

Indigenous and imported Viking Age weapons in Norway – a problem with European implications

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The numerous Viking Age swords and spearheads found in Norway are a mixture of indigenous and imported items, but sound criteria for distinguishing between the two origins are lacking. While Petersen's and other sword typologies are based on the hilts, the debate has mostly been centred on whether Nordic blacksmiths mastered the pattern-welding technique. Spearheads have played a minor role, and scholars have accepted without further debate that the inlay decorations on sword hilts and spearhead sockets were indigenously made. Recent investigations into Norwegian spearheads point to marked technical differences between imported and indigenous specimens of Petersen's types A–E. Future research will have to take both swords and spearheads into account, and it will be necessary to study the blade construction as a whole, including forging techniques and the steel qualities used, by means of radiography and metallographic investigations. It will also be important to focus on indigenous societal premises for special weapon production.

Keywords: swords and spearheads, indigenous technical skills

Introduction

The question of the origins of ancient weapons has interested Norwegian archaeologists for more than one hundred years, but the basic problems are still unsolved. There are several reasons for this, perhaps the most important of which is the lack of sound criteria on which to base a judgment.

Both swords and spearheads were imported into Norway, while other kinds of weapons, i.e. axes, umbones and arrowheads were indigenous products. The swords have always attracted more interest among scholars than the spearheads, and the two are rarely treated together, although to my mind it would seem necessary to take both into account, i.e. to look for similarities and differences in distribution and technical features. Solberg's investigations into Norwegian spearheads have strongly emphasised this point (Solberg 1984; 1991).

I have not carried out any detailed studies of the weapons, and it is not my intention here to discuss all the relevant types, but rather to scrutinize the argu-

ments used and look for others which I hope can carry the discussion forward.

The production of swords and spearheads involved advanced techniques such as pattern-welding and inlay/incrustation of other metals on the sword hilts and spearhead sockets. There has never been any doubt that highly specialized weapon production took place in continental smithies, but opinions have differed widely on how widespread the pattern-welding technique was in the Nordic countries, and the societal premises for such specialized production have hardly been discussed at all. The problems of how and when advanced techniques spread to these countries involve many interesting questions, however, and as long as places of production of many weapon types, some of them fairly numerous ones, remain uncertain, they cannot seriously be taken into account when discussing trade and other relations between the Nordic countries, the continent and the British Isles.

Although the Viking Age is usually treated as a uniform entity, probably important changes in societal

premises and in foreign contacts make it highly probable that new techniques were adopted and spread within the Nordic countries during that period.

Weapons were no doubt produced by a number of Norwegian blacksmiths living and working in many parts of the country, and one can expect that their skills varied a great deal. One cannot just say that either the Norwegian blacksmiths mastered pattern-welding, for example, or they did not. Solberg's opinion is that the pattern-welded spearheads with herring-bone or rosette-patterns belonging to her type-group VI were manufactured in highly specialized workshops, but she does not define what she means by that (Solberg 1991:256). Did these specialized workshops exist in Norway and /or in the other Nordic countries, and if

so, when, where and how were they established? Had specialized techniques spread to a greater number of blacksmiths? The Norwegian smiths must at least have been well informed about European weapon fashions, even though some of Petersen's hilt types, e.g. type G or the special type 5, may have been designed by inventive Norwegian blacksmiths. It is high time to ask more precise questions concerning both production of weapons and the methods by which the above questions can be solved.

The Norwegian finds

Norway has a far greater number of preserved Viking Age weapons than any other European country, and this is also the case with many sword and spearhead

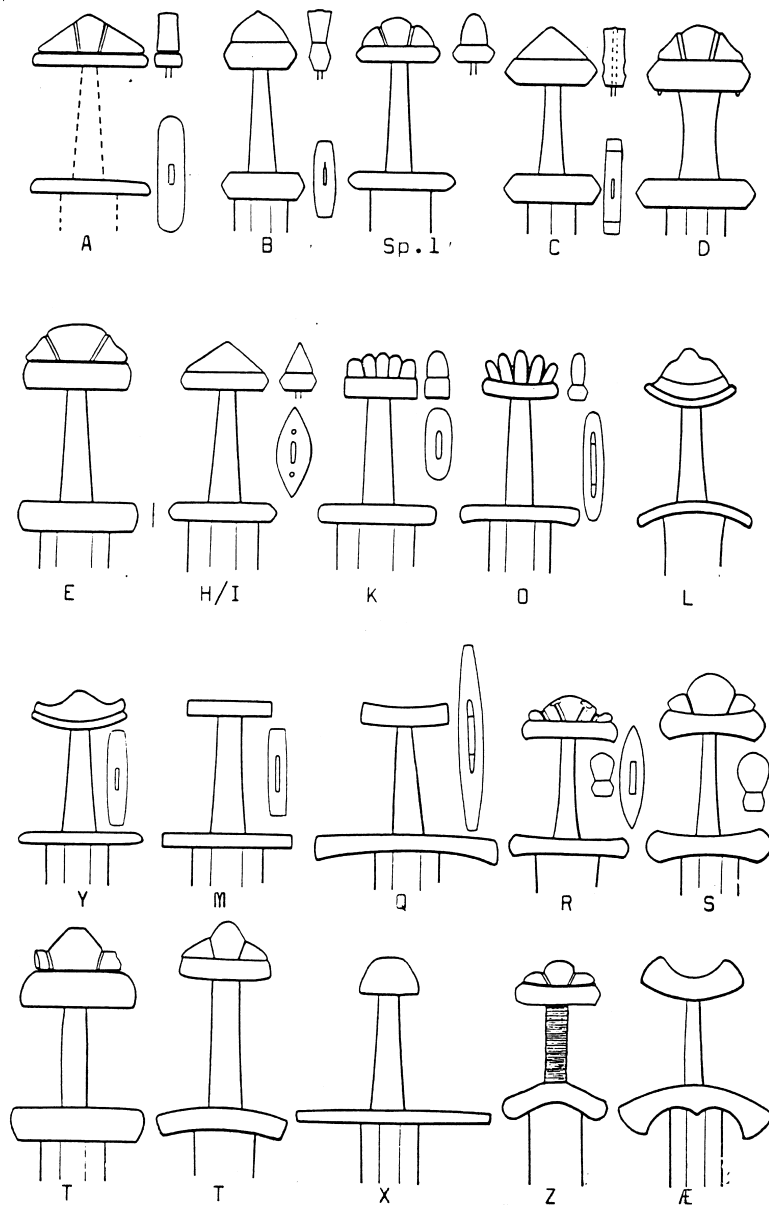


Figure 1. The majority of Petersen's sword types (after Nordman 1943).

types of indisputable continental or Anglo-Saxon origin. Petersen (1919) lists 1773 swords found in Norway, and although no up to date figure is available, it must have increased by more than 50%, with new items coming to light every year (for a more recent estimate, see Jacobsson 1992, although his figures are similarly no longer up to date). A number approaching 3000 would probably not be an over-estimate.

