

THE ESSENCE OF STONE

Making axes during the Late Mesolithic in Södertörn in east central Sweden

Mattias Ahlbeck &
Alexander Gill

Greenstone axes produced during the Late Mesolithic in east central Sweden are notoriously dissimilar. Each axe appears to have been given its own special characteristics. These axes were not made into a certain shape by following a technological template. In this article, the authors present the interpretation that people believed the form of an axe was already present in the stone selected for work. Making axes was about releasing essential forms from stones. The essence of stone effectively determined the appearance the axe was destined to have. This is the reason that axes in the region have such variable appearances.

Key words: Late Mesolithic, east central Sweden, technology studies, tool production, greenstone axes, pecked axes, polished axes

Explaining how people made things in the past is an area of archaeological research concerned with the development of prehistoric technologies. As a line of investigation the archaeology of technology has successfully managed to establish how techniques were developed and tools used when axes were fashioned, pots produced and iron manufactured.

However, it has become increasingly clear that the investigation of how things were made has predominantly construed technology as a field of knowledge detached from the human world of signification. Even though it has become widely accepted that things were inscribed with meaning in the past, making things is often characterised as a process curiously devoid of any kind of significance.

Lately, the scope of some studies involved in the explanation of pre-historic technology has widened the field considerably. A growing interest aimed at understanding technology's social dimensions has pointed out that the way things were made was not governed by an abstract rationality readily separable from human affairs. Instead, knowledge of how to make an object was embedded within systems of cultural beliefs and understandings of the world. If we want to gain an insight into why an object was made a certain way, or was given a specific appearance, we need to try to understand the ideas that guided the production process – what it meant to make an object (Lemonnier 1986, 1992; Pfaffenberger 1988, 1992; Tilley 1999; Dobres 2000; Barndon 2005a; Ingold 2007).

So far, research into the meaning of making things in Scandinavian prehistory has mainly addressed Iron Age societies and ideas involved in the creation of metal objects (Burström 1990; Bergstøl 2002; Rønne 2002; Gansum 2004; Haaland 2004; Barndon 2005b; Goldhahn & Østigård 2007). Our objective is to follow a similar approach in an attempt to create an understanding of the significance of stone tool production during the Late Mesolithic in east central Sweden.

The analysis of how stone tools were made during the Stone Age in eastern Sweden is in itself a well-established field of research (Callahan 1987; Knutsson 1988; Callahan *et al.* 1992; Sundström & Apel 1998; Apel 2001). But is it possible to acquire a deeper understanding of the kinds of ideas that guided the creating and shaping of stone tools?

During the excavation of several Late Mesolithic sites on the Södertörn peninsula south of Stockholm in 2005, a large amount of greenstone axes were found (fig. 1). Vast quantities of greenstone flakes as well as tools used for axe production were also uncovered (Ahlbeck *et al.* 2005; Ahlbeck & Isaksson 2007a). Axes of this kind are quite common in the region. Historically, scholars have shown a great interest in them, and several attempts have been made to sort the axes into chronologically viable typologies (Brøgger 1906; Åberg 1912; Ekholm 1915; Lidén 1938). Every attempt to do so has been quite unsuccessful, however. Even though the axes were made for thousands of years, dating from the Mesolithic well into the Neolithic, and were given a range of different appearances, older and younger axes cannot readily be distinguished from each other (Welinder 1977; Hermansson & Welinder 1997).

In this paper we will not be presenting a new axe chronology as we do not believe that it is possible to create one. The problems surround-

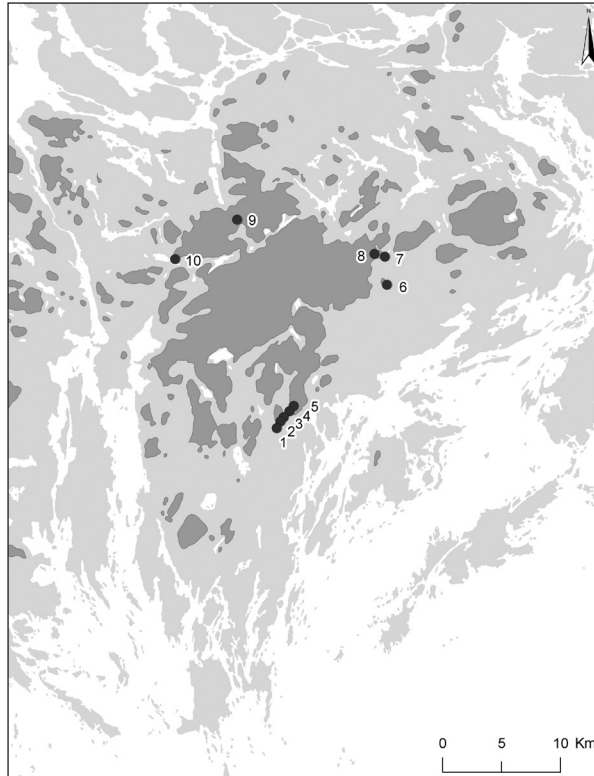


Figure 1. Sites in Södertörn mentioned in the text. 1) Lisseläng 2, 2) Millingsmossen 1, 3) Lässmyran 2, 4) Lässmyran 1, 5) Lövlund, 6) Jordbromalm & Lillsjön, 7) Jordbro industriområde, 8) Rudan, 9) Sjövreten, 10) Eklundshov. Light grey: Södertörns present shoreline. Dark grey: Södertörns shore during the Mesolithic, 50 m.a.s.l.

Illustration: Medea Nyström Huuva.

ing the axes do not represent a situation to be solved so much as they inspire an attempt to approach these enigmatic objects from a different perspective. We believe that the fact that they have withstood scientific ordering tells us something about the ideas at play during their production.

