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From Entities to Interaction: Replacing pots and people with networks of transmission

1. Introduction

The understanding of the relationship between language, ethnic groups, and material culture in prehistory is still very limited, even within highly competent academic communities. To researchers without archaeological training it may be easy to make a direct association between archaeological cultures, distribution of significant artefact types, and ethnic groups, especially as such explicit links are occasionally made also by archaeologists (e.g. Carpelan 2006). While there is undoubtedly some association between material culture and ethnicity (Damm 2010), and by inference perhaps also language, this is not straightforward, and is in many respects still poorly understood.

In my opinion it is not possible to argue for any one-to-one relationship between archaeological categories, be they cultures or artefact types, and ethnicity and language. I believe that we have to develop a very different approach to the relationship between material culture, mobility, and interaction, before we are able to discuss to what extent any distribution of similar material may be linked to the spread of language.

In the following I will first briefly summarise why archaeological entities are problematic to use as a basis for ethnic groups. I will then present an alternative springing from the so called *chaîne opératoire* approach, in this case the complex technological process of making pottery. After a more general excursion into pottery production in northern Fennoscandia, I will finally indicate the advantages of the approach by looking at the use of asbestos temper in the area. This is only meant to serve as an illustration of the approach, and is based only on a brief study of available publications.

A Linguistic Map of Prehistoric Northern Europe.
Suomalais-Ugrilaisen Seuran Toimituksia =
Mémoires de la Société Finno-Ougrienne 266.
Helsinki 2012. 41–62.

2. Archaeological entities: cultures and pots

Archaeologists have always been fond of producing maps demonstrating the general distribution of particular types of artefacts or structures. In some earlier publications several subgroups of pottery from the Early Metal Period are presented together on maps as one group (see figures 1 and 2), termed either Asbestos pottery covering northern Fennoscandia (e.g. Jørgensen & Olsen 1987: 6; Hulthén 1991: 3) or Textile ceramics covering Finland and adjacent areas in Russia (e.g. Lavento 2001: 15). These publications recognise that these more general categories in fact embrace much typological, chronological and geographical variation. However, as they choose to illustrate the overall and general distribution, readers from other disciplines, who cannot be expected to be familiar with empirical details, are provided with the impression of cultural homogeneity over large regions.

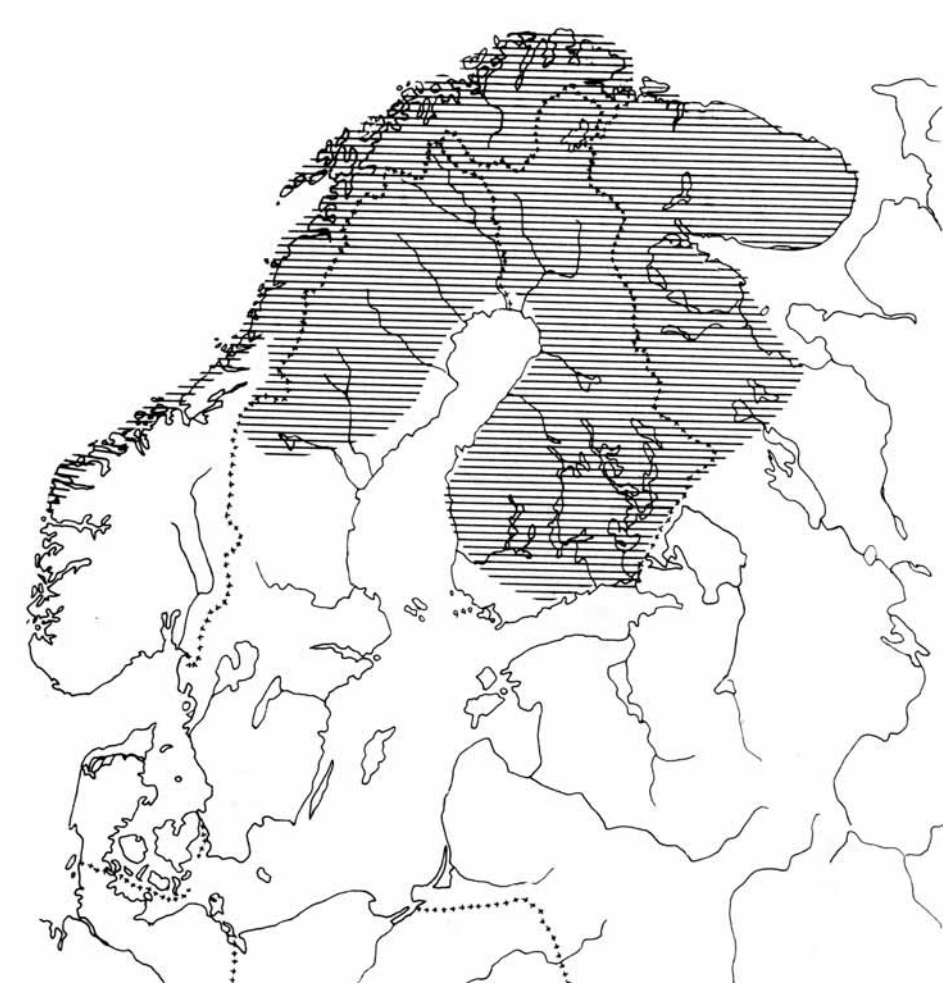

Figure 1. The distribution of Asbestos pottery according to Jørgensen & Olsen 1987.

For the better part of the 20th century archaeologists were prone to link the distribution of various types of pottery to different cultural and ethnic groups. This sprang from culture historical archaeology, which focussed on archaeological cultures. To discover an archaeological culture one mapped a number of cultural features and attributes such as house constructions, distinct burial types, specific artefacts, ornaments, and, of course, pottery. If several distinct types could be seen to be consistently found together in a clearly delimited geographical area, it was argued that they made up a cultural assemblage or an archaeological culture (fig. 3). The Corded Ware culture is, for example, characterised by a set of cultural features, which include beakers with ornaments made by twisted cords, battle-axes, and single inhumation graves where the body is placed in a flexed position. Such cultures were frequently perceived to represent distinct cultural groups, and implicitly or explicitly associated with a 'people'.

