Pointed-based pottery: An experimental approach to the manufacturing of the pottery of the late Mesolithic in Northern Germany

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Introduction

The earliest pottery in Southern Scandinavia and Northern Germany appears within the Ertebøllekultur (EBK), which was a hunter-fisher and gatherer culture during the 5th millenium BC. This case study is based on the finds of a coastal site, dated to the late Ertebølle Culture and earliest Funnel-beaker Culture (Trichterbecher, TRB), and thus it spans the transition to agriculture. A detailed technological analysis of the ceramics of this site showed an autochthonous development of ceramic technology, which leads from the pointed-based EBK pottery to the rounded or flat-based pottery of the TRB.

This article presents an outline of the most important technological features of the pointed-based pottery and an outline of our experiments on manufacturing and firing the pottery. The experiments were primarily conducted in order to study the impact of a potential reservoir effect on the ^{14}C-dating of ancient food crusts (Philippsen 2010a; Philippsen 2010b; Philippsen *et al.* 2010) and consisted of two parts:

1. Manufacturing pointed-based pottery, based on observations of the archaeological material and

2. Cooking of fish, wild boar and blubber from marine mammals in order to produce food crusts.

Characterisation of the site

The submerged site of Neustadt is situated in the Lübeck bay of the Southern Baltic Sea in Northern Germany, and was excavated between 2000 and 2006 by S. Hartz of the Archäologisches Landesamt Schleswig-Holstein (Hartz and Glykou 2008: 15-16; Hartz *et al.* 2001: 10). Due to the rise in sea level over the last seven millennia, the site now lies 3 to 5 m below sea level. The excavated area contained a coastal dump of cultural debris, where the finds were deposited in a mud layer 0.20 to 0.50 m deep covered by a thick sand layer, and had thus been subject to excellent preservation conditions (ibid.). As a result of this, large amounts of organic finds, among them approximately 13000 bones of mammals and birds, wooden artefacts, plant remains, and other find categories such ceramics and flint were recovered.

Neustadt was situated next to a mixed oak forest (Hartz *et al.* 2011), offering its inhabitants a variety of food resources and ideal opportunities for gathering and exploiting the raw material resources (Glykou 2011a: 351). According to various find categories, the site reflects the everyday activities of the inhabitants, such as the manufacturing of pottery, processing of the prey carcasses, production of tools made of flint and red-deer antler, casting fishing nets, accessing the open water with dugout canoes, and fishing. Besides the utilisation of marine resources, the strategic position of the site is indicated by the results of archaeobotanical and palynological analyses. Thus, Neustadt presents an ideal example of the coastal hunting and fishing stations of the terminal Mesolithic and earliest Neolithic commonly found in Southern Scandinavia (Terberger *et al.* 2009: 259-260; Andersen 2008: 67ff.; 1995, 45ff.), which are usually situated in order to take advantage of both terrestrial and marine or freshwater ecosystems.

The site was used for over 600 years, according to a number of ^{14}C dates which fall between 4400 and 3800 cal BC (Glykou 2011). Thus, the Neustadt site covers the transition to the Neolithic, which occurred at the end of the 5th millennium BC (ibid; Hartz and Lübke 2006: 59ff.).

Archaeological material

Approximately 7500 ceramic sherds were found during the excavations. Three main forms are represented: pointed-based pottery, lamps and funnel beakers. Due to the excellent preservation status of the finds, it was in many cases possible to at least partially refit the pots. Thus, the different stages of manufacturing could be observed and subsequently reconstructed.

Pointed-based pottery is primarily tempered by granite with red feldspar and quartz. The occurrence of sharp angular granite grains has been explained in previous studies as an intentional mixture of burnt crushed granite in the clay. Due to temperature shock caused by heating the granite stones in a fire and subsequently throwing them into cold water, the stones crack and can thus be easily crushed to small grains by striking them with another stone (Koch 1998). Granite is easily accessible on the Southwestern Baltic coast and its utilisation in the form of cooking stones has been proposed for Mesolithic sites in Denmark, where granite and sandstone stones have been found in connection with fireplaces (Andersen 1991; 1993). A partially burnt piece of granite has been also found in Neustadt, indicating that the practice of using burnt crushed granite to temper pottery might also have been used there (Figure 1). Still, it is not clear if this was a common practice, or an opportunistic one, emerging from a secondary utilisation of the already cracked cooking stones. Naturally eroded granite boulders are abundant on the coasts of Northern Germany.

Figure 1. Burnt granite from Neustadt (courtesy of Stiftung Schleswig-Holsteinische Landesmuseen Schloss Gottorf).

In many cases, sand was mixed in the clay (Glykou 2010: 179; 2011a: 120). The presence of chamotte was observed macroscopically in one case. Chamotte has also been recorded in thin sections, indicating that the oldest pottery in Southern Scandinavia was the result of a longer ceramic manufacturing tradition (see also Hulthén 1977: 16, 49), the knowledge of which was probably transferred through contacts with Eastern Europe. Organic temper consists solely of charred plant remains. Their extremely rare presence suggests that plant remains were accidentally mixed in with the clay while it was being prepared (Glykou 2011a: 66, 74).

Manufacture of pointed-based pottery starts with the formation of a pointed base. For this stage of manufacture, three different techniques have been observed: (a) the most common one involves formation of the base by pressing a lump of clay into a cone. The vessel is subsequently built up by laying clay coils in rings around the open end of the cone (Koch Nielsen 1986; Glykou 2010); (b) according to another technique, the pointed base is made by one or more clay coils arranged in a spiral; (c) the third technique is found only in three cases. The pointed base was formed by two lumps of clay. One lump was pressed into an oval shape by the fingers, the other was also formed by shaping the clay into a pointed end, which was then fixed from beneath to an upper oval lump by smoothing the surface.