In contradiction to a modernistic approach to technology which assumes that technological practice is readily separable from cultural beliefs, we argue that greenstone was believed to contain an inner essence. The art of making an axe was about recognizing a shape already existent in a certain stone and knowing how to release it. The appearance an axe was given was not controlled by its maker's technological proficiency so much as it was guided by the significance ascribed to stone and the beliefs in powers of another kind. If we want to understand why a certain axe was given a specific appearance during the Late Mesolithic we need to appreciate the various beliefs that guided axe makers in their work.

BACKGROUND

Most of the area comprising east central Sweden today was submerged during the Mesolithic. The parts above sea level constituted a huge archipelago of thousands of islands in various sizes. Numerous archipelago-based sites have been excavated in recent years and locally made greenstone axes are common in assemblages. These axes were supposedly used for woodwork, roughing out canoes, felling trees, and possibly for clubbing seals (Florin 1944; Hermansson & Welinder 1997; Jaksland 2002).

Tools and waste connected to the production of axes have been found at several sites (Lindgren & Nordqvist 1997; Ahlbeck & Isaksson 2007a). Production materials consist of axe preforms, stone flakes, knapping stones and grinding stones, and have on the whole enabled detailed reconstructions of the axe production process (Guinard & Vogel 2006:207–212; and Sundström & Apel 1998 for a Neolithic material). The majority of excavated sites have been dated to the Late Mesolithic and it is a confirmed pattern that greenstone axes are inherently dissimilar. They were given various shapes with different cross sections, and were finished by using a combination of different techniques, often pecking and polishing. It is also becoming increasingly clear that different stages of their production were often carried out in separate areas or locations.

Arguably, the tradition of fashioning axes dissimilar in appearance and the spatial separation of different stages of their production are related phenomenon. Late Mesolithic smiths appear to have shaped and finished axes according to their own personal tastes. At the same time a growing body of evidence suggests that making axes, or at least axe preforms, was delimited to certain sites in a wider landscape setting or specific areas within a settlement, signalling an activity regulated by specific norms or traditions.

The various shapes given to greenstone axes indicate that the intention of individual stone-smiths might not have been the creation of axes modelled in a formalised manner by using a technological template, as seems to be the case with certain Neolithic axes. We want to propose instead that the creation of these objects was guided by a different approach. Methodological considerations were not primary but secondary when making a Late Mesolithic axe.

MAKING AXES

The greenstone axes of east central Sweden were made by combining

several production methods. A simple model illustrating the general stages is presented in figure 2.

Three main techniques were used: knapping, pecking and polishing. These methods do not only create a range of different characteristics in the axes themselves, but also produce waste materials as well as a variety of necessary tools. This enables the production process to be mapped spatially through an analysis of where the production tools and stone waste were deposited.

The first stage of making an axe was the procurement of raw material. Appropriate stone was probably quarried from suitable outcrops.

At present, only three sites where greenstone might have been extracted are known in east central Sweden. The first, Ullevi Klint in the province of Närke, is of uncertain age (Johnsen & Welinder 1980; Welinder 1985). A second, north of the Mesolithic site of Sjövreten in Södertörn, has been identified, but it is unclear whether greenstone was actually quarried or not (Kars *et al.* 2009:16). A third location has been identified at Rudan in Södertörn. The quarry itself has not been excavated but an adjacent site is most certainly from the Late Mesolithic (Ahlbeck & Isaksson 2007b).

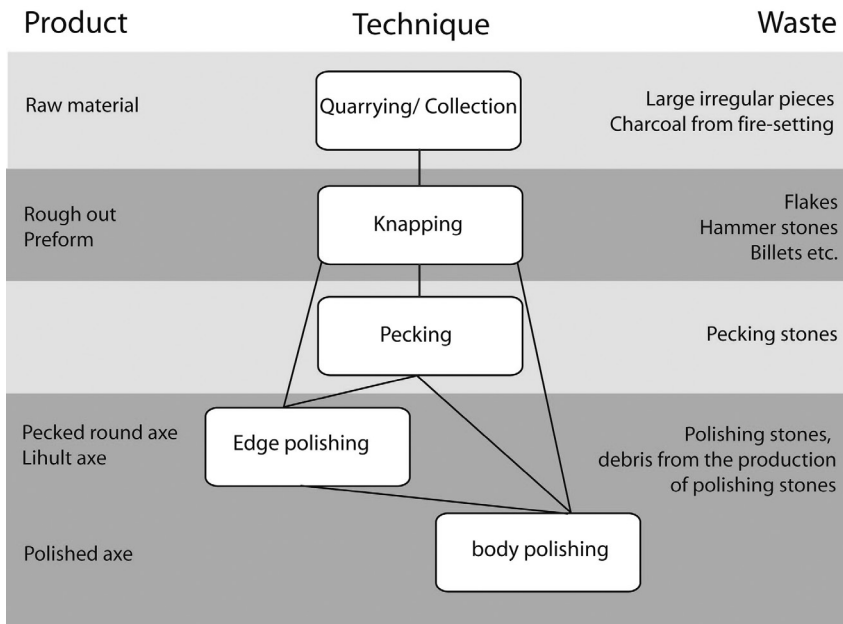


Figure 2. A basic model of the production process.

Waste produced when quarrying stone from such an outcrop can consist of large irregular pieces. Slabs of burnt stone might be present if fire-setting was used to split rock, a method identified at the Bømlo and Stakanaset quarries in Norway as well as at Sélédin in France (Alsaker 1987:40 ff.)

Alternatively, boulders deposited by glacial movement on the lee-side of protruding bedrock could have been collected or quarried. Certain beaches where boulders were collected from deposits washed out by the sea are another possible source.

