

# 1. INTRODUCTION

Norwegian Viking Age swords were single or double-edged one-handed weapons, both of which were produced using the same types of metal, most often with iron hilts. With a blade length of 70–90 cm, and often richly decorated hilts, these swords have become defining artefacts of the period. The number of Viking Age swords found in Norway is by far the largest in any country. No exact number is available, but a reasonable estimate is more than 3,000. This is close to double what was known at the time of Jan Petersen's defining work on Norwegian Viking swords, *De Norske Vikingesverd* (1919).

In this book we will examine the approximately 220 Viking Age swords found in the county of Telemark (formerly Bratsberg amt) in southeastern Norway (see Figure 1).<sup>1</sup> Using X-radiographs and metallography, combined with hardness measurements, we shed new light on the materials and techniques used for the production of the swords, in addition to examining the cultural and historical contexts.

Where find circumstances are known, the swords come from graves. Many swords are single finds, but even such finds are usually assumed to be from burials. Occasionally weapons can also occur in votive deposits (Lund 2009:31–69).

The high number of swords is not the only feature distinguishing Norway. There are several hilt types that are numerous here – and some less common ones – which are rarely found outside the country, and which are undoubtedly of indigenous origin and manufacture (as discussed in Chapter 4).

The great number of single-edged swords is another characteristic trait for Norway. They were common, albeit with decreasing frequency, throughout most of the period. Petersen calculates 370 (1919:6) such swords. All blades were of the same shape, with a straight back and the edge curving to the tip (R 498).<sup>2</sup> The same type of hilt is found on both single and double-edged blades.

The large number of known Norwegian Viking Age swords means that swords were not only a weapon for society's upper classes, but also a symbol of free men.

This is indicated by the wide distribution of finds in all parts of the country, including high numbers in the interior parts of Eastern Norway, where the central parts of Telemark are situated (Martens 2003:55ff).

As we will argue, these features show that there was comprehensive indigenous production of swords. This is a vital point for our studies and for understanding the social contexts of weaponsmithing in the Viking Age.

## 1.1 THE AIM AND METHODS OF RESEARCH

The aim of the research is to study the materials and techniques used on indigenously produced swords, while considering the degree of specialisation needed to produce them. We start with the specifications for a high quality sword both as a functional weapon and an aesthetic status object. A well-crafted sword needed a combination of strength, elasticity and sharp edges. Undoubtedly, only an experienced blacksmith could make such a sword. The prerequisites to achieve both functions are:

1. Good knowledge of the materials used and the ability to improve iron quality by carburisation in a predictable and successful way.
2. Skilled execution of the smithing process and possibly also secondary treatment: quenching and annealing.

The methods applied to study the blacksmiths' knowledge and skills are X-radiographs and metallography, combined with hardness measures. Metallography reveals far more details on sword blade construction, materials and possible secondary treatment, but can only be applied to a limited number of items; while radiographs can be used on all blades in which the metal has been preserved. A combination of the two methods is therefore important.

Blade typology or the ways in which pommels were fastened to the upper guard have not been considered – X-ray photographs of the guards were not made, and one characteristic of the most common indigenous hilt types is that they have no pommels.

1 All swords and other archaeological artefacts are identified with their corresponding museum number. Artefacts from the Museum of Cultural History are designated as C.xxxx, e.g. C.5544. Information is available at UniMus, a database of archaeological artefacts and samples from the archaeological university museums of Oslo, Stavanger, Bergen, Trondheim and Tromsø. See the university museums' web portals <<http://unimus.no>>

2 R and a following number will in this publication relate to key artefacts in "Norske Oldsager" (Rygh 1885).



**Figure 1.1.** Overview map with an outline of Telemark county. Map: K. Loftsgarden, KHM (CC BY-SA 4.0).

### Background

Single-edged swords, dated to the Merovingian and early Viking periods, without preserved hilts are found in all regions of Norway. The most numerous type is characterised by a straight back, with the edge curving to the point (R 498). These swords have not been subject to technical investigations, and the quality of the blades is therefore unknown. X-radiographs of all the Danish specimens of the same blade shape showed a simple construction, not comprising pattern welding or welded-on edges (Nørgård Jørgensen 1999:46). This makes it reasonable to suppose that the Norwegian swords were made in the same way.

Bergljot Solberg's (1984) comprehensive investigation of Norwegian spearheads from the Merovingian and Viking periods shows the same simple construction. Based on the number of weapons found in Norway and the simple construction of many, we argue that a certain number of weaponsmiths were at work in Norway at the beginning of the Viking Age. We further argue that manufacturing was decentralised in general, without the use of advanced techniques. Nevertheless, we should note that it may be difficult to discern which weapons were imported and which were made domestically (Martens 2004).

### Specialisation

Radomir Pleiner's (2006) approach to the question of specialisation is of great relevance to our research. In his comprehensive work *Iron in Archaeology: Early European Blacksmiths* from 2006, Chapter XI deals with reconstructed technologies, based on the metallography of a large number of weapons and tools, carried out by himself and others.