Since pottery generally displays greater variation in time and space than, for instance, stone tools, many such archaeological assemblages or cultures were named after the pottery: Trichterbecher Kultur (Funnel Beaker Culture); Schnurkeramisches Kultur (Corded Ware Culture); Pitted Ware Culture; Comb Ware Culture etc. Perhaps for that reason pottery is often seen as the artefact most closely linked to the concept of peoples or ethnic groups, and one may see references to 'Corded Ware people' or similar expressions. Pots came to stand for people.

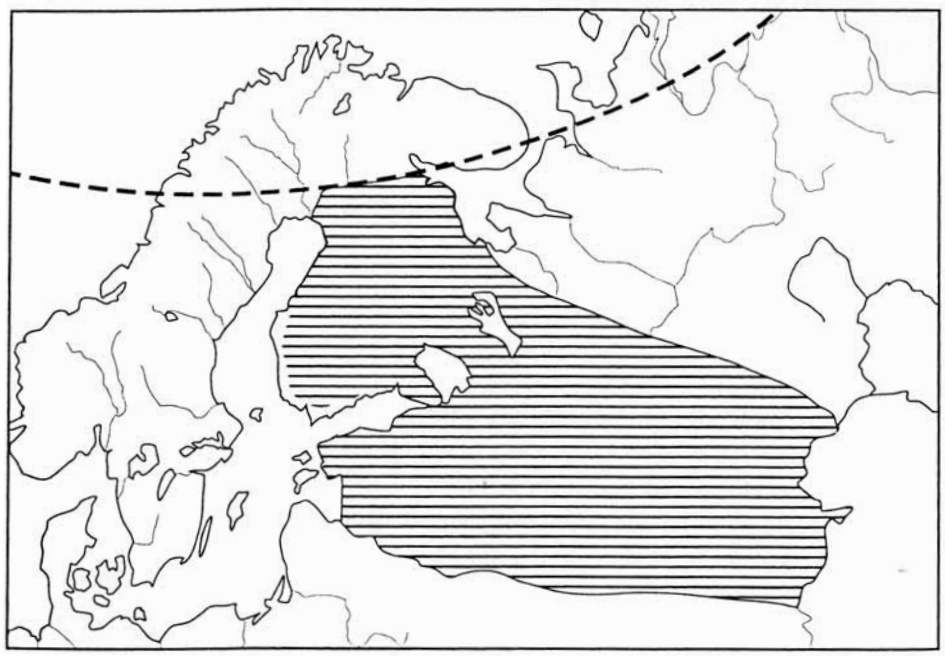

Figure 2. The distribution of Textile ware according to Lavento 2000.

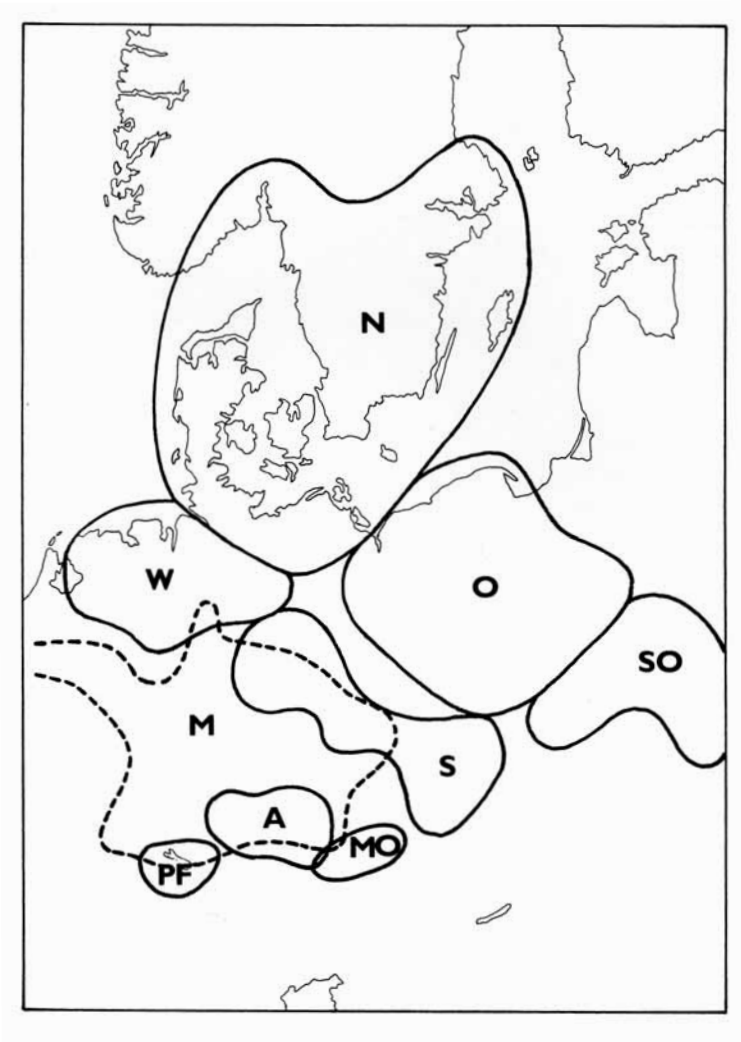

Figure 3. Example of the distribution of archaeological cultures. (From Zápotocký 1992: 552.)

One of the basic premises of the culture historical approach was the belief that past societies (in particular hunter-gatherers and early farmers) changed only gradually and rather slowly. While change in just one cultural element might be caused by diffusion of ideas and technology from neighbouring societies, major or abrupt changes in several features were assumed to represent immigration of a new group of people. Typically, the result was narratives with a succession of waves of immigrating groups. This essentialist perspective on human societies has been rejected by more recent theoretical and methodological approaches.

One of the problems in associating archaeological cultures with ethnic or linguistic groups is that only seldom do all the attributes and features ascribed to any such culture have exactly the same distribution pattern. Mostly, what we get are somewhat differing distributions of each of the selected criteria, although, of course, with some overlap. If we draw circles around each of these distributions we may find an area where they all occur together – and this is considered the 'core' area of the culture – but this leaves us with numerous finds outside

this area, that cannot be accounted for in this model. An example of this is the Corded Ware Culture in Northern Europe, which, of course, is one of those archaeological cultures that have been most explicitly linked to a distinct ethnic group. Battle-axes of the Danish type have one distribution, that of curved beakers another, amphorae a third (Strueve 1955), not to mention the fact that Swedish axes and beakers are quite distinct from the continental types. Deciding the distribution and location of the culture is possible on a very coarse scale only.