Knapping a rough-out is the second stage of production. As a technique for finishing axes, it is known in different kinds of rock early in the Mesolithic of southern Finland (Núñez 1998:109) as well as in south Scandinavian flake and core axes of flint. In east central Sweden, however, greenstone objects made solely by knapping are probably preforms, not finished axes.

Knapping greenstone involved numerous stages, from rough-outing to pre-forming. This technique can be identified by flakes of greenstone, rough-outs, and hammer stones. The tool kit and consequently the technological options were probably much greater than is presently visible in the archaeological record. The renowned stone-smith Erret Callahan is reported to have used a heavy billet for coarse knapping. When working with greenstone, which is a relatively soft material, an antler or wooden billet was preferred. At later points in the knapping process Callahan switched to a punch (Sundström & Apel 1998:163 ff). Billets and punches of organic materials were thus probably used during knapping, and in excellent preservation conditions it ought to be possible to find tools of this kind.

After knapping, stone-smiths often chose to continue the production process by pecking the preform. The technique can be identified in source materials by the tools that were used, in this case pecking stones used to fashion a shape out of the preform. Unlike hammer stones two kinds of pecking stones were probably used. Callahan used a hard spherical or oval stone during his experiments, but ethno-archaeological surveys show that stones with prolific edges or ridges also work well. The functional surfaces in this case are the protruding parts of the stone (Pétrequin & Pétrequin 1993). Numerous discarded pecking stones of this kind were found during the excavations on southern Södertörn. As the working edges were worn down the stones sometimes ended up rounded (Ahlbeck & Isaksson 2007a:16f).

It was not until the preforms were polished during the fourth stage of production that proper greenstone axes were fashioned. In some cases polishing took place directly after knapping, but more often the preforms had previously been pecked. Sometimes polishing was confined to the edge of the axe, in other cases an axe was polished all over. Polishing removed visible scars and traces of pecking in various degrees. Thus, techniques used in earlier stages of production are not always possible to identify later on.

Besides polished axes, archaeological source materials from the fourth stage of work consist of polishing stones and flakes of sandstone that are remnants from the production of polishing stones. Debris from the production of polishing stones has been found at the site of Millingsmossen 1 as well as at Lässmyran 2 in Södertörn (Ahlbeck & Isaksson 2007a).

Preforms were also abandoned during different stages of the production process. It was not until a preform was furnished with an edge that it became a fully functional axe. Therefore, two main types of preforms can be identified according to this interpretation of the production process: knapped preforms, and knapped and pecked preforms.

Our description of the production process is intentionally simple. Within it lie many opportunities for variation. A preform made by knapping, for example, can be given a triangular cross section, as exemplified by the Lihult axe, a pointed oval shape as in the Limhamn axe, or a rectangular cross section as in thin-butted axes. When pecking is added we also see axes with round and oval cross sections, as is the case with the classic pecked axes. There is coordination among the technique, method and shapes of finished axes with their various characteristics. Axes were not made by following a predetermined reduction process and a strict set of rules. They were made by combining a small number of methods in a rather playful and undetermined manner.

WHEN WERE THEY MADE?

In Denmark, Scania and along the west coast of Sweden the chronology of greenstone axes appears to be well understood. Pecked round axes (Sw. trindyxor) occur from the Early or Middle Mesolithic up until the Middle Neolithic (Lindgren & Nordqvist 1997:58ff; Sørensen 2007:184). In western Sweden the Lihult axe was introduced around 5800 BC and was in use at the same time as the pecked round axe. The Lihult style of axes did not spread to eastern or southern Sweden

(Lindgren & Nordqvist 1997:58ff). In south-east Norway its sibling, the Nøstvet axe, was introduced around 6000 BC. This type was, as in Sweden, preceded by the pecked round axe but during the period 6000–5700 BC it was also accompanied by a partly pecked axe (Glørstad 2004:21ff). In Denmark and Scania pecked round axes were eventually replaced by the Limhamn axe that appeared around 4500 BC (Sørensen 2007:184). In Finland only knapped axes were used during the early stages of the Mesolithic. In southern Finland axes with completely polished bodies emerged around 6500 BC (Matiskainen 1989:389).

In east central Sweden the situation is not as clear. As was the case in south Scandinavia and along the western coast of Sweden, pecked round axes emerged early on and were made and used for a very long time. At Eklundshov pecked axes from the Middle Mesolithic have been found (Gustafsson *et al.* 2009), while the youngest pecked axes in the region are from the Middle Neolithic. Around 6000 BC an abundance of polished axes with different characteristics began to emerge (Lindgren & Nordqvist 1997). Amongst the earliest examples is an axe dated to 6500 BC from Vittersjö in the province of Gästrikland (Björck *et al.* 2000).

As mentioned earlier, several scholars attempted to construct a typology of greenstone axes during the first half of the twentieth century. In areas where flint does not occur regularly, as is the case in east central Sweden, the establishment of an axe typology promised the possibility of reconstructing colonization processes and the expansion of settlement patterns during the Stone Age. Early research into the Stone Age of the region was not aware of the early time point of its colonization and as a consequence axes that looked like they were from the Late Stone Age, with features such as narrow sides or completely polished bodies, were classified as local variations of Neolithic axes – axes that we know today are from the Mesolithic.

One of the assumptions of early scholars was that changes in the ways axes were made supposedly represented some kind of cultural development (Ekholm 1915). Polishing was in this case believed to be a younger trait and an example of technological progress. However, as we have already discussed, every technique used in making a greenstone axe – knapping, pecking and polishing – was already in use when the oldest, pecked, round axes were made in the region, albeit that polishing was confined to the axes edges.