Petersen does not give any figure for spearheads, but my own tests have shown that swords and spearheads occur in fairly equal numbers. Because of their size, however, the swords are more easily found by chance, and thus it is interesting to note that equality in numbers even occurs in excavated material.

The known weapons are partly grave finds and partly stray finds, while other contexts are rare. River finds are unknown in Norway. Stray finds are generally assumed to stem from destroyed graves. The weapons are found in all parts of the country as far north as Norse settlement extended, and this holds true even for weapons of indisputable foreign manufacture.

Norway undoubtedly had an indigenous weapon production before the Viking Age. Solberg has shown that some spearhead types from the previous period were unique to Norway, and radiographs of these show no signs of advanced smithing techniques. No such analyses have been carried out on the Norwegian single-edged swords from the 8th. century, but a recent investigation into Danish swords of the same types revealed no instances of pattern-welding (Nørgård Jørgensen 1999:46), so that there is no indication that this was practised by Norwegian weapon smiths at the beginning of the Viking Age. Single-edged swords continued to be used in Norway during the Viking Age, but they were supplied with iron hilts. Petersen states that more than 20% of the swords are single-edged.

Petersen's typology and later systems – general remarks

Petersen divided the swords into 26 types, designated A–Æ, together with 20 special types with only few specimens each (Fig. 1), and the spearheads into twelve types, A–M. These typologies are still widely used in spite of their deficiencies, and supplements and subdivisions, especially for the early Carolingian sword types, are generally accepted. Geibig, in his important publication on swords discovered in the area of the former Bundesrepublik Deutschland, presented a new, detailed element-based typology that differs from Petersen's on several important points (Geibig 1991).

There are obstacles to taking Geibig's typology into general use, however, not least in that many of Petersen's types, among them interesting ones such as types D and E, T and Z, are not included. I prefer to use Petersen's typology here, but will add Geibig's combination types when appropriate. I shall also refer to Geibig (1991) for the history of research into this topic.

Petersen's sword typology was based on the hilts, which show a much greater variety than the blades. He found a direct, but often interrupted typological development, which was susceptible to cross-influences. Some hilt types such as D and L he stated definitely to be of foreign origin, and his claim that the L type was Anglo-Saxon is generally accepted. He similarly states that the K type is certainly not of Norwegian or Nordic origin, referring to the Gravrak sword as definite proof (Petersen 1919:108, see also Müller-Wille 1982). Several foreign types were evidently introduced in the 10th century, most notably the O, R and S types, the latter being imitated in Norway.

Petersen put forward several arguments to support his opinions. In some cases foreign types were identified on the basis of the hilts themselves, supplemented with observations that they always have two-edged blades, or that the blades are often pattern-welded or have inscriptions, both *ULFBERHT* and others. These blade properties were for him evidence of importation (Fig. 2). He also referred to finds made outside Norway, at least for some types.

One feature which he never really discussed was hilt decorations, in which inlays with geometric or other patterns played a dominant part. He believed that these decorations were made by indigenous blacksmiths, and in his treatment of the H type, the most numerous type of all in Norway, he even suggests that decorated, home-made hilts were placed on imported, pattern-welded blades (Petersen 1919:205). He was thus fully aware that hilts and blades could be made in different places and that both parts could be replaced secondarily, but this important point was difficult for him to cope with, as it has been for other scholars occupied with Viking Age swords.

Another point of interest is illustrated by his types B and C, which are of the same shape, the difference being that the pommel and pommel guard are made in two pieces in the B type but in one piece in the C type. Both are undecorated except for simple grooves. The B type (divided into several variants by Geibig) is not a Norwegian model, and most of the blades are two-edged, whereas the C type was home-made and single-edged blades predominated. These types, which go

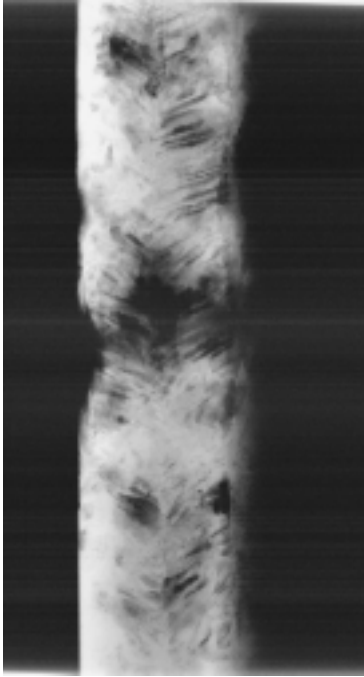


Figure 2. A single-edged pattern-welded sword of type C. Photo: Universitetets kulturhistoriske museer.

back to around 800 AD, prove that originally foreign types were adopted and produced by Norwegian blacksmiths right from the beginning of the Viking Age. One important question thus arises: Are there differences in blade properties between the two origins?