Similarly, the use of archaeological assemblages or cultures that explicitly build on the coherent distribution of characteristic types easily provides the impression that such groups are socially as well as culturally homogeneous, while we know that societies are internally heterogeneous, being composed of a wide variety of individuals with different agendas, depending on their gender, age, social and economic status, kinship ties, etc. (Damm 2010, 2012).

In addition it is important to note that many artefact types are very heterogeneous. The well-known category of Textile pottery, for instance, is in Norway one of the most important categories of asbestos tempered wares (Jørgensen & Olsen 1987), while such temper is unusual in the type in Finland. And perhaps surprisingly, much Textile pottery is not decorated with textile impressions (in Finland this accounts for only ca 25% (Lavento 2001: 52)). With regard to the early northern Comb Ware, Skandfer concludes that "there is so much between-site and regional variation in pottery characteristics that the crisp classic definition of a distinct Sär 1 pottery is no longer tenable, making the whole concept of a 'typical' Sär 1 early Comb Ware in northern Fennoscandia redundant" (Skandfer 2009). Similarly the increasing number of ^{14}C dates on food crusts or birch bark pitch on Neolithic pottery in Finland now demonstrate that many of the types that were thought be chronologically successive, are in fact for a large part contemporary (Pesonen 2004). This demonstrates that instead of expecting homogeneity in prehistoric material culture, we are better advised to anticipate heterogeneity.

For more than half a century there have been intra-disciplinary debates with conflicting views on the extent to which an archaeological type reflects prehistoric categories. The archaeological definition of the individual types also has great impact on the result of the distribution of assemblages. Depending on the research question being investigated, different choices with regard to geographical scale, degree of stylistic and typological variation must be considered. While it is no doubt useful at times to be aware of the wider distribution of groups of pottery, such as Asbestos pottery or Textile ceramics, for other purposes it is imperative to call attention to the geographical, chronological, and technological diversity. To better understand the complex interrelationship between, for instance, pottery and cultural groups, I would argue that instead of attempting to build homogeneous entities we should consider the information provided by the vast amount of variation.

The traditional concept of archaeological cultures covering rather large geographical regions is considered outdated. Nevertheless the general approach does seem to have found a second life in the search for numerous local

or regional groups (Damm 2010). Many studies demonstrate that within one culture or one pottery style it may be possible to find a number of subgroups on a regional or local level (e.g. Lavento 2001, Carpelan 2004, Bergsvik 2006). While the methodological approach in such studies is often highly commendable, and contributes to our knowledge of the societies in question, reducing the scale and size of groups fails to solve the main issue: when looking for entities, no matter how small, the goal is something coherent and homogeneous (a search for entities that may be clearly distinguished from each other). This prevents us from looking into the complexity of human societies (Damm 2012) and from using the fuzziness to actually understand some of the dynamics taking place.

3. From pots to *chaîne opératoire* and learning networks

I suggest that we shift our attention from cultural and typological entities to the various social dynamics that artefacts are a part of. The inspiration for the following is derived partly from Cultural Transmission studies (e.g. Jordan 2007; Jordan 2009; Jordan & Mace 2008) and partly from the anthropologist Olivier Gosselain's studies of pottery in western Africa employing the *chaîne opératoire* approach (Gosselain 1998; 2000; 2008b). In a *chaîne opératoire* study the focus is not on the finished artefact, such as a pot of a particular type or style. Instead one follows the entire process from extraction of raw material through numerous production stages to distribution of the finished artefacts, possible repairs, and finally the discard of the pot, although many studies emphasize the production sequence. In the following I will suggest that by looking at the distribution of technological choices at each stage, we may get a better image of the social interaction taking place between potting communities, and establish a better understanding of the background for the diversity of material culture and the links to social and cultural identities.

Gosselain has demonstrated (2008b) that in many places there is no simple correlation between any type of pottery, or indeed any element of pottery production, and linguistic or ethnic groups. He does, however, show that there are links between the choices made at various stages in the production and positive or negative associations between groups, and more or less direct interaction. In other words, some link between material culture and social (including linguistic) identity does exist – but it is a very complex one.

Pottery manufacture is a fairly complex procedure with many different steps:

- extracting and processing the clay
- acquiring and preparing the wanted temper
- kneading the temper into the clay
- forming the vessel
- decorating the vessel
- drying and finally firing the pots

More steps could be added, depending on the scale of analysis (Gosselain 2008a). This means that a fair amount of knowledge that has to be acquired before one becomes an accomplished potter. That knowledge will have to be transmitted through interaction between potters.

Knowledge is not only transmitted at the initial introduction to the craft, but may be exchanged under many different circumstances. As suggested by Gosselain (2008c) we may distinguish between intra-communal and inter-communal exchange of knowledge. Intra-communal transmission happens within a community. Most learning would have been of a more informal kind (Gosselain & Livingstone Smith 2005; Gosselain 2008b) rather than through formal apprenticeships. Children would assist parents and relatives in various tasks and acquire knowledge through observation and discussion amongst adults. At a later stage, they may have received some formal instruction. This transmission of knowledge would in many cases involve a combination of skills, knowledge of the landscape and resource area as well as social and ideological integration, the latter due to the many symbolic or religious concerns often involved in the production. Such vertical or generational learning networks would contribute towards continuity in technological practices. In other cases the learned practice may have been adjusted due to personal experience and experimentation or due to interaction and communication with others. Adult potters within a community may, of course, exchange ideas and experience, often through evaluation of their own finished products or those of others. Most intra-communal transmission is based on direct interaction between the potters.

Inter-communal exchange of knowledge happens when potters from different communities meet or when they see pots produced elsewhere. Importantly not all aspects of the pottery production require very close interaction in order to be transmitted (Gosselain 1998; 2000). Contact when travelling to kin and friends or for exchange and interaction at aggregation sites will suffice. As a consequence of this, some horizontal or relational learning networks also existed.