The advent of greenstone axes with more or less completely polished bodies should not be considered a transitional type that eventu-

ally ended up becoming a polished Neolithic type, as we now know that these axes were of a considerable age. Differences in appearance do not reflect different levels of technological know-how, but rather divergent aesthetic or functional considerations.

What happened during the later stages of the Mesolithic in east central Sweden is that axe-smiths began using established techniques to make a range of axes with varying appearances in a manner that clearly separates this region from the surrounding areas.

A MIXTURE OF SHAPES

A general characteristic of Late Mesolithic greenstone axes from east central Sweden is thus their diversified appearance. The same cannot be said of axes from surrounding regions, like the Limhamn or the Lihult axe, which are valid chronological types.

If we consider a selection of greenstone axes from southern Södertörn, like those in figure 3, it becomes clear that their heterogeneous appearance is not a question of chronology. Instead axes of the same age are inherently different.

In figure 3, the upper three objects are axe preforms. The uppermost is an example of how a preform for a “classic” pecked axe with a rounded oval cross section looks. Below the preforms are two completely polished axes. To the right is an axe that has been knapped and partly pecked. Polishing has been carried out along its edge as well as in uneven intervals over its body.

Different parts of a single axe are usually worked in different ways. The broad sides can be polished on one side and pecked on the other. In other instances the same broad side can be polished in one area and pecked in another. The axes butts were given different shapes, some only knapped, others rounded or pointed. The cross section of the axes often diverges at different points of the body. The same axe can be faceted on one narrow side and round or flat on the other. Axes with a totally asymmetrical cross section are common.

Certainly, some of the different traits can be explained as functional, but at the same time it is clear that the notion “form follows function” is not valid as there appears to be so many forms and not enough known functions. Another possibility is that the mixture of shapes could be an effect of how the axes were used and progressively worn down throughout their lifespan, a notion, however, that is somewhat contradicted by the circumstance that even the largest axes have very

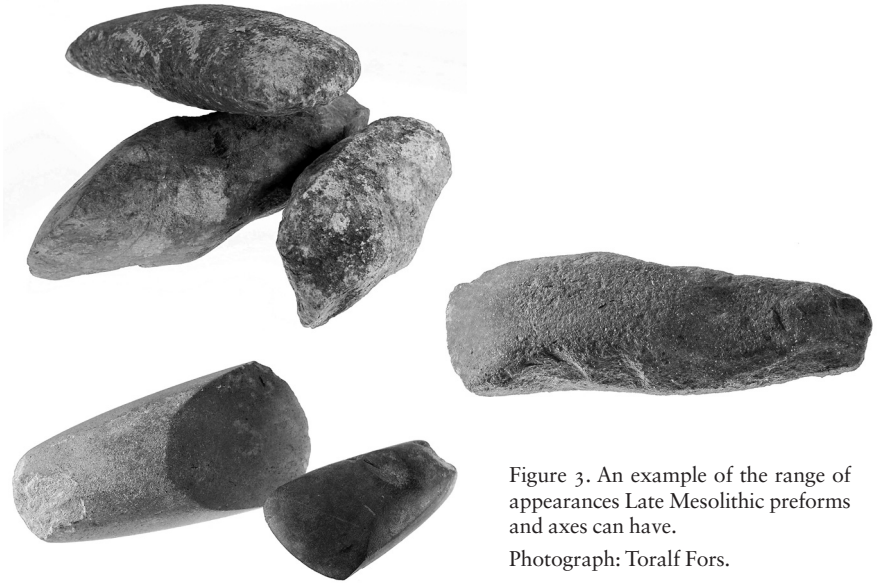


Figure 3. An example of the range of appearances Late Mesolithic preforms and axes can have.
Photograph: Toralf Fors.

different shapes. Another way of explaining the axes' heterogeneity needs to be proposed.

Greenstone was the most common material used for making axes in Södertörn. It was, however, not the only material. Axes made out of other sorts of stone have been found as is the case with assemblages from the site of Jordbro industriområde, kept at the Museum of National Antiquities in Stockholm. An impression of individual difference is in this case strengthened by the choice of a variety of raw materials.

The playful shaping of axes made and used in the Late Mesolithic archipelago corresponds to the situation at Motala on the Mesolithic mainland. No two axes appeared the same, but were rather inherently unique. Tom Carlsson (2007:185) explains the variation by stating that stone-smiths seem to have been concerned with emphasizing the colours, patterns, and other essential qualities previously concealed within the stone.

It appears to be the case that axe makers during the Late Mesolithic were not primarily following a predetermined reduction process of a kind that is recognizable in many Neolithic materials. The creation of Late Mesolithic greenstone axes was governed by a different approach, which is why they were given such diverse appearances.

THE SPATIAL DIMENSIONS OF AXE MAKING

As we have already pointed out, the production of greenstone axes fol-

lowed three general steps: 1) the procurement of raw material; 2) the production of preforms by knapping and pecking; 3) finishing axes by polishing.

During the winter of 2008 we spent a couple of weeks examining assemblages from several Mesolithic sites on northern Södertörn that were stored in the Museum of National Antiquities in Stockholm. It soon became clear that axes had not been produced at every excavated site (also Lindgren & Nordqvist 1997:70). At some sites production was restricted to a certain area (Gustafsson *et al.* 2009). At others production was restricted to certain stages, as is the case at Jordbro industriområde and Jordbromalm where only polishing, and possibly pecking, but no knapping took place. The same pattern was also identified at the nearby site of Lillsjön, which we excavated ourselves in the summer of 2008 (Ahlbeck & Gill 2010).