The same arguments have been used by later scholars, to reach varying conclusions. Arbman (1937) follows Petersen in seeing blades with pattern-welding and inscriptions as imports into the Nordic countries, while several others have claimed that Nordic blacksmiths could very well have mastered pattern-welding (Blindheim & Heyerdahl-Larsen 1999:87ff with ref.). The problem is that it is difficult to find objective criteria and that their place has been taken by beliefs, with an underlying, but not overtly expressed, element of wishful thinking. One point in favour of a wide-spread mastery of pattern-welding is that radiographs and modern conservation methods have revealed that a much larger percentage of sword blades than can be observed by the naked eye are pattern-welded. The same goes for inscriptions and special marks on the blades, and as Müller-Wille has demonstrated, many of them are misspelt, have letters placed upside down or possess other features indicating that they were imitated outside the original smithies (Müller-Wille 1970). Several items with letter-like signs were probably made in Northern

Europe (Kirpichnikov & Stalsberg 1998:512). The Norwegian blacksmith K. Andresen (1993) has demonstrated that inscriptions are not difficult to make. The letters or signs can be hammered into hot metal without making grooves beforehand.

Inscriptions are generally interpreted as quality marks. They have a direct, obvious function as status markers, but the quality of a sword blade depends on its composition as a whole, not least on the edges. Only a few metallographic investigations have been carried out on inscribed sword blades, and the necessity of such investigations should be stressed.

The European distribution of Viking Age weapons forms another great obstacle to research into the actual problems, and is by no means an unimportant matter. The distribution reflects above all the regions where burial practices still demanded that weapons should be deposited in graves, and that means above all the regions that lay outside the Christian areas of Central Europe and the British Isles. There are great differences in the frequencies of deposition of weapons in graves between the regions where this was practised, however, weapons being rare in Danish graves, for example. Pedersen reckons that there are about 75 Danish graves with swords or information about swords, the majority being of 10th century types (Pedersen 1997:175).

The number of finds, even of types produced in the Frankish empire, is small in the production areas, and many are river finds. These have often been associated with Viking raids and skirmishes, but this is no longer tenable, as many were found in places to which the Vikings never came, or at fords and river crossings which were used for many centuries (Geibig 1991:179). Weapons found in Viking graves in western Europe, e.g. the graves of the Kilmainham and Island Bridge burial grounds in Dublin, are of little value as far as the determination of their places of production is concerned.

One group of sword types which poses few problems in a survey like this, apart from pinpointing the production sites, are the early Carolingian ones. These swords are of excellent workmanship and have fine inlay decorations on the hilts, including majuscular inscriptions with Christian meanings, e.g. *BENEDICTUS*, and many have pattern-welded blades. The earliest *ULFBERHT* inscriptions are also to be found on these swords. These types were made within the Frankish empire, probably somewhere in Niederfranken. Although restricted in number, they have a very wide distribution in Europe, stretching from the Nordic countries down to Croatia (see the lists of finds in Müller-

Wille 1982). Detailed information on their technical qualities would be of great interest for future studies, however. As they represent the introduction of two-edged swords with iron hilts into Norway, their influence on Norwegian weapons is important. I shall not discuss these types any further, but will use another, more numerous type, Petersen's type H/I (Geibig's combination type 5 I), to scrutinize some points that illustrate how complicated these problems are. The H type came into production before 800 AD, and the two closely related types cover the whole 9th century and the beginning of the 10th.

These types, the H type by far outnumbering the I type, are the most numerous not only in Norway but also in Sweden and Finland. Exact numbers are not available for any of the three countries, but the minimum figures are 350, approx. 240 (Androshchuk 2004) and 60, respectively.

Petersen "cannot conclude otherwise than by taking it for an indigenous type, even though some of the blades were probably of foreign make" (Petersen 1919:101, my translation). Indirectly, one gains the impression that the great number made it difficult to believe that they were all imported. Another point was the high percentage of single-edged blades. As mentioned above, Petersen was aware that blades and hilts could be made separately.

Arbman (1937:223) took the H type to be Frankish, but in his posthumous paper on French weapons published in 1969 (Arbman & Nilsson 1969) he held it to be Nordic, because the finest metal inlays on the hilts are found in the Nordic countries. As late as 1999 Blindheim stated that it is preferably to be regarded as an indigenous type (Blindheim & Heyerdahl-Larsen 1999:86–87). Geibig points to the small number of H/I types found in the territory of the former Bundesrepublik Deutschland, and thus he finds more comprehensive Frankish production improbable. He concludes that production was mainly carried out in Scandinavia, but that the type was modelled on continental items such as the Joshofen sword that represents his combination type 5 II (Geibig 1991:165).

I regard it as beyond doubt that the H type is of continental origin. The question is whether all the examples were imported into the Nordic countries or whether copies were made here, and if the latter was the case, what was the ratio between imported and indigenous swords? The many Norwegian single-edged swords, some of which are pattern-welded, are of special interest. Geibig found German swords in which the split in the underside of the lower guard does not correspond to the blade going into it, and he sees this

as an indication that the two parts were fitted together secondarily (Geibig 1991:95). I would find it very interesting to study such details on Norwegian swords, and the H/I swords stand out as being of special interest in this respect.

Spearheads

Before going on to discuss the swords further, we should turn our attention for a moment to the spearheads. Here I shall rely heavily on Solberg's investigations into the Norwegian examples (Solberg 1984; 1991). She had radiographs taken of a great number of spearheads, and this in combination with a new, detailed typology and a firmer theoretical basis, led to remarkable results that are relevant to the discussion on swords as well.

Pattern-welded blades have, of course, been an important criterion for import, and have been used and interpreted in the same way as for the swords by several scholars. Arbman saw lugs on the sockets as an indisputable Frankish feature, an assumption that seems to rest on the wide European distribution of such spearheads (Arbman 1937:233).

Solberg studied the European distribution of all her spearhead types, and used the combinations of spearhead finds in the Norwegian material that she studied. One very important group is her type-group VI, corresponding to Petersen's types A–E (Petersen 1919:figs. 7–13, except for fig. 11). Solberg subdivides type-group VI into four types which are further subdivided into A and B + 4C, where A and C are without lugs and B has lugs on the socket. The division 1–4 is based on proportion elements and the transverse section between the socket and blade (Solberg 1991:244–46).

The results of the radiographs of 279 spearheads were astonishing, as it turned out that some of her sub-types had very high frequencies of pattern-welded blades while others had very low frequencies (Fig. 3), and another difference appeared in that the non-pattern-welded sub-types showed a greater variation in proportion elements, indicating more widespread production by local blacksmiths. There was no difference in proportions between the specimens with and without lugs on the socket.