Some elements and techniques are visible on the finished product (decoration, tempers, vessel shape, etc). The visibility will allow many people to become aware of the choices made, even if they were not present during the production or in fact have never met the potter. Such production elements may be transmitted simply by seeing a different vessel shape or decoration, i.e. only the pot, not the potter has to travel. The reproduction of the technique may not be absolutely identical. A decoration pattern may be copied using a different tool; the temper may be prepared differently and come from a different source. Thus the similarity may be as superficial as the contact.

Other stages such as clay selection, processing and firing may not be visible on the finished vessel. The only way they are transmitted is therefore by closer interaction between potters and consequently these elements often reflect local or regional networks of interaction (Gosselain 2000: 192). An individual moving into a new area may either adopt new practices there or introduce craftsmen and women in that area to new techniques.

Finally a number of elements, perhaps in particular forming techniques, involve particular gestures and motor habits, and are more resistant to change and horizontal transmission (although for some modification of this see Gosselain 2008b). These are typically transmitted intra-communally and vertically.

4. Pottery production in northern Fennoscandia

In eastern parts of Fennoscandia, roughly east of a line from the western part of the Varangerfjord to the mouth of Kemijoki at the Gulf of Bothnia, pottery was introduced at around 5400–5200 calBC (Torvinen 2004; Kosmenko 2004; Skandfer 2005; 2009). North of the Saariselkä watershed (Skandfer 2003) in the northernmost parts of Finland and adjacent parts of Norway the production and use of pottery ceases again towards 4500–4200 calBC, with only very sporadic finds until the late 3rd millennium BC (distributions in Finland based on Pesonen 1999, dates based on Pesonen 1996, 2004). In the period 4000–2000 calBC the pottery in Finland and adjacent eastern regions pass through a number of stylistic and technological developments. In western parts of northern Fennoscandia (Norway and Sweden) pottery was introduced at a late stage, roughly around 2000/1800 BC, when the technology spread from the east (in the middle part of Swedish Norrland some Neolithic pottery dates to the 3rd mill calBC (Lindholm et al 2007)).

In the following a number of the most central steps in the production process are considered on a general basis, but taking into account that we are dealing with predominantly hunter-gatherer populations in northern Fennoscandia. Many of these communities are characterised by seasonal mobility, but each appear to have specific resource areas (Damm 2012).

4.1. Clay extraction and processing

We know that in Africa today clay is usually extracted within a 3 km radius of settlements (Gosselain & Livingstone Smith 2005). What is considered an acceptable distance will, of course, vary with the available means of transport, the perceived quality of the clay, and the importance of the craft. In northern Fennoscandia it is likely that much clay was extracted from fresh water sites (sediments deposited in shallow lakes, slow rivers, streams, river mouths). Fresh water clay retains plasticity better than salt water material (Skandfer 2003: 333). In Finland clays are most readily available in the sub-aquatic areas, although clay sources do occur in the supra-aquatic regions too (Lavento 2001: 46). Similar circumstances may have existed in Swedish Norrland, although again good clay sources are known from the interior (Hulthén 1991: 48). Accordingly, clays may have been fairly easy to discover in large parts of Finland and in the lower areas of Sweden. General knowledge of typical locations would have been sufficient to find clay. In other areas, such as Finnish Lapland and inland areas of Sweden and most of Norway, potters would perhaps have been more dependent

on local knowledge. At the introduction or reintroduction of the pottery craft into a new area this would have been an important element. Knowledge of the locations would later perhaps have been passed on when new generations of potters helped with the extraction, i.e. extraction would have relied on intra-communal transmission.

The association with lakes and rivers also means that clay could have been transported by boat, allowing for extraction some distance from the location for further processing and production. There are relatively few analyses of clays from Fennoscandia, but in many cases sorted fine clays were used (e.g. Hulthén 1991: 17, 22; Brorsson, Isaksson & Stenbäck 2007: 419; Hallgren 2008: 185).

Although we have no knowledge of the further processing of the clay (removing impurities etc.), this is an important process. Again, since the actual process leaves no visible trace on the pots, transmission would have required direct observation.

4.2. Acquiring, processing, and adding temper

Some amount of other materials is almost always added in the final preparation of the clay. The temper may help retain or better the plasticity, minimise shrinking, and prevent cracking during firing (Papmehl-Dufay 2006: 140). Additionally, it may strengthen the pot, assist in reducing the wall thickness (Carpelan 1978), or in other ways alter the properties of the pure clay. Anthropologists, however, caution us that in many cases the choice of temper is less related to function and technology, than to other social mechanisms (Gosselain & Livingstone Smith 2005). Arguably one of the definitive functions of tempers in the Early Metal Period is the use of large amounts of asbestos in the 'asbestos ware' in northern Sweden, which would have enhanced the insulation capacity (Hulthén 1991: 34; for critique of this see Sundquist 2000).

In northern Fennoscandia the temper varies greatly in time and space, and is probably the most often employed technological element in archaeological studies. Tempers known to have been used in Fennoscandia include crushed quartz, sand, chamotte/grog (crushed pottery), granite, bone, mica, talc, asbestos, soapstone, pumice, ochre, limestone, amphibole/hornblende, feldspars, organic tempers such as hair, feathers, shell/eggshell, and various vegetation such as hay, grass (Jørgensen & Olsen 1987; Lavento 2001; Skandfer 2003; Pesonen 2004). In many cases more than one type of temper was mixed into the clay, and more rarely no temper appears to have been used or is not discernable.

Some tempers would have been readily available close to most potting sites. Other tempers are more regional or local in their distribution, e.g. asbestos.

The temper may be visible and discernible on the surface of the finished vessel, at least to an experienced potter. This means that it may be possible to be inspired to employ a different type of temper simply from seeing a pot. The more important question is, of course, why certain tempers are used and others not. Initially one would expect a potter to continue the tradition he/she was trained within. Other tempers may have been adopted through either experimentation

or interaction with potters from other traditions. As noted above this may be related to perceived technical or functional advantages, but is often not. Gosselain's studies (Gosselain 2008d) demonstrate that even though potters in Niger are aware of alternative tempers, they are reluctant to use them. There the different temper 'recipes' are associated with different social and cultural groups. Newcomers into a potting community will often be gently pressured to shift to local norms.