Following this process, the rest of the pot was manufactured using clay coils. Observations on how these coils are treated in order to shape the pot has led to the recognition of three different techniques, the U-, H- and N-techniques (Hulthén 1977: 25-26, 35 Fig.15), which appear in a wide variation (Glykou 2011a: 78-80; 2010: 181). After shaping the pot, the surface was smoothed. This was a necessary step which allowed the potter to join the clay coils together. Additionally, because coarse granite grains up to 1.5 cm were used for tempering the clay, the uneven surface was treated in most cases by using the 'paddle and anvil' technique (Rice 1987: 137) to obtain a homogeneous and even surface. Traces of the tools used for smoothing the surface are visible in many cases.

Firing took place in an open fire, either in an oxidising atmosphere, or alternating oxidising and reducing atmosphere. The latter must have been the result of putting the pot with their opening on the ground, and then covering them with fuel.

Traces of use such as soot on the outer surfaces and charred food crusts indicate the function of pointed-based pottery as cooking pots. In many cases, the surfaces of the pots reveal cracks (Figure 2), which have been described in previous studies as a result of a sudden temperature change during cooking (Koch Nielsen 1987: 116).

Figure 2. Rimsherd from a pointed-based pot. The surface is partially cracked and partially covered by food crusts (courtesy of Stiftung Schleswig-Holsteinische Landesmuseen Schloss Gottorf).

However, it has been observed that sherds from Neustadt reveal such cracks over the entire surface and not only from the lower part, which presumably was the only part directly exposed to fire during food preparation. Can these cracks also be due to other procedures linked with the manufacturing process?

Experiments

As raw material for the manufacturing of pointed-base pottery, commercial clay mixed with experimentally crushed granite was used, because this is the most often observed tempering material in the archaeological context. A naturally eroded granite stone collected from the coast was easily crushed by hammering it with another stone, which showed that the granite did not necessarily have to be burnt before crushing (Figure 3).

Figure 3. A naturally eroded granite stone collected from the coast was easily crushed by hammering it with another stone (photograph by the author).

Figure 4. Forming the pointed base (photograph by the author).

The granite grains were sieved to three main sizes, which are observed in the archaeological material, and were mixed in the clay. At first, the pointed base was formed by pressing a lump of clay into a cone (see description of manufacturing techniques [a] above), onto which clay coils were attached by pressing them with the fingernails – the so called H-technique, which is the most common for pointed-based pottery (Figure 4; Andersen 1975: 58; Glykou 2011b: 279).

Both surfaces were carefully smoothed by using wet hands and a pebble stone (Figure 5).

Figure 5. Smoothing the surfaces by using wet hands and a pebble stone (photograph by the author).

During this procedure, horizontal traces emerged on the fresh clay - this being a common observation on many pointed-based vessels from Neustadt (Figure 6).

Figure 6. Traces of smoothing on the surface of a pointed-based pot from Neustadt (photograph by the author).

After leaving the pots to dry for almost two weeks, firing took place in an open fire. The ground was previously warmed and dried with glowing embers. The pots were put with their opening onto the ground, heated to 80-140 °C and gradually covered with fuel (wood) to avoid a sudden temperature change (Figure 7).

The temperature was increased over the course of half an hour, reaching 600 °C and, for a short time,

Figure 7. Firing of the pots in an open fire. The pots were put with their opening onto the ground and gradually covered with fuel (photograph by the author).

Figure 8. During intensive firing a pointed base cracked, arrowed (photograph by the author).

750 °C. After intensive firing for approximately 20 minutes, the fire was allowed to die down for almost two hours. The firing conditions are similar to those already described for open fire conditions (Tite 2004). The pots gained a red-black colouring due to alternate oxidising and reducing of the firing atmosphere (Figure 9).

In two cases, the pointed bases cracked during the firing (Figure 8). One possible explanation is that the thick clay in the base was not dried enough, so that the increase in temperature led to a cracking of the point. The assumption that two pointed bases from Neustadt with similar attributes were cracked during firing was confirmed as a result of these experiments. This was observed only in one kind of pointed base made by two lumps of clay, the thicker and rarer type. Surface crackings occurred over all surfaces during the firing. They emerged only during the firing at points where the tempering was coarser. These cracks did not affect the cooking in any way.

Figure 9. Red-black colouring of the pots due to alternate oxidising and reducing of the firing atmosphere. In the background fish is prepared to be cooked (photograph by the author).

During the second part of the experiment the pots were placed between three stones within a small fireplace. Different ingredients were cooked in five pots, mainly roach, wild boar, and roe deer, all with vegetables, using water from the river Alster (Philippsen *et al.* in press). In one pot, blubber of marine mammals was cooked. The fluid content of the pots began to boil after *ca.* 15 minutes. Food crusts were formed only after the water evaporated, which, depending on the content of the pot, was after one to two hours (ibid. Philippsen *et al.* 2010; Philippsen 2010b).

Conclusions

The burning of granite to use as a temper was not the sole option. A naturally eroded granite stone can also be quite easily crushed, and such stones must have been accessible to the inhabitants of coastal sites of the Southwestern Baltic. Pointed bases of the pots are more sensitive to temperature changes than the rest of the pot. Cracked points from the experiments suggest that similar finds found in an archaeological context resulted by sub-optimal manufacturing techniques and/or burning conditions.

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