 1996). These new shapes are not related to new fashioning trends, as we could see in our work, and the answers seem to be related to dietary practices or storage needs.

By using binocular microscope techniques, we found that some pottery sherds from the latest stages seem to have been made with rotative kinetic energy movement. It has been suggested, however, that pottery was decorated using a slow tournette leading to the increased use of strongly linear, larger geometric designs. Oval mouths and rounded bases on other pottery shapes seem to have been finished with a type of rotative kinetic energy. These sherds belong to small wares, bowls, and open shapes. Although Tell Halula offers good contextualised contexts, it is important to underline that similar processes can be observed at sites such as Chagar Bazar (A. Gómez, work in progress), Domuztepe (Irving 2001), etc.

It seems reasonable to suggest that these different manufacturing techniques were associated to different pathways of learning. In addition, evidence of combination techniques has now been confirmed, as has the use of wheel coiling. Wheel coiling and wheel-throwing co-existed. The use of such methods required that the potters had specialised skills, denoting a particular transmission of knowledge that affected several dimensions: object function, technological innovation, and social identity.

Also, the large number of painted decorative motifs, and their high quality, as well as the presence of polychrome examples, seem to indicate the consolidation of increasingly complex societies (Davidson 1977), as a consequence of the social inequalities initially documented in the formative Halaf. The way in which these communities managed their resources and consolidated and socially assimilated Ubaid influence is another major pending issue.

References


Wilkinson T.J., 2003, Archaeological Landscapes of the Near East, University of Arizona Press, Tucson, AZ.


ACKNOWLEDGEMENTS

We are grateful to the General Direction of Antiquities and Museums (DGAM) of Syria, the Spanish Ministerio de Ciencia y Tecnologia (HUM2007-66237), and the Generalitat de Catalunya (SGR-2009-00607). This paper was reviewed at UAB Language Service.