Finally the temper must be kneaded into the clay. But in some cases temper appears to have been added during the building phase. Pasvik pottery and some Norwegian textile ceramics have a thick string of asbestos fibres placed horizontally just below the rim (Jørgensen & Olsen 1987).

4.3. Vessel building

A very common building method is coiling. Here coils are added successively on top of each other to build the wall of the vessel. The coils are drawn together by smoothing the inner and outer wall. This smoothing may be directed upwards or downwards and often in different directions on the inside and outside, thus creating recognisable patterns (U-N-∩) when looking at the vertical cross section of a sherd. The Neolithic Early Asbestos ware in Finland was built through coiling with a U-type smoothing (Pesonen 1996: 12), the Neolithic pottery in Swedish middle Norrland was coiled using both U and N-technique (Lindholm et al. 2007: 208).

Coiling is by far the most common technique in prehistoric pottery in Fennoscandia, but other methods do occur. Different techniques may be used on different parts of a vessel. The Early Metal Period in particular saw the introduction of other building techniques (Carpelan 1978). Some vessels were built over a wooden log or mould and occasionally imprints of the wooden structure are preserved on the inside of the vessel (Kleppe & Simonsen 1983; Hulthén 1991: 17). According to Hulthén (1991: 38) the large amount of asbestos temper in the Swedish asbestos ware makes it impossible to use the coiling method, and here the alternative was the log method. There is some indication from Sweden that some vessels were made using another vessel as an internal mould, as there are negative imprints of decoration on the inside of the vessel (Hedman 1993).

Since the beginning of the early 20th century, suggestions have been made that the so-called textile impressions are the result of a special building/shaping technique, where the clay vessel was formed inside a vessel made of textiles or baskets with such patterns (overview in Lavento 2001: 54). With regard to the Fennoscandian material there are at present no studies that confirm that the impressions were related to the building of the vessel, rather than a secondary feature. The possible exception is the negative imprints mentioned above, suggesting the use of moulds.

4.4. Vessel shape

The vessel size and shape is one of the most easily observable elements of the pottery. They are, of course, to a certain extent determined by the function of the vessel, but this still leaves a wide range of options. While the general shape of a vessel may be copied easily, variation on rims is perhaps an element that is partly akin to decoration, and partly an aspect of shaping. In the latter case, rim forms could be more closely linked to local and regional preferences associated with direct and long term interaction. Unfortunately even these elements may not always be possible to determine due to fragmentation in the prehistoric pottery.

4.5. Decoration

When studying prehistoric pottery it is not always possible, nor of interest, to distinguish final surface treatment from ornamentation. Of importance here is partly the techniques used and the visible result on the finished vessel. Some treatments may have been done either to smooth or roughen the final surface of the vessel (i.e. adding slips (a thin solution of clay and water) or scratching/hatching the surface). Slips are common in Comb Ware[1] (Skandfer 2003: 133) and various forms of surface treatment are noted in Swedish Norrland (Lindholm et al. 2007: 209). Décor may consist of plastic moulded elements, but for the northern Fennoscandian material most décor is made through imprints of various sorts in the clay. These may be made by the potter's fingers, with sticks, lithics, bone, shell, cords, or stamps made specifically for this purpose. The variation in imprints and patterns are, in addition to vessel shape, the elements most used to distinguish archaeological styles in pottery.

Ornamentation/surface patterns are, of course, easily copied, even without interaction between potters. However, unless you know exactly what kind of tool was used, some variation in the actual imprint may be observable. Similarly, stylistic similarity may be easy to copy, but more complex decoration schemes are likely to be identical only where closer interaction between potters occurs. It must be remembered that ornamental patterns may have existed on other, not preserved material as well, i.e. there may have been several sources for transmission of patterns.

The use of surface colouration or paint is also known from northern Fennoscandia, primarily in the form of ochre. The use of red ochre is very common on Comb Ware. When fired the ochre melts onto the surface as a thin glaze (Skandfer 2003: 134). Black colouration is known, for example, from late Early Metal Period wares (Lavento 2001: 60), but also elsewhere (Holm 1999: 135).

1. Perhaps the use of a slip explains the observations that comb ware pottery on the Kola Peninsula was built using 'double moulding' (Gurina 1987: 41).

Preparation or decoration of the vessels after firing is also possible, e.g. through applied paint or by filling the imprints with a paste. In Southern Fennoscandia there are examples of a white paste made of crushed shell. Covering the vessel with resin after firing makes the surface smooth and the pot more watertight.

4.6. Firing

The firing is a very important element in the process with great impact on the final result. The temperature and access to air, either oxidised or reduced atmosphere, during firing determine the hardness and the colour of the vessel. For the Neolithic and Early Metal Period pottery of northern Fennoscandia there are no indications of ovens or kilns, i.e. all firing seems to have taken place in the open (Hulthén 1991; Lavento 2001: 60). Even without kilns there are many possible options: simple hearths or firing pits, the choice of fuel, how to build the fire and how to place the vessels, whether or not to cover the pots (to obtain reduced atmosphere) etc. (Sinopoli 1991: 31).

The transmission of firing techniques require direct interaction between potters, as the process leaves few distinguishable traces on the pottery.

4.7. Transmission of pottery production and styles

Certain elements of the production sequence, in particularly tempers, are dependent on the availability of specific resources, either locally or through exchange. Other elements, such as clay sources, the treatment of tempers, building processes, complex decoration schemes, intricate stamps, and details of the firing, can only be correctly copied through direct transmission of knowledge. And some elements only require visual observation of other pots, e.g. shape, decoration, and perhaps temper. What may be 'read off' the pot is of course dependent on how accomplished the observing potter is. The copying of many of the latter elements will naturally occur intra-communally or through more direct interaction – the point here is that in principle this is not a pre-requisite for transmission of these traits.

Unfortunately the traits that require least interaction are the traits that dominate archaeological research on pottery, and which consequently form the basis for discussions on interaction regionally and interregionally. It would appear that the more technical elements of the production, such as building techniques, are most dependent on direct and close interaction of an intra-communal kind. The spread of such aspects may therefore be more closely tied to demographic movement such as marriages or other events that would allow potters to interact and work together for longer periods.