The analysis of source materials from southern Södertörn tends to confirm this general pattern; that is, when axes were made at a site only certain stages of production usually took place. At Millingsmossen 1 knapping was the only stage identified, while source materials from Lövlund indicate that pecking and polishing were carried out on preforms that clearly had been knapped somewhere else. At Lässmyran 2, knapping, pecking, and polishing took place but hardly any finished or broken axes were found. Complete axes had apparently been removed from the site and put to use elsewhere. In this case the whole site appears to have been a special workshop. Other possible workshops in Södertörn as well as in surrounding regions have previously been identified and described as special “axe sites” (Carlsson 1998:29ff).

Lisseläng 2 is another site where the whole production process was identified, with the exception of quarrying raw material. In this case traces of the production process were spread over the site in an erratic manner, indicating that different stages were not carried out simultaneously but instead at different occasions. Radiocarbon dates from the site indicate that it was used sporadically for hundreds of years (Ahlbeck & Isaksson 2007a:165f).

The tendency towards a spatial separation of production stages has also been identified in the northern parts of the Mesolithic archipelago, as exemplified by the Stormossen sites in the province of Uppland. Here, preforms were knapped at Stormossen 1 while polishing was carried out at Stormossen 4 (Guinard & Vogel 2006:212).

As can be gathered, numerous sites located in an archipelago environment during the Mesolithic have been excavated in the last couple of decades. It has become increasingly clear that sites in the archipelago were similar to each other as well as different. The spatial separation of production stages indicates that these traits have to be understood as part of a mutual process of some kind.

TWO DIFFERENT APPROACHES TO TECHNOLOGY

Sven-Eric Liedman (1997) has described two fundamentally different ways of understanding technology. During Antiquity and the Middle Ages the materials themselves were emphasized. A basic idea was that a certain material contained an inner quality or essence that a skillful craftsman had the ability to call forth. Stone, wood and metal were, just like acorns or seeds, believed to hold their own perfect form within them. Craftsmen and artists were not different professions as is the case today. A good craftsman or artist had the aptitude to realize the ideal form contained in a material.

This understanding of technology differs greatly from a modern approach rooted in Enlightenment ideas. Nowadays technology is more about how tools are used on materials, and how techniques are applied to materials, than about the materials themselves. The notion that a material contains its own inner essence has been abandoned by artists as well as craftsmen (Liedman 1997). Material has become an object with characteristics that science can quantify and calculate. Today, technology emphasizes the abstract principles that govern how objects are made rather than the things or materials themselves. Transferring technological knowledge from one generation to another is about learning a body of more or less theoretical scientific know-how, whereas in the past the passing of knowledge from master to apprentice entailed conveying a sense of the kinds of forms that were present in a raw material as well as ways of bringing them forth.

Both of these approaches can be identified in Scandinavian Stone Age archaeological research. An example of a modernistic approach is Jan Apel's thesis *Daggers, knowledge & power* (2001) in which the manufacture of south Scandinavian flint daggers during the Late Neolithic is probed.

Apel treats technology as a level of knowledge applied to a raw material and explains that knowledge of how to make a dagger was probably restricted to certain groups in society. Making a dagger required

skills that could not be acquired without special training and they might have been taught within systems of apprenticeship.

The production process, from the procurement of raw material at a natural source to the final finishing of a dagger, is claimed to include simple as well as more complicated stages. By means of a spatial analysis Apel argues that production stages of varying difficulty were carried out at different kinds of locations. Simpler stages were carried out at a distance from the settlements whereas more difficult ones were performed in or near the settlements themselves.

In Apel's opinion, the spatial distribution of different stages of production reflects how simpler stages, which were easy to copy, were carried out in locations where it would have been difficult for outsiders to gain insight into the process. On the other hand, stages that were more complicated and almost impossible to copy were performed in more public locations. In this way important technological knowledge could be kept secret. At the same time, the system maximized the prestige of the flint-smiths (Apel 2001).

Jimmy Strassburg's study of south Scandinavian thin-butted flint axes from the Early Neolithic (Strassburg 1998) exemplifies the other approach to technology. Here, technology is understood to be something inseparable from cultural beliefs. The human life cycle from birth to death is used as a metaphor to understand how an axe proceeds from production to disposal. Flint is portrayed as full of life, with inherent qualities. The life of a thin-butted flint axe is followed from its birth in a quarry, through the formative years as a child in the caring hands of a flint-smith, in work as a mature grown-up, until death when it breaks or is discarded. In Strassburg's vision the creation of an axe is more about knowing how to emancipate life from a stone than how to knap flint into a functional tool.

Worth noting is that Strassburg also identifies a spatial distribution of different stages of the axe-making process. This separation is not claimed to reflect an attempt to keep knowledge secret, however. Instead, he presents the idea that people sought to separate a material from other spheres of life because it had inherent qualities regarded as potentially dangerous.

In this case the spatial patterning of different stages of production is interpreted as a reflection of the culture-specific meanings inscribed in stone during the Early Neolithic – understandings that structured how stone itself was handled.

Strassburg's work has connections to a steadily growing field of landscape archaeology where landscape is understood to consist of a palimpsest of places inscribed with special significance. Mountains, rivers, islands and forests – the elements of landscape – are approached as places believed to have been created by the actions of gods or ancestors in a mythological past (Tilley 1994).

Quarries were, in this case, not just sites where important raw materials could be collected, but places where people may have believed something divine had happened in the past. Perhaps it was a mythical event that created the greenstone itself, imbuing it with its essence.

The beach ridge Järavallen in the province of Scania is an example of a natural feature that appears to have been construed in such a way. The beliefs that rendered the ridge comprehensible in the past appear to have affected the way in which flint nodules procured from it were handled (Högberg 2002).