She even found differences in distribution, both in Norway and in Europe, The frequently pattern-welded sub-types being found to a great extent in the coastal areas in Norway and also having a wide distribution in Europe, whereas the others predominate inland and are rarely found outside Norway. She even found divergencies in the combinations of finds, in

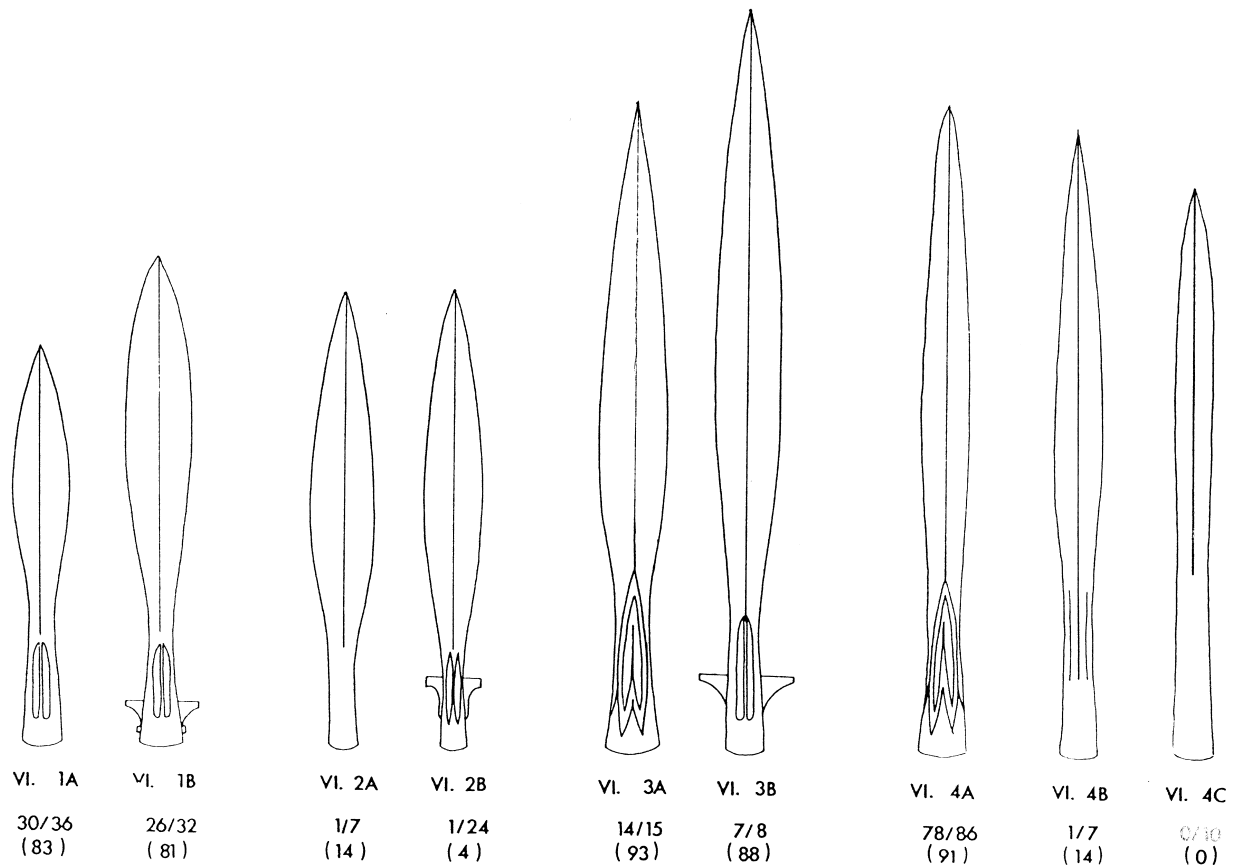


Figure 3. Sub-types of spearheads of type-group VI (Petersen's types A–E) and percentages of pattern-welded specimens among those examined by radiography (after Solberg 1991).

that the pattern-welded types were often found in combination with imported objects, including swords, while the others mostly occurred with swords of indigenous make. She includes Petersen's types B, H, I, K and X and special type 7 among the imported swords (Solberg 1991: notes 23 and 47).

Solberg's conclusions are clear: "The marked similarity between the Nordic and the Continental spearheads of the types VI.1 and VI.3 and sub-type VI.4A indicates a centralized production area. This is further supported by the wide European distribution of these weapons. The marked location in the Nordic countries to the trade routes, i.e. coastal areas indicates import to these countries. The distribution of these spearheads is similar to that of the swords of Frankish manufacture, pointing to the Frankish empire as the production area. This is further supported by historical and linguistic sources." (Solberg 1991:256)

Westphal, on the other hand, points to differences in pattern-welding technique which make him conclude that these spearheads were of Norwegian make

(Westphal 2002:262). I find his conclusions premature. The spearheads in question have a wider distribution in western Europe than the regions covered by his investigations. Thus one cannot exclude the possibility that the Norwegian specimens originated from other areas, and Swedish and Finnish spearheads must certainly be taken into account.

Type-group VI covers a long period. VI.1 goes back to the middle or later part of the 8th century, while the latest sub-type was still in use at the beginning of the 10th century. Even considering this long time-span, the number of spearheads most probably imported into Norway is astonishingly high. In addition, two important counties, Vestfold and Rogaland, which generally have a high incidence of imports, are not included in Solberg's investigations.

One other type of spearhead apart from type-group VI, namely Petersen's type F (Solberg's type VII.1A), came into use in the 9th century. There are numerous examples of this type, but it has rarely been recorded outside Norway, and only two out of 119 specimens

are pattern-welded. The proportional elements are heterogeneous, indicating a number of manufacturers (Solberg 1984:169). VII 1A is obviously an indigenous type, thus underlining the fact that the difference between spearheads made by plain and specialized techniques most probably corresponds to that between indigenous and imported weapons respectively.