The transmission of other elements indicates inter-communal interaction of some kind. We must expect people from dispersed communities to meet and interact under many different circumstances. They may meet at aggregation sites or trade fairs for exchange or ritual activities, people would have travelled to

visit kin, people relocate through marriage, and with irregular intervals deaths or other unforeseen events would have forced people to move temporarily or permanently to other locations. It need not always be the potters that move between communities. As noted above, some elements may easily be copied and it would be possible for a skilled potter to copy elements from a pot brought into a community from elsewhere, as a gift, as part of an exchange. However, pots do not travel on their own, but needs to be transported by somebody, travelling for some reason or another.

Finally, the reason for transmission of various elements may vary. New elements may be transmitted due to incoming craftspersons that teach new potters a different technique, elements may be adopted because they are perceived to be superior or because the function of the vessel changes, and in many cases the adoption or rejection of elements is based on positive or negative social and cultural associations.

5. Asbestos tempered pottery

Summing up the discussion above, there is a lot of unrealised potential for analysis of the northern Fennoscandia pottery, if we discard typological entities and proceed to consider individual elements of the *chaîne opératoire*. Different technological aspects may have been transmitted in very different ways and for different reasons. Consequently, they may have separate distributions, which do not correspond to any typological or stylistic group.

In the following I will consider the distribution of asbestos tempering. The asbestos is an obvious element to focus on as it is not readily available everywhere, and as this is the temper used when the craft spreads north and east into Norway and Sweden ca 2000 calBC.

5.1. Asbestos sources and types

The most prominent asbestos sources in Finland are found in the Tuusniemi-Kaavi-Outokumpu area in eastern Finland (Figure 4). A few occurrences are found in Kainuu and in southwestern Lapland, and then there is a belt of locations from Sodankylä to Kittilä (Lavento & Hornytzkyj 1996: 52). Further east there are known sources in the River Vyg area close to the White Sea, as well as on the west and southeast shores of Lake Onega. In Norway, asbestos has been found at lake Virdnejavre on the Finnmark Plateau and at Alta (Sundqvist 2000: 51), while asbestos deposits are found in several places in Swedish Norrland (Hulthén 1991: 14). There is no direct information available concerning asbestos sources in Troms and Nordland, but there is every reason to believe that local sources existed in the area, as soapstone occurs in numerous places (see below).

The three most commonly used types of asbestos are actinolite, anthophyllite, and chrysotile (Lavento & Hornytzkyj 1996). The first two are commonly

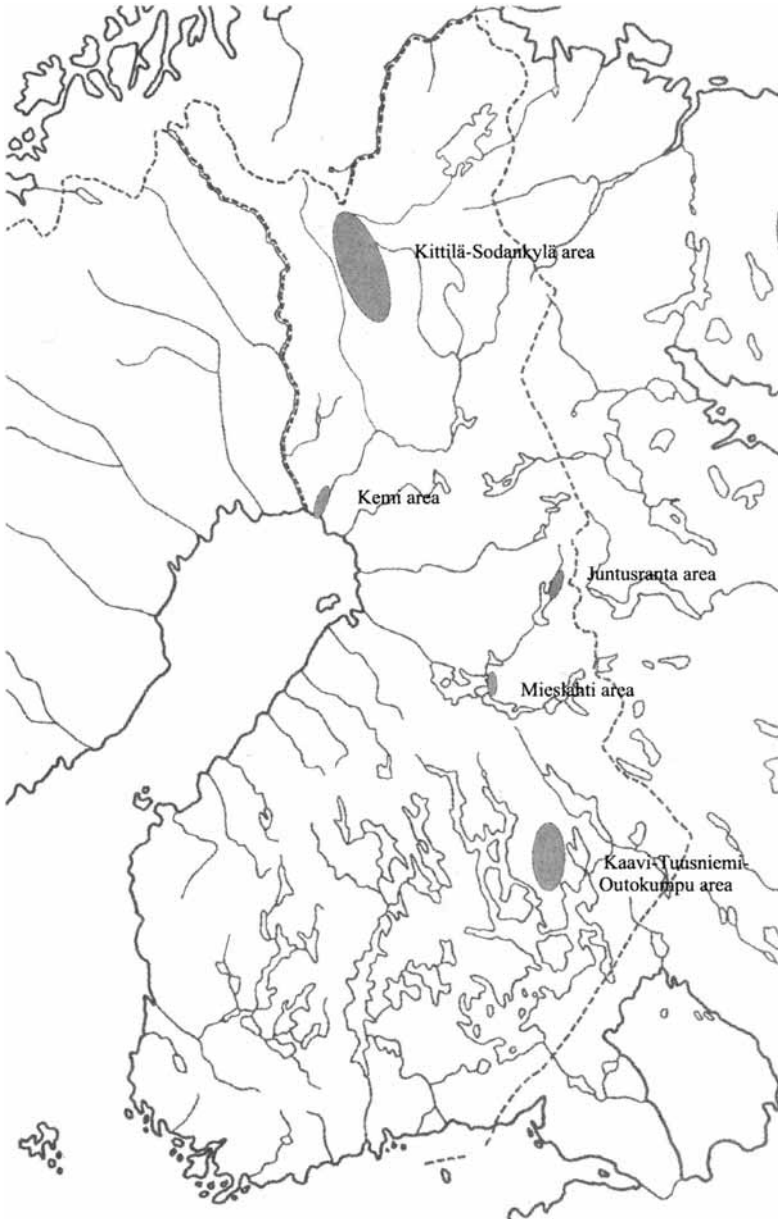

Figure 4. Asbestos sources in Finland (Lavento 2001: 49.)

found in association with greenstone and talc, while chrysotile is associated with soapstone (Andreassen 2002: 55). As all of the three associated types were commonly used in the Neolithic and Early Metal Period, it is likely that many smaller asbestos sources would have been known by local communities.

The three asbestos types act and look rather differently when crushed. The actinolite asbestos will be green with short, powderlike fibres, while the anthophyllite asbestos is light brown with long fibres. Chrysotile asbestos creates more cotton-like structures (Sundqvist 2000: 53).