Collecting or quarrying stone from a location enshrouded in mythological beliefs might not have been a straightforward affair at all. If suitable stone for making axes was believed to contain a force of some kind, collecting it as well as working it might have been considered a risky business indeed.

Apel's and Strassburg's studies are examples of two possible ways of approaching the production of greenstone axes during the Late Mesolithic of east central Sweden, and two different ways of interpreting a spatial separation of different production stages. In Apel's case, the basis for his interpretation is presented as the rational decision to use knowledge to gain power. The same kind of division in Strassburg's example is explained by culture-specific beliefs in powers of another kind.

As discussed above, the production of greenstone axes does not appear to have been guided by a formalized template. The apparent absence of a specific set of orderly rules means that the spatial separation of different stages of axe making might not reflect a desire to secretly and jealously guard know-how.

In this case the separation is possibly a reflection of specific beliefs held during the Mesolithic about the properties of stone and how the act of creating axes ought to be handled.

THE ESSENCE OF STONE

Summing up, we want to define a difference between an object's shape and its form. For example, if the shape of a nail was given to it by the

machinery that produced it, its form was already present as a possibility in the iron ore it was made of. Whilst the shape of an oak can hardly be identified in an acorn, its potential form is on the other hand easily recognized. Form is about becoming whereas shape is something created.

So, when archaeological research debates thin-butted Neolithic axes, it is debating the shape that a specific material was given via a *chaîne d'opératoire* geared at producing such a shape. In short, our argument is that the Late Mesolithic axes of east central Sweden did not have a shape – they had a form.

Greenstone was a coveted material during the Mesolithic, with special qualities that allowed it to be formed into a very useful tool. As an axe, greenstone had become a mighty thing. It was powerful enough to rework trees into canoes as well as to take a life. The axe was a catalyst in the transformation of things from one state of being into another.

With its transformative characteristics it acted within two diametrically opposed and possibly dangerous liminal zones. Bringing forth the canoe from its potentiality in the tree, it brought fulfillment. Bringing down a human being, it brought deadly destruction. This is the kind of potential found slumbering in greenstone. It was not only a raw material one could shape into a tool, but also a bringer of life or death waiting to be brought into existence.

A prerequisite when making an axe is to know how to work the stone. If greenstone was believed to have an essence of divine qualities then the ability to transform it into an axe might have involved knowledge of powers of ancestral or mythical provenance. Working forth the form of such powers might have been considered a dangerous endeavor. If this was the case, then the spatial separation of facets of axe production from the settled, or otherwise sensitive, places was probably a sensible thing to do.

Late Mesolithic axes from east central Sweden have different forms. It is very clear that they were not made as copies in accordance with a certain type. If Mesolithic axe makers believed that the material they were working contained a powerful inner essence and a form they were called upon to materialize, then the wide range of different forms becomes clear; it was not up to the smiths themselves to decide what form an axe would have. The form was already present in the stone at hand. It was the notion of a presence already in the stone that guided the axe-smith's hands and choice of techniques, rather than a set of given technological rules.

Indeed, a couple of instances indicating that axes might have been considered objects with special powers rather than mere functional tools have been recorded. At Sjövreten on northern Södertörn, two axes were found deposited in a position next to each other (Welinder 1977). At Lövlund a pair of axes standing side by side was found with the axe blades thrust into the ground (Ahlbeck & Isaksson 2007a:159). At Rudan a single axe was found in a similar circumstance. It also had its blade thrust into the ground (Ahlbeck & Isaksson 2007b). Many axes found on Mesolithic sites throughout the region also appear to have been intentionally broken (Carlsson 1998:32). In Neolithic contexts equivalent actions have been interpreted as attempts to neutralize an axe's power (Karsten 1994:171ff).

This kind of reasoning, that the form of an axe was already a given, seems at first glance to differ from the way in which many Neolithic axes were produced in the region. A Neolithic idiom is, for example, identifiable in the measurements of thin-butted axes, where axe-smiths seem to have been making copies of an already existing shape. However, this kind of reasoning might not have been a Neolithic trait in central Sweden. In a paper explaining how Early Neolithic greenstone axes were made in the region, Lars Sundström and Jan Apel show that they were produced by using a different method than that of the south Scandinavian thin-butted axes of flint (Sundström & Apel 1998).

In the case of south Scandinavian axes, preforms were produced



Figure 4. An early Neolithic axe from Lisseläng 2 made by the double ridge method. The axe was found in a posthole dated to 3800–3460 BC.

Photograph: Toralf Fors.

using a square axe method, whereas in east central Sweden preforms were made using a double ridge method (fig. 4). What thus appears to be the case is that a certain way of producing axes was not imported to east central Sweden at the onset of the Neolithic, but rather a new notion of the possible forms an axe could have. Pecked round axes were made well into the Middle Neolithic in the region, indicating that ideas concerning the essential qualities of stone were not only restricted to the Mesolithic.

In this paper we have presented our understanding of the ideas that guided the creation of greenstone axes. Our conclusion is that people held the belief that greenstone had essential qualities, the material itself being loaded with meaning. Using this approach we can begin to grasp why these axes were given various shapes and why their production sequence tends to be spatially isolated.