Pleiner divides smithing techniques into three levels:

1. Simple techniques, comprising working of low carbon and heterogeneous wrought iron. Simple shaping of one piece of material and forge-welding of carbon-poor iron, including piled blades (Pleiner 2006:196–200).
2. Advanced techniques includes additional carburising, heat treatment, forge-welding of iron and hardenable steel in several different combinations, among them steel shells, iron-steel-iron sandwich, edge steel. Welding-in the steel, either as scarf-welding or butt-welding i.e. perpendicularly to the long axis of the artefact's cross-section "surface to surface" (Pleiner 2006:200–212, Figure 71).
3. Top techniques comprises striped blades (see Pleiner 2006:XXVIII, 2–4), pattern-welding, making of chain-mail and plate armour, lock-smithing and clock-making.

It is important to study sword production in a wider technical context. The same smiths most likely made both swords and spearheads, and consequently it is important to take the production of spearheads into account as well.

In her study of spearheads found in Norway, Solberg based her research on X-radiographs of 881 Viking Age (c. 750–1050 AD) spearheads (1984:246). She states that several of her type groups were made in specialised or highly specialised workshops (1984). She does not define the two terms, but from the text it is obvious that pattern welding was carried out in highly specialised workshops, while some decorative elements, like horizontal circles on elevated parts of the socket, believed by her to have been made by using a lathe, were produced in specialised workshops. As metallography did not form part of her project, the materials used and smithing qualities could not be examined. Nevertheless, her results are of great interest to our work, as 99 of the finds are from Telemark.

Both of the criteria Solberg used, pattern welding and decorations, refer to the aesthetic appearance of the spearheads, not their qualities as weapons. For pattern welding she used a modified version of Jüri

Selirand (1975), in all nine pattern types including single, double and serrated strip patterns, swords 1–3 (1984:Figure 19). As with sword blades, it is difficult to distinguish between imported and indigenously made items. Advanced techniques include inlay decorations on sword hilts and spearhead sockets. The study of such decorations can therefore reveal the technical skills mastered by Norwegian blacksmiths.

### *Typology*

Petersen's typology (1919) based on hilts has been widely used in European Viking Age research and has proved very serviceable. Several other typologies have been published, but we prefer Petersen's, supplemented by the comprehensive and more systematic one by Alfred Geibig (1991). Some remarks and revisions are appropriate, such as an effort to combine typology with hilt decorations (Chapter 4).

## 1.2 WEAPON PRODUCTION AND SOCIETY

The research area, Telemark, is large and diverse, stretching from the Hardangervidda mountain plateau in the north to the milder coastal regions in the south. Settlement conditions vary considerably within the county, and some general outlines are presented in Chapter 2. Lakes and rivers connected settlement areas, and in combination with other lines of communication, they are a good indication of the location and type of centres one can expect to find there (see map Figure 2.1a and below Chapter 7).

It was revealed at an early stage in our investigations that advanced smithing techniques were introduced to, and carried out in Norway in the Viking Age, probably in smithies attached to centres, i.e. royal or chieftain's farms, or to marketplaces within their domain. Key questions for our research were: How specialised was sword production in Telemark and how was it organised? New techniques were certainly not indigenous inventions. In order to compare the knowledge and skills achieved by Norwegian weaponsmiths during the period, a survey of other technical investigations was necessary. In our project we have stressed collaboration between technicians and archaeologists, and relevance to specified archaeological problems.

Our aim is to clarify the transference of skills in Telemark and to search for places (communities) where technically advanced blacksmiths were at work. In order to approach these questions the find distribution within Telemark is important, and because of the inner variations in topography, we have found it necessary to divide the county into four parts (Maps, Figure 2.1a–b).

At this stage of research, possible places for smithies mastering top techniques must rely on a concentration of high-level objects. We are, however, aware of the need for better and more accurate criteria in future investigations.

One basic question relates to access to raw materials. Initially, the relation between iron extraction and weapons production was most relevant, and the choice of Telemark as the area for investigation partly relied on Martens' excavations of the extensive iron extraction sites at Møsstrond in the municipalities Vinje and Tinn (Martens 1988). Today other conditions are equally relevant, such as the question of who had access to other metals, especially silver and copper for inlay decorations on sword hilts and spearhead sockets, and how these metals were spread and distributed inland, even though only a limited number of weapons were equipped with such decorations.

The results of the Kaupang excavations in the neighbouring county of Vestfold underline the importance of access to raw materials. Unn Pedersen states, "The survey of the evidence from Kaupang leaves us in little doubt that the non-ferrous metalworkers had access to exceptionally good raw materials" (2016:194). Further, "Non-ferrous metalworking seems to have reached Kaupang as a fully developed craft." And, "The discussion of the finds from Kaupang has concurrently shown that there are other types of sites at which non-ferrous metalworking was carried out in a similar manner" (2016:197–198).

The finds from Kaupang are all remains of casting procedures, but access to raw materials were independent of craft techniques, and the same holds true for the problems of how advanced techniques were spread from innovation centres to other areas. The Kaupang finds are predominantly from the 9<sup>th</sup> century, while indigenously made inlay decorations on weapons before c. 900 AD is uncertain. In the 10<sup>th</sup> and 11<sup>th</sup> centuries, an ample supply of silver is well substantiated by the many silver hoards. These are distributed mainly in the coastal areas with concentrations that may indicate centres (Grieg 1929:201).

## 1.3 FOREIGN INFLUENCES

Finally, we attempt to address the problem of source areas for advanced smithing techniques introduced in Telemark during the Viking Age. Relevant investigations are limited in number, but in connection with our studies of, for example, inlay decorations we find that it is high time to question the exaggerated importance of the Carolingian realm as the production centre for all the best quality weapons found in Central and Northern Europe.