5.2. Asbestos tempering in northern Fennoscandia

The following summary of the use of asbestos temper in Finland is largely based on Lavento and Hornytzkyl (1996). The first use of asbestos for temper in Fennoscandia is found in what is called 'Early Asbestos pottery' (Carpelan 1978), which dates back to ca 4500 calBC (Pesonen 1996: 28). The main area for this early use of asbestos was in eastern Finland, but with some finds also to the northwest (Carpelan 1978: 12; for distributions see also Pesonen 1999). There was little use of asbestos in the following widespread Typical Comb Ware. In contrast, the late Neolithic Kierikki and Pöljä wares were typically tempered with asbestos. Both of these had an easterly distribution, but with finds spreading northwest. At the transition to the Early Metal Period the use of asbestos temper appears to cease in eastern Finland, with the exception of a more limited area close to the asbestos sources (Lavento pers.com.). Asbestos was, however, used in northern parts of Finland and into Norwegian Finnmark and the Kola peninsula in the Lovozero ware. In Finnmark and Kola, asbestos was also used in the so-called Pasvik ware (Jørgensen & Olsen 1987). Asbestos was only used to a very limited extent in the various types of Textile ware in Finland in the 2nd millennium calBC (Lavento 2001: 47), but was the dominant temper in contemporary Norwegian and Swedish Textile wares (Jørgensen & Olsen 1987; Hulthén 1991). In the later part of the Early Metal Period, asbestos continued to be favoured in Norway and Sweden and was reintroduced in a number of Finnish wares, notably Kjelmøy ware with a northern Finnish distribution, and Luukonsaari and Sirnihta wares with eastern distributions (Lavento 2001: 115–16).

Different types of asbestos were used in different regions. In Finland, most examined vessels were tempered with anthophyllite asbestos (Lavento & Hornytzkyj 1996), although some use of actinolithic asbestos occur as well. There is some indication that the eastern Finnish sources were of anthophyllite asbestos, while Karelian sources were actinolithic (Lavento & Hornytzkyj 1996: 60). A few sherds of Norwegian Kjelmøy ware from Virdnejavre contain actinolithic asbestos (Sundqvist 2000: 52), but chrysotile asbestos is also available locally. All examined Risvik pottery from Troms and Nordland was tempered with chrysotile (Andreassen 2002: 55), as were the Swedish sherds (Hulthén 1991). There is, however, some doubt as to the comparison of the results, as different methods of analysis were employed (Andreassen 2002: 56).

5.3. Material and demographic movements indicated by asbestos temper

The following is an outsider's preliminary interpretation of the spread of asbestos tempering. It should be duly noted that I have no first-hand experience with the pottery in question, and that I base my narrative on only one element in the production sequence. A much more complex and reliable narrative should be based on more elements from the pottery as well as other data.

5.3.1. Neolithic pottery

Asbestos is first introduced in eastern parts of Finland ca 4500 calBC (Early Asbestos pottery). This may well be a local invention as suggested by Carpelan (Carpelan 1978: 12), and the highest concentration of asbestos tempered vessels is in the vicinity of the known asbestos sources in the Saimaa region (Pesonen 1999). According to the available analyses the asbestos used in finds northwest of the Saimaa region is also anthophyllite, suggesting that the temper comes from Saimaa sources, as the Kainuu-sources are of a different kind (Lavento & Hornytzkyj 1996: 57, 63). Early Comb Ware is partly contemporary with this Early Asbestos pottery, with the main distribution south and west of the Saimaa area. Here asbestos is not used, although some overlap between the two wares and tempers are found in northern Ostrobothnia.

The usual temper in Typical and Late Comb Ware (ca 4000–3400 calBC; for the most updated C14 dates see Pesonen 2004) is sand and crushed stone, but in the Saimaa region there are some examples of the use of asbestos, although not crushed as before, but broken into pieces (Carpelan 1978: 13). In the latter half of the 4th millennium calBC asbestos is used in Kierrikki and Pöljä wares (the latter dating from the last half of 4th millennium calBC and most of 3rd millennium calBC). Kierikki ware has a marked concentration in the Saimaa region in eastern Finland, in addition to finds further northwest, notably around Kierikki itself. Pöljä ware has a very similar distribution, but with an increasing number of finds to the west and north.

The present data has a number of shortcomings: the available distribution maps are made according to ceramic styles, not tempers; there are only limited analyses of the kinds of asbestos tempers used and the possible sources for these. Based on the data as it stands today we may suggest that the first use of asbestos for temper most likely was a local innovation in Eastern Finland, where the asbestos was readily available. The innovation spread predominantly between neighbouring communities. This need not have been a result of permanent residential moves, but could have resulted simply from transmission of information between potters meeting at social gatherings. The finds further away, however, indicate an exchange network involving asbestos, assuming that only the Saimaa sources were used. The wish to employ asbestos in areas distant from its sources may have several explanations, that all entail close and positive contacts to the Saimaa region. The use of asbestos in the northwest may have been introduced and maintained by potters moving into the area from the Saimaa region, e.g. due to residential moves after marriage. If potters had learned to use asbestos, they may have preferred to continue that practice, even after moving away, i.e. we are predominantly dealing with vertical transmission. Obtaining the temper from their social network back in Saimaa would not have been difficult. If permanent demographic movements were rare, then the use of this specific temper still indicates a very positive association between the communities in Saimaa and to the northwest, partly on behalf of the potters in the northwest wishing to copy a practice, partly on behalf of the Saimaa residents, who must have agreed to

supply the asbestos or access to the source. Some more distant and isolated finds may be the result of exchange of pots or their contents, or long distance journeys to communities with whom interaction was more sporadic. The particular geographical spread towards the northwest and to a lesser extent south, but not directly west, is undoubtedly linked to the directions of the water systems and regional mobility patterns.

Based on the most recent 14C dates, the use of asbestos decreases for some centuries when Typical Comb Ware is at its height. Then asbestos again becomes a prominent temper in Kierikki and Pöljä wares in the Saimaa region as well as to the northwest. Anthophyllite asbestos still dominates the analysed sherds. The geographical distribution and the possible explanations of spread and contact are much the same as in the earlier period. It is possible, however, that other asbestos sources came into use. The increase of finds along the River Kemijoki may suggest use of the sources at the river mouth, and some use of actinolite asbestos also indicates that temper was obtained from several sources, perhaps including Karelia (Lavento & Hornytzkuj 1996: 57). It is therefore possible that the networks became more complex, with slightly less focus on the links to Saimaa.