Mattias Ahlbeck, Arkeologikonsult,
Box 20, 194 21 Upplands Väsby, Sweden

Alexander Gill, Arkeologikonsult,
Box 20, 194 21 Upplands Väsby, Sweden

References

- Ahlbeck, M. & Gill, A. 2010. *Lillsjön: en senmesolitisk lokal med inslag från neolitikum och äldre järnålder på fastigheten Jordbromalm 4:2*. Särskild arkeologisk undersökning av Raä 233, Österhaninge socken, Haninge kommun, Stockholms län. Rapport från Arkeologikonsult 2010:2197. Upplands Väsby: Arkeologikonsult.
- Ahlbeck, M. & Isaksson, M. 2007a. *Riksväg 73. Slutundersökningar Raä 661, 663, 664, 665 och 666, Ösmo sn, Södermanland*. Särskilda arkeologiska undersökningar längs Riksväg 73, Överfors-Västnora. Rapport från Arkeologikonsult 2007:2037. Upplands Väsby: Arkeologikonsult.
- Ahlbeck, M. & Isaksson, M. 2007b. *Rudan 1:2. Arkeologiska förundersökningar av stenåldersboplatserna Raä 263, 264, 590:1 och 590:2, Österhaninge sn, Södermanland*. Rapport från Arkeologikonsult 2007:260. Upplands Väsby: Arkeologikonsult.
- Ahlbeck, M., Isaksson, M., Fors, T. & Risberg, J. 2005. *Riksväg 73. Förundersökningar Överfors – Västnora*. Rapport från Arkeologikonsult 2005:1091. Upplands Väsby: Arkeologikonsult.
- Alsaker, S. 1987. *Bomlo – Steinalderens råstoffsentrum på Sorvestlandet*. Bergen: Historiskt museum.
- Apel, J. 2001. *Daggers, Knowledge & Power. The Social Aspects of Flint-Dagger Technology in Scandinavia 2350–1500 cal BC*. Uppsala: Department of Archaeology and Ancient History.

- Barndon, R. 2005a. Sparks of Life. The Concept of Fire in Iron Working. *Current Swedish Archaeology*. Vol. 13. Pp. 39–57.
- Barndon, R. 2005b. Metall og myter – magi og transformasjon. Refleksjoner omkring den norrøne smedens kunnskap og identitet i et komparativt perspektiv. *Primitive tider*. Vol. 8. Pp. 61–75.
- Bergstøl, J. 2002. Iron Technology and Magic in Iron Age Norway. In: Ottway, B. S. & Wager, E. C. (Eds). *Metals and Society. Papers from a session held at the European Association of Archaeologists Sixth Annual Meeting in Lisbon 2000*. Pp. 77–82. BAR International Series 1061. Oxford: Archaeopress.
- Björck, M., Björck, N. & Martinelle, K. 2000. *Vittersjö. En mesolitisk boplats. Arkeologisk undersökning Raä 65, Ockenbo socken, Gästrikland 1994 och 1995*. Rapport Länsmuseet Gävleborg 1999:09. Gävle: Länsmuseet Gävleborg.
- Brøgger, A.W. 1906. *Studier over Norges stenalder*. Christiania: Videnskapselskabet skrifter.
- Burström, M. 1990. Järnframställning och gravritual. En strukturalistisk tolkning av järnslag i vikingatida gravar i Gästrikland. *Fornvännen*. Vol. 85. Pp. 261–271.
- Callahan, E. 1987. *An evaluation of the lithic technology in Middle Sweden during the Mesolithic and Neolithic*. Uppsala: Department of Archaeology and Ancient History.
- Callahan, E. Forsberg, L., Knutsson, K., & Lindgren, C. 1992. Fakturbilder. Kulturhistoriska kommentarer till det säregna sönderfallet vid bearbetning av kvarts. *Tor*. Vol. 24. Pp. 27–63.
- Carlsson, A. 1998. *Tolkande arkeologi och svensk forntidshistoria. Stenåldern*. Stockholm: Department of Archaeology, Stockholm University.
- Carlsson, T. 2007. *Mesolitiska möten. Strandvägen, en senmesolitisk boplats vid Motala ström*. Lund: Lund University.
- Dobres, M-A. 2000. *Technology and social agency: outlining a practice framework for archaeology*. Oxford: Blackwell.
- Ekholm, G. 1915. *Studier i Upplands bebyggelsehistoria*. 1. *Stenåldern*. Uppsala: Filosofiska fakulteten i Uppsala.
- Florin, S. 1944. Stenåldersbebyggelsen i östra Södermanland. *Sörmlandsbygden*. Vol. 13. Pp. 33–48.
- Gansum, T. 2004. Role the Bone – from Iron to Steel. *Norwegian Archaeological Review*. Vol. 37. Pp. 41–57.
- Glørstad, H. 2004. Kronologiske resultater fra Svinesundprosjektet. In: Glørstad, H. (Ed.). *Oppsummering av Svinesundprosjektet. Bind 4*. Pp. 21–46. Oslo: Universitetets kulturhistoriske museer.
- Goldhahn, J. & Østigård, T. 2007. *Rituelle spesialister i bronse- og jernaldern*. 2. *Transformatoren: Ildens mester i jernalderen*. Göteborg: Institutionen för arkeologi.
- Guinard, M. & Vogel, P. (Eds.) 2006. *Stormossen. Ett senmesolitiskt boplatsskomplex i den yttre uppländska skärgården*. SAU Skrifter 20. Uppsala: Societas archaeologica Uppsaliensis.
- Gustafsson, P., Lindgren, C., Risberg, J. & Karlsson, S. 2009. The Eklundshov Site. In: Åkerlund, A., Olson, E., Gustafsson, P. & Miller, U. (Eds.) *Södertörn Interdisciplinary Investigations of Stone Age Sites in Eastern Middle Sweden*. Pp. 1–111. Stockholm: Riksantikvarieämbetet.
- Haaland, R. 2004. Technology, Transformation and Symbolism: Ethnographic Perspectives on European Iron Working. *Norwegian Archaeological Review*. Vol. 37. Pp. 1–19.