Some preliminary conclusions and new questions

These conclusions are, of course, relevant to the parallel discussion on swords. I find it unlikely that pattern-welding was carried out by indigenous blacksmiths on sword blades but not on spearheads. Thus the chances that a large number of pattern-welded sword blades were imported into Norway and the other Nordic countries are great, but I hesitate at accepting that pattern-welding was not carried out at all in the Nordic countries in the 9th and early 10th centuries. A few spearheads of indigenous types and single-edged sword blades are pattern-welded, one example being the C-type sword in Fig. 2. Although no comprehensive studies parallel to Solberg's, including radiographs, have been carried out on Norwegian swords, there are good reasons to believe that pattern-welding occurred sporadically on numerous indigenous sword-types such as C and M. One cannot exclude the possibility that a very limited number of blacksmiths in 9th century Norway, perhaps working on farms belonging to the king or his chieftains, mastered pattern-welding without this speciality spreading to the greater number of blacksmiths working elsewhere in the country.

Another important point concerns smithing techniques and blade properties. Radiographs reveal only certain major features, while more details are observable by other methods, especially metallography. This is a far more demanding method, however, which can only be carried out on a limited number of objects. It is indeed an indispensable supplement to radiography and is necessary in order to study other significant differences in blade properties, not only between pattern-welded and non-pattern-welded blades, but also regarding steel qualities, for instance.

In addition, Solberg's results on distribution are important and are paralleled by the distribution of swords. The common Norwegian sword types, such as C, M and Q, are rarely found outside Norway, and even the Swedish specimens are very few in number. This is an indication that the types that are widely distributed in Europe were probably of non-Norwegian origin, but it does not mean that they were not copied

indigenously. The numerous Norwegian types never have hilt decorations other than simple lines.

Hilt decorations

I find it very unsatisfactory that, without any further discussion, it has been taken for granted that all the fine inlay decorations on sword hilts, e.g. on the H type, represent indigenous work (Fig. 4). It is true that inlay decorations that were probably Nordic work are known from the early Merovingian Period (Holmqvist 1951), but they are coarser, and there is no continuity through the 7th and 8th centuries in either Norway or Sweden (B. Arrhenius, pers. comm. regarding Sweden). On the other hand, decorations of this kind, which are technically advanced and employ a variety of patterns, are frequently found on early Carolingian swords of continental manufacture. There are good reasons to question whether such decorations were produced in the Nordic countries at the beginning of the Viking Age. One should rather ask when and how the fine inlay technique was taken up in these countries.

I shall point to one object of interest, rattle No. 139

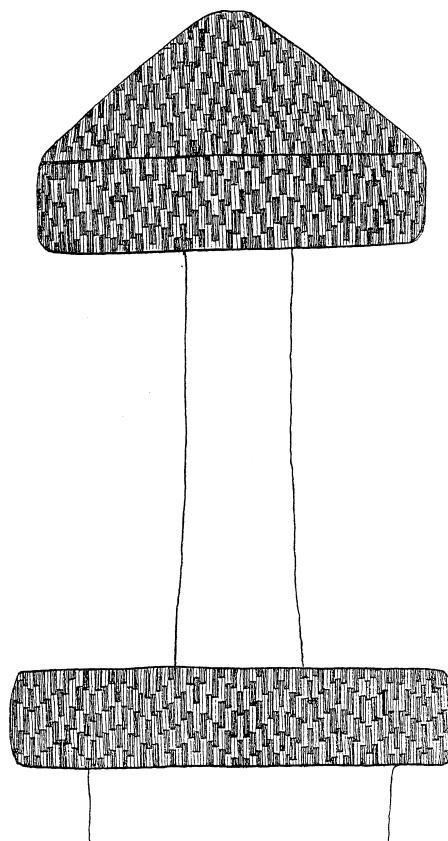


Figure 4. A sword hilt of type H with inlay decorations.

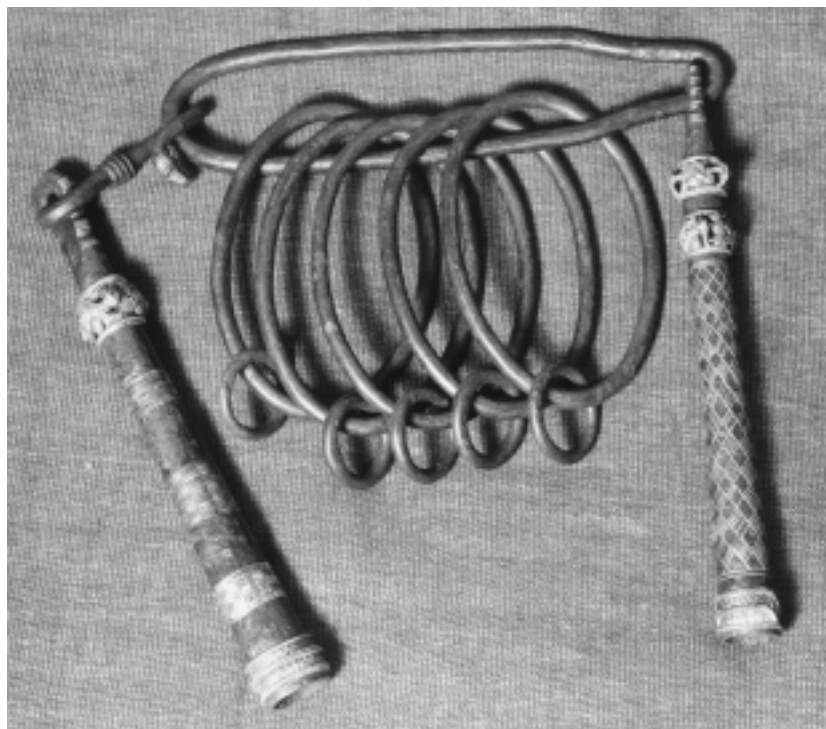


Figure 5. The decorated rattle shaft socket and hook from the Oseberg find. Photo: Universitetets kulturhistoriske museer.

from the Oseberg grave, which has geometric inlay decorations on the shaft socket and hook (Fig. 5). The rattle as a whole is a Scandinavian object type, and the Oseberg example was most probably made in Norway. The decoration is unique for this type of object, however, and one cannot take one single artefact as proof that the inlay technique was well known in Norway in the early 9th century. I find it more likely that it reflects the milieu in which such an advanced technique was first introduced, perhaps by foreign craftsmen coming to work there, and perhaps parallel to the introduction of pattern-welding.