5.3.2. Early Metal Period

During the next phase there are two major developments. The use of asbestos temper practically ceased in the Saimaa region, while the pottery production spread north and east, and predominantly involved asbestos temper. The first expansion of the craft was into Finnish Lapland and adjacent areas of Norway and Russia. Lovozero pottery had a markedly northern distribution with finds in Kainuu, Lapland, Norwegian Finnmark as well as Karelia and the Kola Peninsula. Pasvik pottery was another contemporary northern type. They were both tempered with asbestos. The slightly later Textile ware, however, was found across the entire region of Northern Fennoscandia, representing a wider expansion of the technology. The variation in temper in the Early Metal Period, specifically in Textile pottery, covers almost all used tempers throughout Finnish prehistory (Lavento 2001: 47). However, Textile wares in Finland were only seldom tempered with asbestos. The known cases are either from eastern Finland, i.e. apparently a continuation of past traditions, or from Kainuu or Lapland (Lavento & Hornytzkyj 1996: 60). The Textile wares in Norway and Sweden, on the other hand, were almost exclusively tempered with asbestos. There is every reason to believe that new local sources for asbestos were used. The large amounts of Pasvik type pottery at Virdnejavre 112 (Olsen 1994: 122) close to an asbestos source would suggest this.

For the ceramic technology to spread into new areas some transmission of knowledge had to take place. The first expansion took the craft northwards from Kemijoki into northern Lapland and Norwegian Finnmark. It is in theory possible that individuals from the north learned the craft while visiting further south, but it is perhaps more likely that the knowledge was a result of residential moves, i.e. individuals or groups moving into the northern region. This need not

have been a new phenomenon. There is every reason to believe that contacts existed between northern and southern region also in the Neolithic. If, however, as is usually argued for the period, new settlement patterns involving greater mobility over longer distances were established at the transition to the Early Metal Period, this may have intensified interaction. It is also possible that new areas were settled by groups from the south. It is noticeable that in Norway the Pasvik-pottery was more or less restricted to the Pasvik and Alta-Kautokeino water system. The Lovozero ceramics were also found on several sites in Pasvik, and then more sporadically along the coast of Finnmark (Jørgensen & Olsen 1987; Olsen 1994: 130). The earliest pottery was, in other words, restricted to a few local areas, which again may indicate some demographic movement northwards to selected areas. There is, on the other hand, no indication of any massive immigration.

In southern parts of Finland a wide variety of wares were produced from the late Neolithic onwards. This diversity continues in the Early Metal Period. Of particular interest here are the Textile wares. In Finland, these were tempered with a variety of materials, but rarely asbestos. The almost complete abandonment of asbestos tempering in a technological environment that seemed to accept almost any kind of temper is peculiar. The phenomenon certainly does suggest that the networks that supported the use and distribution of asbestos in the eastern region (marriage and exchange networks) broke down, possibly due to a reorientation in allegiances.

The textile impressions found on some of the pottery within the category Textile ware was a common feature across a wide region from the Urals to the Baltic Sea and beyond. It has been suggested that this stylistic phenomenon was part of a Textile ceramic culture that emerged in the east and spread towards the northwest (Carpelan 1978: 16; 2006: 80).

Does this suggest major immigration from the east? On the one hand it should be remembered that such décor may be copied and spread without much long term direct interaction or major demographic movement (see also Lavento 2001: 176). In addition it may be possible to see influences, as in copying of traits (horizontal transmission), from several directions. In the western area, textile impressions are known already in the Neolithic, notably on Corded Ware pottery in Estonia as well as in Finland, and it is very common in Kiukainen pottery, immediately preceding Textile wares (Lavento 2000). The western Sarsa subgroup of Textile ware may therefore be linked to late Neolithic Finnish pottery (Lavento 2001: 166; 2005: 764). An alternative hypothesis to a more unilinear westward spread is consequently that the different subgroups of Textile pottery (Sarsa, Tomitsa and the Kainuu group) developed quite differently, some from more local knowledge and tradition without any necessary new craftspersons, others due to some incoming groups or individuals (Lavento 2001: 177). A general preference for textile impression cut across these groups, suggesting positive associations between groups, but not necessarily much demographic mobility.

When the Textile ware spread further north and west, into Norway and Sweden, the vessels were predominantly tempered with asbestos. This may suggest that the transmission of knowledge (learning networks) was now linked to networks within the northern and western regions, where the employment of asbestos was continued. On the other hand, the copying of the textile decoration indicated positive associations with communities further east (as emphasized by Jørgensen and Olsen 1987). The continuation of asbestos tempering and the variations in décor patterns (indicating the use of different types of tools for decorations) suggest that this was a case of horizontal inter-communal transmission, mostly likely copying of décor and vessel shape, rather than the result of any distinctive demographic movement, contrary to the spread of Lovozero and Pasvik wares.

6. Conclusion

Abandoning large cultural entities, be they archaeological cultures or stylistic types, and instead focussing on studies of technological elements and their transmission within various types of networks may provide a more reliable foundation for discussion the intensity of interaction. I hope to have demonstrated that rather than linking a particular type of pottery such as Asbestos pottery or Textile ware to homogeneous cultural (and by implication linguistic) entities and demographic migrations, the spread of elements such as asbestos tempering or textile impressions may be connected to several different types of transmission within and between communities. It may also potentially improve the possibilities for discussing linguistic diversification and change. This approach enables us to discuss the extent to which certain similarities may have necessitated demographic mobility and certain other similarities may have been a result of emulation and copying only. In other words, I find the attempt to understand interaction between communities through a detailed analysis of the *chaîne opératoire* a promising exercise.

In this very preliminary study the focus was on one element only. This, of course, limits the analysis severely. More detailed studies of other elements (vessel building techniques, vessel shape, details in tools for decoration, decorative schemes) would add greatly to the understanding of the social dynamics and interactions taking place. The assumption here is that not all of these elements would show the same patterns: some would be restricted to vertical transmission with more limited geographical distributions, other elements may be linked to horizontal transmission and therefore would be more widespread.

In order to be able to proceed with such analyses more studies focussing on specific parts of the pottery production sequences is needed, studies along the lines put forward by Lavento & Hornytzkyj (1996) with determination of tempers, and by Pesonen (2004) where temper and other technological elements are studied separately.

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