- Hermansson, R. & Welinder, S. 1997. *Norra Europas trindyxor*. Östersund: Mitt-högskolan.
- Högberg, A. 2002. Production Sites on the Beach Ridge of Järavallen. Aspects on Tool Preforms, Action, Technology, Ritual and the Continuity of Place. *Current Swedish Archaeology*. Vol 10. Pp. 137–162.
- Ingold, T. 2007. Materials against materiality. *Archaeological Dialogues*. Vol 14. Pp. 1–16.
- Jaksland, L. 2002. Berget 1 – en senmesolitisk boplass med hyttetuft. In: Glørstad, H. (Ed.). *Svinesundprosjektet*. Bind 1. Utgravninger avsluttet i 2001. Pp. 35–72. Oslo: Universitetets kulturhistoriske museer.
- Johnsen, B. & Welinder, S. 1980. Ett neolitiskt stenbrott i Kilsbergen. *Från Bergslag till bondebygd*. Vol 34. Pp. 158–161.
- Kars, E., Olsson, E. & Kars, H. 2009. Greenstone Axes – Local Manufacture or Import? In: Åkerlund, A., Olson, E., Gustafsson, P. & Miller, U. (Eds.) *Södertörn Interdisciplinary Investigations of Stone Age Sites in Eastern Middle Sweden*. Pp. 1–53. Stockholm: Riksantikvarieämbetet.
- Karsten, P. 1994. *Att kasta yxan i sjön: en studie över rituell tradition och förändring utifrån skånska neolitiska offerfynd*. Stockholm: Almqvist & Wiksell International.
- Knutsson, K. 1988. *Making and using stone tools: the analysis of the lithic assemblages from Middle Neolithic sites with flint in Västerbotten, northern Sweden*. Uppsala: Societas archaeologica uppsaliensis: Department of archaeology.
- Lemonnier, P. 1986. The Study of Material Culture Today: Toward an Anthropological theory of Technical Systems. *Journal of Anthropological Archaeology*. Vol. 5. Pp. 147–186.
- Lemonnier, P. 1992. Introduction. In: Lemonnier (Ed.). *Technological choices: Transformation in material cultures since the Neolithic*. Pp. 1–35. London: Routledge.
- Lidén, O. 1938. *Sydsvensk stenålder belyst av fynden på boplatserna i Jonstorp. 1. Skivyxekulturen*. Lund.
- Liedman, S-E. 1997. *I skuggan av framtiden. Modernitetens idéhistoria*. Stockholm: Bonnier.
- Lindgren, C. & Nordqvist, B. 1997. Lihultyxor och trindyxor – om yxor av basiska bergarter i östra och västra Sverige under mesolitikum. In: Larsson, M. & Olsson, E. (Eds.). *Regionalt och interregionalt. Stenåldersundersökningar i Syd- och Mellansverige*. Pp. 57–72. Stockholm: Riksantikvarieämbetet.
- Matiskainen, H. 1989. The Chronology of the Finnish Mesolithic. In: Bonsall, C. (Ed.). *The Mesolithic in Europe, III International Mesolithic Symposium*. Pp. 379–390. Edinburgh: John Donald Publishers Limited.
- Núñez, M. 1998: Slates, the “plastics” of Stone Age Finland. In: Holm, L. & Knutsson, K. (Eds.). *Proceedings from the Third Flint Alternatives Conference at Uppsala*. Pp. 105–124. Uppsala: Department of Archaeology and Ancient History.
- Pétrequin, P. & Pétrequin, A.M. 1993. *Écologie d'un outil: la hache de pierre en Irian Jaya (Indonésie)*. Paris: Centre de Recherches Archéologiques.
- Pfaffenberger, B. 1988. Fetishised objects and humanised nature: towards an anthropology of technology. *Man*. Vol. 23. Pp. 236–252.
- Pfaffenberger, B. 1992. Social Anthropology of Technology. *Annual Review of Anthropology*. Vol. 21. Pp. 491–516.
- Rønne, O. 2002. Smeden i jernalder – ildens hersker. *Primitive tider*. Vol. 5. Pp. 55–63.

- Sørensen, S. 2007. Limhamn axes in Denmark. In: Hård, B., Jennbert, K. & Olausson, D. (Eds.). *On the Road: Studies in Honour of Lars Larsson*. Pp. 184–187. Stockholm: Almqvist & Wiksell International.
- Strassburg, J. 1998. Let the “Axe” Go! Mapping the Meaningful Spectrum of the “Thin-Butted Flint Axe”. In: Andersson, A.C., Gillberg, Å., Jensen, O.W., Karlsson, H., Rolöf, M.V. (Eds.) *The Kaleidoscopic Past*. Pp. 184–187. Göteborg: Department of Archaeology.
- Sundström, L. & Apel, J. 1998. An Early Neolithic axe production and distribution system within a semi-sedentary farming society in Eastern Central Sweden, c. 3500 BC. In: Holm, L. & Knutsson, K. (Eds.). *Proceedings from the Third Flint Alternatives Conference at Uppsala*. Pp. 155–192. Uppsala: Department of Archaeology and Ancient History.
- Tilley, C. 1994. *A Phenomenology of Landscape: places, paths and monuments*. Oxford: Berg.
- Tilley, C. 1999. *Metaphor and Material Culture*. Oxford: Blackwell.
- Welinder, S. 1977. *The Mesolithic Stone Age of Eastern Middle Sweden*. Stockholm: Antikvariskt arkiv. Kungl. vitterhets och antikvitets akademien.
- Welinder, S. 1985. *Tunnackiga stenyxor och samhälle i Mellansverige 5000 B.P.* Oslo: Universitetets Oldsaksamling.
- Åberg, N. 1912. *Studier öfver den yngre stenåldern i Norden och Västeuropa*. Uppsala: Akademiska bokhandeln.