The 10th century and onwards

Some marked changes in weapon production technology took place around 900 AD, the most important being the cessation of the complicated herring-bone pattern-welding (Geibig 1991:fig. 41). This can in fact be inferred from Petersen (1919). While often mentioning pattern-welded blades on 9th century swords, he remarks, not without astonishment, that pattern-welding is not observed on most of the 10th century types, which he regards as imported, e.g. R and S. This change was probably a slow process, but as far as I can see, it took place simultaneously over a large area.

The same holds true for the spearheads. The new 10th century types, the most important of which were Petersen's I, K and M, have a very wide distribution, especially in Northern Europe (Fig. 6). These have a high frequency of a simpler kind of pattern-welding on the blades, a V-shaped ribbon between the core and the edges. The K type is the most numerous 10th century type in Norway, and it occurs in large numbers in Sweden, Finland and Estonia as well. The Estonian items are also pattern-welded with a single ribbon, while no information on this point is available for Sweden or Finland. Solberg finds that the K type, her type-group VII.2B, is of European origin, but deems it likely that the spearheads were manufactured in Norway (Solberg 1984:105, 108–09).

The I and K types are the earliest spearheads with inlay decorations on the socket. Geometric patterns with triangles, plaited ribbons and horizontal herring-bone lines predominate, i.e. Blindheim's pattern type Aa (Fig. 7; Blindheim 1963:42–48). Three spearheads with inlay decorations had been placed in the rich blacksmith's grave at Byggland in Morgedal, Telemark, and Blindheim interpreted these as the blacksmith's own products, and supporting her view by pointing to a concentration of similarly decorated spearheads in the surrounding area (Blindheim 1963:51). I have

found further support for her interpretation in some other concentrations of finds of decorated sword hilts and spearheads (Martens 2002).

The other most distinct concentration, centred around a rich blacksmith's grave at By in Hedmark, is of late Viking Age origin, mainly 11th century (Martens 1969; 2002). Here the sockets of the M-type spearheads are decorated in Ringerike style, which makes it very likely that they were made in the Nordic countries (Fuglesang 1980:42). The sword hilts are of Petersen's types T and Z.

Several new sword-types were introduced in the 10th century, and I shall confine myself here to a few types with decorated hilts. The hilts are often combined with blades having inscriptions and other signs on them, and this is the main century for ULFBERHT inscriptions, including the false ones (for a chronology, see Geibig 1991:Abb.41,155).

I shall start with Petersen's type O (Geibig's combination type IX), with five-lobed, sometimes seven-lobed pommels. Petersen divides this into three sub-groups: I – having the hilt/pommel in cast bronze with geometric ornaments, II – having an iron hilt with inlay animal and entrelac-style decorations, and III – having a lower pommel and geometric inlay.

Petersen never doubted that the O type had developed from the K type, and Geibig placed O III to-

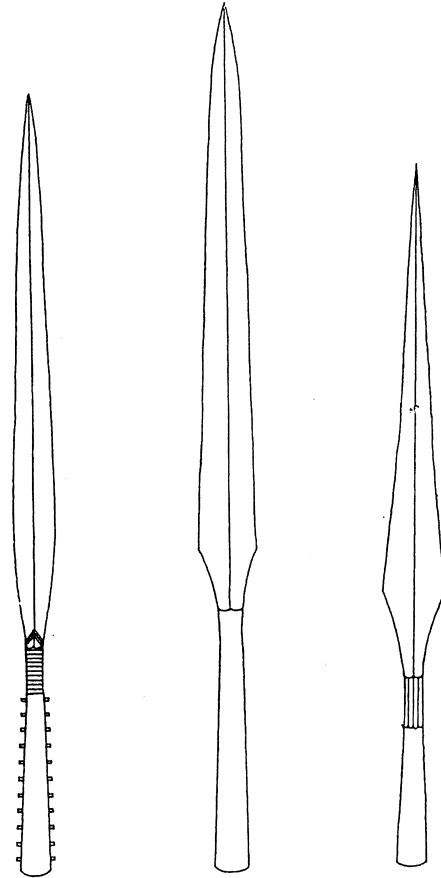


Figure 6. Spearheads of Petersen's types I, K and M.

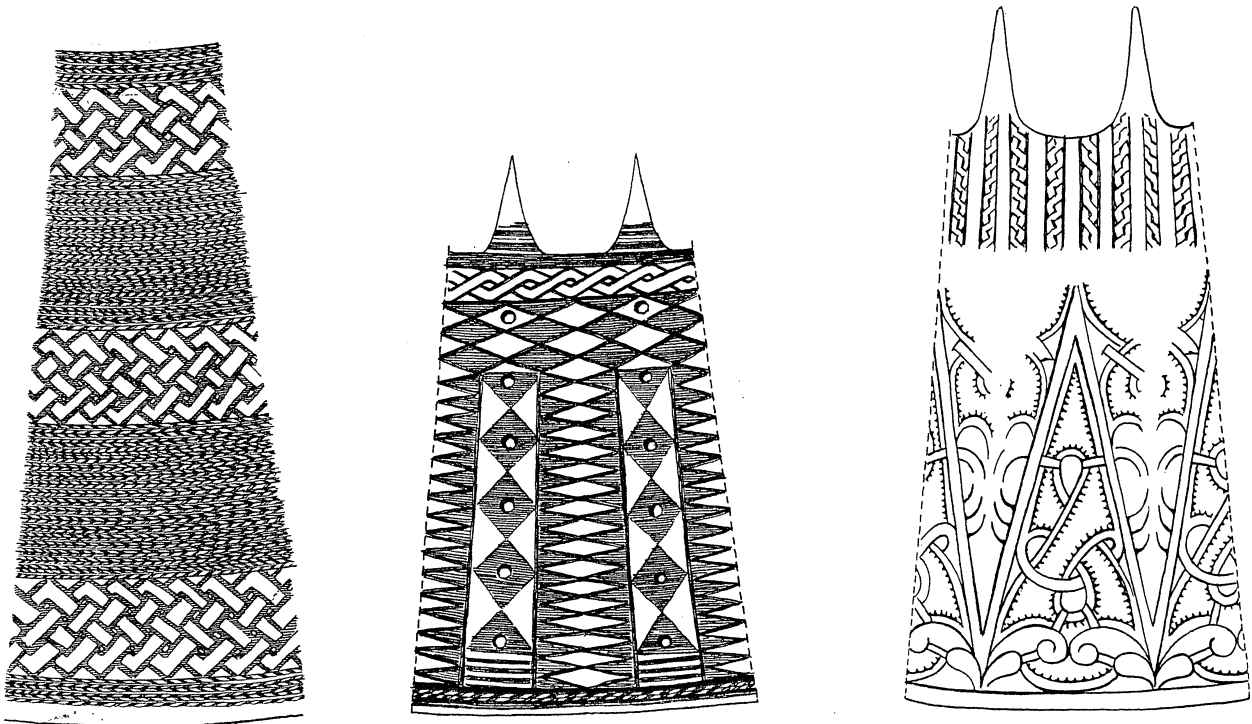


Figure 7. Socket decorations on spearheads: Blindheim's pattern types Aa, Ab, and B (Ringerike Style).

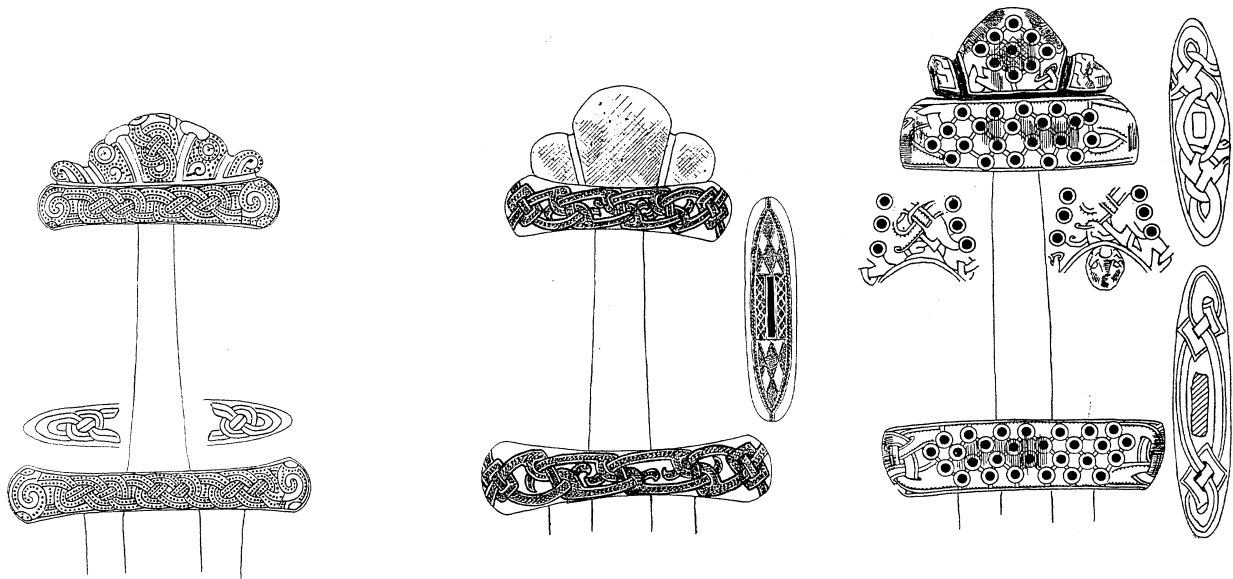


Figure 8. Decorated sword hilts of Petersen's types R, S and T.

gether with the K type in his combination group 6 (Geibig 1991:47), which is quite natural. The guards on the O type are slightly curved and the ends extended on the concave side. The interesting point here is that an originally continental type had evidently developed into two other ones which showed distinct differences in decoration, one of them distinguished most obviously by being cast in bronze. Does this mean that sub-groups I and II were made in different areas? It is high time to pay more attention this type of question, as also to the patterns related to the different hilt types.

The R swords have straight guards with extended ends, and the pommel has a thick middle part and end parts more or less in the shape of distinct animal heads. The similarities between the R and S types have often been emphasised. The hilts are of the same shape, but heavier on the S type, the thick middle part of the pommel is more pronounced in this latter type and the end parts normally bear no likeness to animal heads. Geibig placed the two together in his combination group 10, but I wish to point to certain differences which I find important. Firstly the decorations. Even though both types have inlay decorations, the patterns are different.

The O II and R type hilts are similarly decorated in entrelac patterns ending in spirals, normally with single contour lines and a central line. The inner parts of the ribbons are filled with dots and the pattern covers all the side panels and the pommel. The S type ei-

ther has decorations in the Jellinge style or entrelac motifs, often two ribbons symmetrically arranged along the longitudinal axis and joined in knots. The inner parts of the ribbons are patterned, and these motifs stand out against the background (Fig. 8). The top and underside of the hilt have different patterns, too: simple knots on the O II and R types but geometric patterns on the S type.

The S type is the most numerous one and is widely distributed in the Nordic countries and eastern Europe, with a small number in the west. The R type is rarely found outside the Nordic countries (Jacobsson 1992: maps 226 and 225).

Petersen considered these types and the O type to be foreign, and points to several specimens with blade inscriptions, mostly *ULFBERHT* (Petersen 1919:132, 142, 149), whereas he thought that the S type had been copied at home. Arbman points to the animal heads on the R-type pommels as a Nordic feature. Geibig notes out that his combination types 9, 10 and 11, corresponding to Petersen's O, R/S and U/V/W types, have a very limited distribution in the area of the former Bundesrepublik Deutschland, nearly all the finds coming from the Hedeby and Hamburg areas. Thus, as more than 60% are found in the Scandinavian region, he suggests a Scandinavian origin for these types. Moulds for O I bronze hilts found in Hedeby shows that they were evidently produced there (Geibig 1990:241 and 250).

Müller-Wille suggests that various metal objects

decorated in the Jellinge style were made in a workshop belonging to the Jellinge dynasty. He also mentions the two S-type swords from Busdorf bei Hedeby decorated in the Jellinge style, which obviously indicates that they came from this workshop (Müller-Wille 1986:165–66).

I have referred elsewhere to several R, T, V and Z swords found in association with spearheads having inlay decorations on the sockets, the R and V swords with spearheads having geometric Aa patterns and the T and Z swords with spearheads decorated in the Ringerike style (B patterns). I know of no combinations of S swords with Aa-decorated spearheads, however, although the well-known grave at Gjermundbu, for example, contains an S sword and a spearhead with a geometric Ab pattern not visible to Grieg when he published the find (Grieg 1947: Pl. II and IV:10). My interpretation is that a sword and spearhead with inlay decorations found in one grave or on the same farm will normally have been made by the same blacksmith, and that except for the Gjermundbu type of combination, they will be of indigenous manufacture.

Petersen mentioned that several of the relevant swords had the inscription *ULFBERHT* on them, and it is interesting to note that some of these are found on Geibig's list of possible inscriptions (Geibig 1991, Liste:121: No.113, 114 119).

My conclusion so far is that Petersen's sword types O II, R, T, V and Z were made in several places in the Nordic area and perhaps even in the Baltic countries, by a limited number of blacksmiths. The S swords differ from these in several respects and have a much wider distribution outside northern Europe, probably reflecting more widespread places of production. Inscriptions alone are not suitable for establishing the origin of sword blades, but must be studied in combination with a detailed investigation, including blade properties in general.

A recent study of Petersen's M-type spearheads found around the central part of the Baltic Sea, in Sweden, Finland, Estonia, Latvia and the adjacent part of Russia, emphasizes the importance of detailed studies, including radiographs (Creutz 2003). These spearheads, which are often decorated with incrustations in the Ringerike style, are mainly of 11th century origin.

One important point is Creutz' identification of 25 blacksmiths who made M-type spearheads, partly based on special features such as knobs, facets and the inside of the transitional part. She was also able to detect the personal touches of certain blacksmiths, although she admits that the identifications are partly impressionistic (Creutz 2003:164–5 Ch.11.3).

In ten cases only two spearheads could be attributed to the same blacksmith, and more than 50% of the total stock could not be attributed to any particular blacksmith at all. Still, I find Creutz' results very promising, but again they should be supplemented with technical investigations, e.g. into the raw materials used.

Conclusions

My aim here is not to reach conclusions on where the different sword and spearhead types were produced or to take into account all the details relevant to future research. I am rather calling for more precise questions to be asked as a basis for detailed studies. Further progress will to a large extent depend on technical investigations, above all radiographs, which are non-destructive and can be carried out on a large number of objects. It is necessary to point out, however, that radiographs only reveal a minimum number of blade inscriptions, for instance, and that they have to be supplemented by other methods, above all metallography, which give more details about blade composition and the steel qualities used.

Some major changes in blade composition and smithing techniques probably took place in the middle part of the Viking Age, affecting both swords and spearheads. It was then that the classical pattern-welding disappeared and blade inscriptions become more frequent. These changes are poorly known at present, but may be of great importance from several points of view, including the spread of technical skills and the possibilities for observing regional differences. Opinions based on beliefs have to be replaced by firm knowledge of the properties of the weapons themselves.

It may even be necessary to look for new alternatives. One would be the possibility semi-fabricated objects were imported into the Nordic countries, e.g. pattern-welded blanks which could be provided with edges and forged into swords and spearheads locally. The five sword blades found at Hultestad, Öland, are probably a deposit of imports intended to be fitted with hilts in Sweden (Arbman 1937:232).

We now have to look for methods of revealing regional differences in steel quality, e.g. trace element analyses, and the same is true of differences in welding techniques, including pattern-welding, but these probably depend as much on how such techniques spread among the smiths who made the weapons. Were inlay decorations and the production of specialized blades carried out by the same smith or by specialists working separately?

Such questions strongly underline the need for a variety of technical investigations carried out through close cooperation between archaeologists and metallurgists. And, above all, they stress the necessity for studying combinations of elements and not just certain spectacular ones.

My hypothesis on the spread of specialized technologies is that they were learned by a small number of Nordic blacksmiths in the 9th century. These blacksmiths probably worked in centres such as royal farms and those of important chieftains, and perhaps in the Viking towns of Hedeby, Birka and Kaupang, and such centres continued to play an important part in the production of high quality weapons throughout the period, taking up innovations from continental smithies.

How the specialized technologies reached the Nordic countries is another question. It was probably a matter of direct learning by one man from another, but where were the continental specialist smithies situated, and were the Vikings in direct contact with them? Did they bring specialists back to their homelands, or were the indigenous craftsmen able to work out the specialized techniques simply by studying imported specimens?

Specialized technologies probably did not spread to the ordinary country blacksmiths, or did so only to a limited degree, although the weapon smiths, who never reached any great numbers, were a highly skilled minority. It seems reasonable to assume that a certain amount of development took place during the period, but again detailed studies would be needed to perceive this.

More precise knowledge about the production of weapons would be important for studying the relations between the central European area, especially the Frankish empire, and the outside world, particularly the Nordic countries as far as I am concerned. Weapons have never occupied the place they deserve in discussions about trade relations, and they have, consciously or unconsciously, been associated mainly with Viking raiders. One fact should be pointed out, however: that the presence of bronze objects such as mounts and bowls, many made for ecclesiastical purposes, in the rich Norwegian material indicates that many items had been acquired by robbery and were predominantly of insular (Anglo-Saxon and Irish) origin, even though a substantial number of Frankish pieces also occur.

It is different with weapons, however, as the majority of those of foreign make were of continental origin, while only one type, the L type is known for certain to be Anglo-Saxon. This is an indication that the two groups of objects reached Norway in different ways,

and that weapons were probably the most substantial trade goods of all. This fact alone is a good reason for paying more attention to the production and distribution of weapons.

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